

How Evidence-based Is US Dental Workforce Policy for Rural Communities?



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School of Public Health
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PREFACE

Populations residing in rural America have lower rates of dental care utilization, higher rates of dental caries, less water fluoridation, and fewer dentists per capita when compared to those living in urban environments. Dental workforce shortages in rural communities are endemic, despite the research on best practices for enhancing the rural workforce.

The Oral Health Workforce Research Center (OHWRC) at the Center for Health Workforce Studies (CHWS) at the University at Albany's School of Public Health completed a study to examine the alignment of policy and infrastructure with evidence-based workforce strategies to increase access to oral health services for rural populations. Research focuses on best practices as well as the barriers and facilitators to effective implementation of workforce strategies to increase the availability of oral health services.

This report was prepared for OHWRC by Miranda Werts, Ginachukwa Amah, and Elizabeth Mertz, with layout design by Leanne Keough.

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The mission of OHWRC is to provide accurate and policy-relevant research on the impact of the oral health workforce on oral health outcomes. The research conducted by OHWRC informs strategies designed to increase access to oral health services for vulnerable populations. OHWRC is based at CHWS at the School of Public Health, University at Albany, State University of New York (SUNY), and is the only HRSA-sponsored research center with a unique focus on the oral health workforce.

The views expressed in this report are those of OHWRC and do not necessarily represent positions or policies of the School of Public Health, University at Albany, SUNY.

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EXECUTIVE SUMMARY

BACKGROUND

Rural communities around the globe struggle with the recruitment and retention of health care providers, and dental care in the US is no different.¹⁻⁴ People residing in rural America have lower rates of dental care utilization, higher rates of dental caries, less access to fluoridated water, and fewer dentists per capita when compared to those living in urban environments.² Additionally, rural populations in general suffer poorer overall health outcomes than urban populations.⁵ Traditional approaches through recruitment and retention strategies, such as rural training programs or the National Health Service Corps (NHSC), have been utilized to improve access to oral health providers. Alternative approaches include expanding scope of practice for existing community-based providers and incorporating dental services into primary care practices or others in rural clinics.⁶⁻¹⁰ Teledentistry and mobile services can also extend the infrastructure into these communities. While there are many strategies, it is unclear how aligned state and federal policy are to support or inhibit the operationalization of these important approaches.

A Cochrane review in 2009 reporting on the efficacy of strategies to “increase the number of health professionals working in rural and underserved areas” found no studies with strong evidence for any strategy. When Cochrane updated this review in 2015, only one study was found that met any criteria, an outcomes study of implementing national health insurance in Taiwan.¹¹ A recent systematic review¹² and other literature^{2, 4} identified critical components of rural workforce recruitment, retention and viability, providing a reasonable evidence base against which to assess US health care policy efforts.¹³

This study examines the alignment of policy and infrastructure with evidence-based workforce strategies to increase access to oral health services for rural populations. We examine how and where best practices are employed across US states, the strength of the evidence on outcomes, and the policy factors that enable success in bringing access to oral health services for rural populations.

METHODS

A systematic review of evidence-based strategies specific to dental care constituted our starting point.¹² The review

by Godwin identified 8 positive and 12 negative factors that affected dentists’ decisions to live and work in rural areas, and detailed 6 distinct strategies to enhance the dental workforce in rural communities. OHWRC researchers conducted an additional review of published and grey literature to identify research between 2014-2019, resulting in the identification of 4 additional strategies, for a total of 10 strategies, categorized as primarily retention, recruitment, or redesign.

For each strategy, web searches and literature reviews were conducted using PubMed, Library of Congress, and other related search engines, using terms specific to each topic and related factors. The use and prevalence of each strategy across the US was then assessed as well as any evidence on the strategies’ effectiveness in rural areas. Based on the volume and quality of the evidence, each strategy was categorized to be low (almost no studies or outcomes), medium (mixed studies or outcomes), or high (strong studies or outcomes). Any policies—federal, state, or local—as well as institutional support (eg, university programs) were highlighted to assess whether strategy implementation coincided with the strength of the evidence base.

KEY FINDINGS

Recruitment

- Student loan repayment programs (LRP) and scholarships supported on the state and federal policy levels, through programs like the National Health Service Corps, provide financial incentives to practice in rural areas. Though the available evidence shows some effectiveness in recruiting providers to these areas, long-term retention has proven difficult.
- Dental pipeline programs, often philanthropically funded, have provided a path of support for underrepresented and low-income students to become dentists. Although not all are focused specifically on students with rural backgrounds, some are, and there is evidence to support the positive impact of these programs on recruiting students who go on to serve rural and underserved communities.
- While there are some state-based initiatives to increase dentists’ salary through increased Medicaid reimbursement, there is minimal evidence that increased remuneration

ation is an effective or widely used strategy in the US to recruit providers to rural areas.

- The current use of the J-1 Visa and Conrad 30 Waiver Program to recruit foreign-trained medical professionals to rural practice has shown some effectiveness. However, currently these mechanisms are not used in the dental field.

Retention

- There is a high level of evidence supporting that increasing the number of dental students with rural upbringings improves retention. Being from rural areas, they are likely to be more comfortable living in the community and acclimating to rural life, as well as more satisfied with their professional environment.¹³
- Currently there are 66 dental programs in the US. Nine of those programs opened in the last 10 years and 2 have opened in the last 5 years, some with support through state funding.¹⁴ Although these schools are in urban centers of rural states and thus are not located in rural ZIP codes, many have implemented externship and training programs in the surrounding rural areas.¹⁴⁻¹⁷ However, long-term impacts have not been adequately assessed, especially for newly established schools.
- While there is some evidence that placing health care students in rural areas for externship increases their receptivity of practicing in rural areas, extensive research on this strategy in the US is lacking. Federal funding through HRSA provides grants for dental school programs to incorporate externships in underserved communities; however, these grants usually focus on certain specialties and are not solely intended for rural education.¹⁸ The lack of dental services to serve as training site in rural communities may be a limitation.

Redesign

- Community dental health coordinators currently work in 45 states across the country and have proven to be effective in bridging the divide between community and clinic by giving presentations to community members, using motivational interviewing, and conducting one-on-one counseling on oral health.¹⁹⁻²¹ Their presence in rural areas of the country, from the Southwest to the Appalachia region, has improved patient experience and increased access to care.^{19, 20, 22}

- In the past 2 decades, following the implementation of dental therapy in Alaska, eleven other states have implemented dental therapy in varying degrees.²³ There is evidence from several studies assessing early adopters, Alaska and Minnesota, that show that this new dental role has expanded access to dental care, especially for tribal communities, which are predominantly rural.²⁴⁻²⁶
- State legislation expanding dental hygienists' scope of practice through direct access has allowed hygienists to practice independently and has proven to be more affordable and accessible, and the evidence on the safety and effectiveness of direct access is fairly strong.²⁷⁻²⁹ In addition, studies have shown that DHs in public health programs have improved access to care and quality of life in rural and socioeconomically disadvantaged communities.³⁰
- There is widespread support in both the medical and dental field to expand scope of practice for primary care providers to include preventive oral health services (POHS).³¹⁻³³ Strong evidence was found supporting the improvement of oral health access in underserved areas when states implemented these services by giving primary care physicians with Medicaid reimbursements for POHS.³⁴⁻³⁷ However, federal and state policy can better align with the strong evidence-base supporting this strategy.
- Nearly all states had at least one mobile clinic serving some portion of its residents, with roughly half of states serving rural areas and approximately a quarter target rural populations.³⁸ In addition, telehealth has been extensively researched and reported on as a viable option to extend care into rural communities in both the medical and dental field.³⁹ It is also a strategy that is only expected to continue growing given the novel coronavirus pandemic.
- Federal and state entities (CDC, HRSA) often fund private organizations, usually nonprofits, who run the school-based dental programs.⁴⁰⁻⁴³ Though the literature review produced case studies of school-based dental programs in rural areas, it did not produce any research analyzing the effectiveness of those programs.
- Federal and state investment in Rural Health Clinics, rural community health centers, as well as Indian Health Service clinics and other community health centers, forms

the care delivery basis for placements by dental loan repayment, are the partners for dental education, and often the sole source of care. Without these sites, access to care in many rural communities would be non-existent.⁴⁴

DISCUSSION AND CONCLUSIONS

Rural communities in the US face a host of challenges when it comes to accessing high quality sustainable health care services, including oral health care.⁴⁵ The state and federal government have an important role to play in creating regulatory and fiscal environments that can improve access for rural communities.⁴⁶ This paper sought to examine the alignment of policy and infrastructure in the US with evidence-based workforce strategies to increase access to oral health services for rural populations. This report presents a comprehensive scoping review of the use and evidence behind these key strategies in the US health policy context.

The 2014 systematic review's main finding was a lack of "comprehensive or definitive research into the influences on the work movement decisions made by dental practitioners" and the studies they did find found no definitive evidence about the long-term recruitment and retention of dental practitioners to rural communities.¹² Not surprisingly, our analyses found many of the most popular recruitment approaches, such as loan repayment programs, while showing immediate impact, lack a strong empirical basis for long-term success. Because the US lacks central health workforce planning, the strategies used to recruit dentists to rural communities tend to focus on individual incentives, usually financial. The strongest evidence to inform recruitment (and retention) efforts to rural areas was found in efforts that combined multiple approaches into a pipeline program with an explicitly rural focus. By addressing multiple factors that exist across those that are personal, professional, and financial, these programs have shown the combined impact at a high and sustainable level. Unfortunately, there are few of these in practice.

The strategies that were primarily for retention were recruiting rural students, locating dental schools in rural communities, and training rotations in rural communities. The factor with the most evidence that seems to be shared across studies for long-term retention is the impact of enjoying rural lifestyle – this is related to good personal relationship and a sense of integration into the community.¹²

This aligns with broader evidence across rural health care that finds the most consistent factor related to rural practice choice is growing up in a rural community.¹³ However, there is little state or federal policy with this specific focus.

What there is more evidence of in the past 2 decades comes from the policies and programs of educational training institutions. For example, outside of pipeline programs, moving to a holistic review admissions process may help identify students with a rural background. There has been a larger increase in community based dental education (CBDE) which provides exposure to rural practice. Reinforcing rural interest must be paired with stable employment opportunities for dentists in rural communities that are now lacking, where for example physicians can be employed without the additional cost of setting up a practice. Similar to our findings in the recruitment strategies, the retention approaches that combine multiple efforts seem to have greater potential for long-term success.

The current literature and policy focus remains on understanding and trying to modify personal factors related to dentists' individual choice through lifestyle and financial approaches. Largely absent from the suite of evidence-based solutions are structural approaches that take into account the changing model of care delivery. In particular, the workforce redesign approaches that include new team members or expand the scope and roles of existing team members has been extensively studied and found to be beneficial. Yet, most of these are not paired with rural-specific infrastructure and access strategies, all of which have strong evidence of impact, which might make them even more successful in the future. There are clear policy implications for improving evidence-based resource allocation and aligning state scope of practice policy for rural dental access.

LIMITATIONS

This study has several limitations. Researchers were restricted to reviewing literature and documents from existing programs where it was available. While the scoping review was comprehensive, relevant programs may have been missed if there is no publicly available information. Also, the lack of evidence due to minimal studies does not indicate lack of efficacy, simply that researchers can't find strong studies.

REFERENCES

1. Hart LG, Salsberg E, Phillips DM, Lishner DM. Rural health care providers in the United States. *J Rural Health*. 2002;18: 211-322. doi: 10.1111/j.1748-0361.2002.tb00932.x.
2. Skillman SM, et al. The challenge to delivering oral health services in rural America. *J Public Health Dent*. 2010;70(1)(suppl 1):S49-S57.
3. Wright B, Damiano PC, Bentler SE. Implementation of the Affordable Care Act and rural health clinic capacity in Iowa. *J Prim Care Community Health*. 2015;6(1):61-65.
4. Patterson DP, Andrilla CHA, Schwartz MR, Hager L, Skillman SM. *Assessing the Impact of Washington State's Oral Health Workforce on Patient Access to Care*. Seattle, WA: Center for Health Workforce Studies, University of Washington; 2017.
5. Hartley D. Rural health disparities, population health, and rural culture. *Am J Public Health*. 2004;94(10):1675-1678.
6. Freeman R. Dental therapists/hygienists working in remote-rural primary care: a structured review of effectiveness, efficiency, sustainability, acceptability and affordability. *Int Dent J*. 2013;63(2):103-12.
7. Naughton DK. Expanding oral care opportunities: Direct access care provided by dental hygienists in the United States. *J Evid Based Dent Pract*. 2014;(suppl14):S171-S182.
8. Biordi DL. Improving access and provision of preventive oral health care for very young, poor, and low-income children through a new interdisciplinary partnership. *Am J Public Health*. 2015;105(suppl 2):S23-S29.
9. Holwager D. The community dental health coordinator: Beyond the pilot study. *J Indiana Dent Assoc*. 2015;94(3):14-15.
10. Senturia K. Dental health aides in Alaska: A qualitative assessment to improve paediatric oral health in remote rural villages. *Community Dent Oral Epidemiol*. 2018;46(4):416-424. doi: 10.1111/cdoe.12385.
11. Grobler L, Marais BJ, Mabunda S. Interventions for increasing the proportion of health professionals practising in rural and other underserved areas. *Cochrane Database Syst Rev*. 2015;6:CD005314. doi: 10.1002/14651858.CD005314.pub3.
12. Godwin DM. Dental practitioner rural work movements: a systematic review. *Rural Remote Health*. 2014;14(3):2825.
13. Hempel S, Gibbons MM, Ulloa JG, et al. *Rural Healthcare Workforce: A Systematic Review*. Washington DC: Department of Veterans Affairs (US). December 2015.
14. The Keen Dentist. Two new US dental schools are set to open. <http://www.thekeendentist.com/two-new-dental-schools-set-open/>. Published September 12, 2017. Accessed September 4, 2019.
15. Clinical rotations. AT Still University Arizona School of Dentistry and Oral Health website. <https://www.atsu.edu/arizona-school-of-dentistry-and-oral-health/about-asdoh/clinical-rotations>. Accessed July 19, 2020.
16. About MOSDOH page. AT Still University Missouri School of Dentistry and Oral Health website. <https://www.atsu.edu/missouri-school-of-dentistry-and-oral-health/about-mosdoh/dental-school-of-the-future>. Accessed July 19, 2020.
17. School of Dental Medicine: Mission vision and values. East Carolina University website. <https://www.ecu.edu/cs-dhs/dental/missionVisionValues.cfm>. 2020. Accessed July 19, 2020.
18. Find grants. Health Resources and Services Administration website. <https://data.hrsa.gov/tools/find-grants>. Accessed November 22, 2019.
19. Manchir M. Community dental health coordinator programs expand. American Dental Association website. <https://www.ada.org/en/publications/ada-news/2017-archive/march/community-dental-health-coordinator-programs-expand>. Published March 20, 2017. Accessed July 10, 2019.
20. Lukens J. Community health workers get trained to reduce oral health disparities. Rural Health Information Hub website: Rural Monitor. <https://www.ruralhealthinfo.org/rural-monitor/chw-oral-health/>. Published March 15, 2017. Accessed May 22, 2019.
21. Regional oral health pathway. Rural Health Information Hub website. <https://www.ruralhealthinfo.org/project-examples/815>. Accessed May 22, 2019.
22. Breaking down barriers to oral health for all Americans: the community dental health coordinator. American Dental Association website. http://www.ada.org/~media/ADA/Advocacy/Files/ADA_Breaking_Down_Barriers-Community_Dental_Health_Coordinator.ashx. Published October 2012. Accessed September 17, 2020.
23. Nash DA, Mathu-Muju KR, Friedman JW. The dental therapist movement in the United States: A critique of current trends. *J Public Health Dent*. 2018;78(2):127-133.
24. Bader JD. Clinical technical performance of dental therapists in Alaska. *J Am Dent Assoc*. 2011;142(3):322-326.
25. Chi DL. Dental therapists linked to improved dental outcomes for Alaska Native communities in the Yukon-Kuskokwim Delta. *J Public Health Dent*. 2018;78(2): 175-182.

26. Wetterhall S. Cultural context in the effort to improve oral health among Alaska Native people: the dental health aide therapist model. *Am J Public Health*. 2011;101(10):1836-1840.
27. Freed JR, Perry DA, Kushman KE. Aspects of quality of dental hygiene care in supervised and unsupervised practices. *J Public Health Dent*. 1997;57(2):68-75.
28. Mertz E, Glassman P. Alternative practice dental hygiene in California: past, present, and future. *J Calif Dent Assoc*. 2011;39(1):37-46.
29. Langelier M, Continelli T, Moore J, Baker B, Surdu S. Expanded scopes of practice for dental hygienists associated with improved oral health outcomes for adults. *Health Affairs* (Millwood). 2016;35(12):2207-2215.
30. Olmsted JL. Public health dental hygiene: an option for improved quality of care and quality of life. *J Dent Hyg*. 2013;87(5):299-308.
31. Clark MB, Slayton RL. Fluoride use in caries prevention in the primary care setting. *Pediatrics*. 2014;134(3):626-633. doi: 10.1542/peds.2014-1699.
32. Manchir M. Family physicians' group backs oral health primary care plan. American Dental Association Website: ADA News. <https://www.ada.org/en/publications/ada-news/2016-archive/january/family-physicians-group-backs-oral-health-primary-care-plan#>. Published January 12, 2016. Accessed June 11, 2019.
33. Sams LD. Adoption and implementation of policies to support preventive dentistry initiatives for physicians: a national survey of Medicaid programs. *Am J Public Health*. 2013;103(8):e83-e90.
34. American Academy of Pediatrics. Policy Statement. Maintaining and improving the oral health of young children. *Pediatrics*. 2014;134(6):1224-1229. doi:10.1542/peds.2014-2984.
35. Helseth C. Finding new ways to meet oral health needs in rural areas. Rural Health Information Hub website: The Rural Monitor. <https://www.ruralhealthinfo.org/rural-monitor/oral-health-needs-in-rural-areas/>. Published August 17, 2010. Accessed July 22, 2019.
36. Kranz AM, Preisser JS, Rozier RG. Effects of physician-based preventive oral health services on dental caries. *Pediatrics*. 2015;136(1):107-114.
37. Reimbursing physicians for fluoride varnish. Pew Charitable Trusts website. <https://www.pewtrusts.org/en/research-and-analysis/articles/2011/08/29/reimbursing-physicians-for-fluoride-varnish>. Published August 29, 2011. Accessed September 22, 2020.
38. ADI Mobile Health. Mobile health clinic state and federal laws & regulations. <http://adi-mobile-health.com/wp-content/uploads/2017/01/Mobile-Health-Clinic-Regulations-Federal-State.pdf>. Accessed November 22, 2019.
39. Langelier M, Rodat C, Moore J. *Case Studies of 6 Teledentistry Programs: Strategies to Increase Access to General and Specialty Dental Services*. Rensselaer, NY: Oral Health Workforce Research Center, Center for Health Workforce Studies, School of Public Health, SUNY Albany; December 2016.
40. CDC-funded programs. Centers for Disease Control and Prevention website. https://www.cdc.gov/oralhealth/funded_programs/cooperative_agreements/index.htm. Published October 1, 2019. Accessed December 4, 2019.
41. Oral health program plans. Centers for Disease Control and Prevention website. https://www.cdc.gov/oralhealth/funded_programs/oh_plans/index.htm. Published November 6, 2019. Accessed December 4, 2019.
42. HRSA awards \$2.3 million to integrate oral health care into school-based health centers. Health Resources and Services Administration website. <https://www.hrsa.gov/about/news/press-releases/2011-09-27-oral-health.html>. Published September 27, 2011. Accessed September 22, 2020.
43. School-based health center grant awards. Health Resources and Services Administration website. <https://www.hrsa.gov/about/news/2012-tables/2012-12-18-school-based-awards.html>. Published December 19, 2012. Accessed November 22, 2019.
44. Langelier M, Surdu S, Rodat C. *Survey of Federally Qualified Health Centers to Understand Participation with Dental Residency Programs and Student Externship Rotations*. Rensselaer, NY: Oral Health Workforce Research Center, Center for Health Workforce Studies, School of Public Health, SUNY Albany; December 2016.
45. Weil AR. Rural health. *Health Affairs* (Millwood). 2019;38(12):1963.
46. Skinner E. Boosting oral health care in rural communities. National Conference of State Legislatures (NCSL) website. <https://www.ncsl.org/research/health/boosting-oral-health-care-in-rural-communities.aspx>. Published July 2020. Accessed September 22, 2020.



TECHNICAL REPORT

BACKGROUND

Rural communities around the globe struggle with the recruitment and retention of health care providers, and dental care in the United States (US) is no different.¹⁻⁴ People residing in rural America have lower rates of dental care utilization, higher rates of dental caries, less access to fluoridated water, and fewer dentists per capita when compared to those living in urban environments.² Additionally, rural populations in general suffer poorer overall health outcomes than urban populations.⁵ Dental workforce shortages in rural communities are endemic. The contributing factors include a lack of personal interest in rural practice by most providers, threadbare infrastructure for providing services in these regions, and gaps in supportive policy.⁶ Traditional approaches through recruitment and retention strategies, such as rural training programs, or the National Health Service Corps (NHSC), have been utilized to improve access to oral health providers. Alternative approaches include expanding scope of practice for existing community-based providers and incorporating dental services into primary care practices or others in rural clinics.⁷⁻¹¹ To build the infrastructure needed, Federally Qualified Health Centers (FQHCs) have continued to expand care in rural environments; however, while many health centers dispersed across the various Health Professional Shortage Areas (HPSAs) offer medical and psychological care, they often lack dental departments. Other approaches like teledentistry and mobile services can also extend the infrastructure into these communities. While these many strategies have been suggested and studied, it is unclear how state and federal policy are aligned to support or inhibit the operationalization of these important strategies.

A Cochrane review in 2009 reporting on the efficacy of strategies to “increase the number of health professionals working in rural and underserved areas” found no studies with strong evidence for any existing strategy. When Cochrane updated this review in 2015, only one study was found that met any criteria, an outcomes study of implementing national health insurance in Taiwan.¹² However, a recent systematic review⁶ and other literature^{2,4} have identified critical components of rural workforce recruitment, retention, and viability, providing a reasonable evidence base against which to assess US health care policy efforts.¹³

This report examines the alignment of policy and infrastructure with evidence-based workforce strategies to increase access to oral health services for rural populations. OHWRC researchers examine how and where best practices are being employed across US states, the strength of the evidence on outcomes, and the policy factors that enable success in bringing access to oral health services for rural populations.

METHODS

Evidence-based strategies specific to dental care identified in a systematic review of published literature in Organization for Economic Cooperation and Development countries from 1999 through 2013 constituted our starting point.⁶ The review identified 8 positive and 12 negative factors (Table 1) that affected dentists’

decisions to live and work in rural areas, and detailed 6 distinct strategies to enhance the dental workforce in rural communities.

TABLE 1. Factors Influencing Decisions to Practice in Rural Areas

| Factor Type | Positive | Negative |
|--------------|--|--|
| Personal | <ul style="list-style-type: none">● Personal support networks● Successful integration into the community● Enjoyment of rural lifestyle for both the individual and their family | <ul style="list-style-type: none">● Their own or their family's dissatisfaction with rural lifestyle● Inability to successfully integrate into the rural community● Social Isolation● Lack of access to education for children |
| Professional | <ul style="list-style-type: none">● Wide range of challenging clinical exposures● Increased clinical and administrative experience● Enjoyable patient base● Professional support networks | <ul style="list-style-type: none">● Access to further education and professional development opportunities● Limited access to facilities● Limited access to activities● Professional isolation● Increased workload● Inadequate time off duty● Type of clinical work undertaken |
| Financial | <ul style="list-style-type: none">● Appropriate salary remuneration | <ul style="list-style-type: none">● Limited job opportunities for the individual or their partner |

Source: Godwin et al 2014. Systematic review of factors influencing the rural dental workforce.

An additional review of published and grey literature was conducted to identify more recent research between 2014-2019 that described or assessed strategies that have been used to address the shortage of dentists in rural areas in the US. Our review resulted in the identification of 4 additional strategies, for a total of 10 strategies.

For each strategy, web searches and literature reviews were conducted using PubMed, Library of Congress, and other related search engines, using search terms specific to each topic and related factors. Information was then gathered to outline the use and prevalence of each strategy across the US as well as any evidence on the strategies' effectiveness in rural areas. Based on the amount and quality of the evidence, the evidence level for each strategy was determined as low (almost no studies or outcomes), medium (mixed studies or outcomes), or high (strong studies or outcomes). Any policies—federal, state, or local—as well as institutional support (eg, university programs) were highlighted to assess whether strategy implementation coincided with the strength of the evidence base for each strategy.

FINDINGS

Strategies

The Godwin et al 2014 review focused primarily on strategies that impact recruitment and retention of dental providers, while the additional 4 strategies included technology and the changing infrastructure of care delivery (Table 2). OHWRC researchers categorized these strategies as primarily a retention, recruitment, or redesign approach, with the acknowledgement that in some cases they may work across categories. Each strategy was then linked to the factors (positive or negative) that it addressed, categorized as personal, professional, or financial.

TABLE 2. Rural Dental Provider Recruitment, Retention, and Redesign Strategies

| Strategies | Primary Approach | Factors Addressed | Source |
|---|------------------|------------------------|--|
| Student scholarship or loan repayment schemes | Recruitment | Financial | Godwin et al 2014; Skillman et al 2010; Davis et al 2017 |
| Dental pipeline programs | Recruitment | Professional | Skillman et al 2010 |
| Increasing remuneration | Recruitment | Financial | Godwin et al 2014; Davis et al 2017 |
| Employing more foreign-trained dentists in rural areas | Recruitment | Personal | Godwin et al 2014 |
| Increasing the number of dental students with rural upbringings at universities | Retention | Personal | Godwin et al 2014; Skillman et al 2010 |
| Increasing dental school locations in rural areas | Retention | Personal | Godwin et al 2014 |
| Rural placement programs during training | Retention | Personal | Godwin et al 2014; Skillman et al 2010; Davis et al 2017 |
| New Dental Team Roles | Redesign | Professional | Skillman et al 2010 |
| Expanding Scope of Practice | Redesign | Professional | Davis et al 2017; Skillman et al 2010 |
| Local infrastructure for care delivery | Redesign | Personal, Professional | Skillman et al 2010; Davis et al 2017 |

Source: Godwin et al 2014. Systematic review identifying strategies to address rural workforce shortages; Skillman et al 2017. Challenge to delivering oral health services in rural America; Davis et al 2017. Washington State's Oral Health Workforce on Patient Access to Care.

Finally, for each strategy, programs or policies enacted at various levels of implementation (national, state, or institutional) were identified as well as the available evidence of program effectiveness in the US context. Lack of evidence does not mean the program is not effective, just that studies have not yet been conducted (Table 3).

TABLE 3. Implementation and Evidence Level of Rural Dental Provider Strategies

| Strategies | Implementation Level | Available Evidence |
|---|--|--------------------|
| Student scholarship or loan repayment schemes | State/Federal | Medium |
| Dental pipeline programs | Institutional (Education) | Medium |
| Increasing remuneration | Institutional | Low |
| Employing more foreign-trained dentists in rural areas | State (Licensing), Federal (Immigration) | Low |
| Increasing the number of dental students with rural upbringings at universities | Institutional (Education) | High |
| Increasing dental school locations in rural areas | Institutional (Education) | Medium |
| Rural placement programs during training | Institutional (Education) | Low |
| New Dental Team Roles | State (Legislation and licensing), Institutional (Education) | Medium |
| Expanding Scope of Practice | State (Legislation and licensing), Institutional (Education) | High |
| Local infrastructure for care delivery | Institutional | High |

Source: Godwin et al 2014. Systematic review identifying strategies to address rural workforce shortages; Skillman et al 2017. Challenge to delivering oral health services in rural America; Davis et al 2017. Washington state's oral health workforce on patient access to care.

Recruitment

Proposed recruitment strategies to increase available dental providers in rural areas focus on creating educational avenues through which the dental profession can be made accessible to rural residents while also encouraging exposure to rural practice for dental students. These recruitment strategies address multiple factors affecting practice decisions by investing in experiences that strengthen social and professional relationships in rural areas and providing financial support for those interested in rural practice. In addition, other strategies such as improving recruitment of existing dental professionals, specifically foreign-trained dentists (FTDs), and establishing or building more comprehensive dental pipeline programs are strategies that tap into neglected resources of the workforce. Financial incentives can also be an effective strategy to recruit individuals at the academic level through scholarships or at the professional level through loan repayment or increased salaries.

Student loan repayment programs (LRPs) pay off all or a portion of the student loans that burden dentists in exchange for work in underserved areas like rural areas, which are perceived as less desirable places to work or live. These loans can be used in rural areas to increase the supply of dentists, increasing the appeal by offsetting financial factors—often lower salaries or wages—that ordinarily deter dentists from setting up a practice or choosing to work in rural areas. Scholarships work in the same way; however, they are awarded prior to dental school, while loan repayment is applied for after dental school is complete.

This strategy of dental LRPs is implemented throughout the US at both the national and state level. The federal government and certain individual state governments provide funds for loan repayment for those dentists who work in designated areas, often for some predetermined minimum length of time. For example, the NHSC's programs, which includes the Rural Community Loan Repayment Program for rural settings, provide dentists working in NHSC sites in any state with assistance paying off their student loans.¹⁴ An additional \$300 million was granted to the NHSC in 2009 through the American Recovery and Reinvestment Act (Recovery Act), resulting in the large and rapid growth of the workforce supported by the NHSC. The Recovery Act also made it possible for all clinics in all HPSAs eligible to become NHSC sites automatically, doubling the number of NHSC sites to over 10,000.¹⁵ At the state level, 42 states have implemented at least one LRP, though only 10 states' programs are specifically for rural practice as opposed to HPSAs or underserved areas in general. In Kansas, the Kansas Initiative for New Dentists Program provides multiple scholarships and loan forgiveness grants for dental students who commit to practicing in rural areas as a Medicaid provider.¹⁶

While our search turned up a number of clearinghouses for finding a LRP—for example, the American Dental Education Association maintains a list,¹⁷ as do many state dental associations—the literature review produced a reasonable amount of evidence of effectiveness of student LRPs as a recruitment strategy to address the shortage of dentists in rural communities, but less evidence on long-term retention. One study examined the impact of the Recovery Act on the NHSC and found that the numbers in the LRPs' dental health disciplines roughly doubled during the period the act was in place, in part by opening LRPs to dental hygienists (DHs) as well.¹⁵ For dentists only, the workforce experienced moderate growth through the NHSC scholarship program. In total, across both the LRPs and scholarship programs assessed in the study, the number of dentists in rural areas almost tripled in size. A second study on Colorado LRPs pooled data from all types of clinicians involved in the program, including medical and dental professions. They determined that LRPs do impact the provider's initial choice of a community for placement, but may also play a role in retention of rural providers given that LRP participants self-reported that they remained in rural areas after their LRP was complete.¹⁸ While scholarships and loan repayment strategies are not a singular option to solving the provider shortages, it does help decrease the financial burden of dental school while making more clinicians available to practice in shortage areas.

Dental Pipeline Programs

Dental pipeline programs support individuals from underserved communities on their paths into the dental workforce. Because of their holistic, programmatic nature, they are able to address multiple factors influencing dentist practice decisions. From assisting undergraduates with dental school applications to providing scholarships and unique externship opportunities, pipeline programs have the capacity to expand and diversify the dental workforce to serve underserved communities by recruiting students from those backgrounds. As a result, personal factors such as strong social connections, integration into local lifestyle, and personal support networks are already in place for these individuals.¹⁹ Although regional pipeline programs incorporate several other strategies discussed in this report that stand on their own—among them being LRPs, rural clinic sessions, and recruitment of underrepresented students—their strengths may be magnified when utilized together in the pipeline program strategy.

The Robert Wood Johnson Foundation and the WK Kellogg Foundation invested in expanding the workforce in underserved and rural areas to address the issues of access and lack of diversity in the dental field by establishing the Dental Pipeline program in 2003.^{20, 21} Following 5 years of the program in California and the Northeast, with 15 total participating dental schools, evaluations of both regions showed an increase in underrepresented minority and low-income (URM/LI) student recruitment, with the applicant pool to participating programs almost doubling from 2003 to 2007. Although the final number of URM/LI enrollees was considerably lower than their applicant pool, the data illustrate a trend of increasing URM/LI enrollment, demonstrating that these recruitment patterns are effective and should be sustained to continue this positive increase.^{21, 22} As previously discussed, students from rural and underserved communities are more likely to return for work in those same communities, and the program evaluations found that student characteristics were significant in influencing graduates' decisions to provide care to underserved patients – including being an URM, or Asian/Pacific Islander, or from a lower-income family. The pipeline curriculum's focus on incorporating clinical rotations for senior students and residents at a variety of different dental facilities such as FQHCs, community hospitals, the Indian Health Service, and private practices was also shown to influence the desired practice locations of graduates.²² In a similar approach at Arizona's AT Still University dental school, the "Hometown Scholars" program highlights community-minded applicants and utilizes their knowledge to meet the needs of community health centers in the areas they come from, which may offer unique opportunities for rural-based applicants.²³ However, it is important to note that these programs had a broader focus beyond solely recruiting individuals from rural areas, so the evidence of the impact on rural communities as a result of these programs is unclear.

From the beginning of their education to their clinical practice decisions, pipeline programs are able to invest in individuals from rural and underserved communities and help improve access to oral health care for those specific communities. They can also serve to develop and reinforce interest in students who are not from rural areas toward rural practice.

Increased Remuneration

Many factors involved in the recruitment and retention of dentists revolve around financial incentives. A 2018 survey by the National Network for Oral Health Access (NNOHA) found that one of the main reasons dentists reject employment offers is due to inadequate salaries or benefits.²⁴ These were also important factors in dental graduates' decisions between private and public sector opportunities, and moving for financial incentives was found to be related to dentists staying in a rural region less than 5 years.^{25, 26} A literature review on the factors involved in retaining providers in rural practice, which primarily included studies on Australian dentists, found that salary is one of several positive influences on rural practice, but was never rated as the main reasons for staying in or leaving a rural position.²⁶ The same sentiment is echoed in the results from the NNOHA 2018 survey, stating that salary alone is not the sole reason dictating providers' reasons to stay in or leave Health Center practices, many of which are located in rural areas.²⁴ Beyond the NNOHA's survey of dental providers, little literature was found that assessed the effects on salary increases among American dentists; however, there is some mention of improving reimbursement for dental services, which is one method of increasing income, assuming the fee-for-service model then makes the greater reimbursement translate to higher income.

The Access to Baby & Child Dentistry (ABCD) program in Washington State, started in 1994, is one example of using reimbursement as an incentive to increase access to underserved populations. The ABCD program sought to address dental disease among children under 6 years of age, particularly among Medicaid-eligible children, and the lack of pediatric dentists to treat them. The program offered training programs and increased Medicaid reimbursement for certain procedures to dentists who completed the training.²⁰ Spokane launched the first ABCD program in 1995 in partnership with the state Medicaid administration, community partners, and state universities, and the program has now expanded to every county in Washington, many of which are rural, as counties volunteer to implement the program.^{4, 27} Ultimately, the ABCD program increased dental care utilization rates among Medicaid Children. In 2 years, Yakima County reported a 153% increase in the number of dentists serving Medicaid-enrolled children, and by 2010, the program quadrupled the number of children receiving dental care before their second birthday across the entire state.^{28, 29} Furthermore, dentists saw the program as having additional personal benefits. The training program allowed dentists to expand their skills and reach a new patient population, which is cited to be beneficial in times of economic downturn.^{28, 29} In addition, because the program is associated with the dental society, dentists felt they were having a direct effect on their community as a result of their professional career.²⁹

Professional and developmental opportunities paired with increased financial benefits, as exhibited by the ABCD program, which provide training opportunities in exchange for increased reimbursements for those procedures, can improve dentists' dedication to their work. It also shows how local and state policy can encourage these new programs. Beyond this program and strategy, not much evidence is present to determine if this would have a significant improvement on rural access. Dentists often earn high salaries—even in rural and underserved areas where entry-level can be over \$100,000—which may be a key reason why directly

increasing salary is not a common strategy in the US.²⁴ As such, increasing salary could have some effect if paired with other solutions, such as incorporating raises with additional professional opportunities to reward experience, thereby encouraging graduates to stay in the public sector and rural areas.²⁶ Other incentives like a flexible working schedule, leave policies, and fringe benefits can further supplement these income-based strategies, and are already reported to attract some dentists to remain in rural areas.²⁴

Foreign-Trained Dentists (FTDs) in Rural Areas

A strategy described in the systematic review as being used in other countries successfully is incentive programs that place FTDs in rural or underserved communities. This strategy was not found in the US. Despite the US being a major destination for foreign students and scholars, as well as having the largest number of international students, there are substantial barriers to practice in the US for FTDs.³⁰ These dentists, having received their classroom and clinical training in a foreign country, are required to repeat the majority of their education if they wish to practice in the US, passing through credential evaluations and multiple exams before admission to a dental school or residency program accredited by the Commission on Dental Accreditation (CODA).³¹⁻³⁴ While there are no current programs to incentivize FTDs to practice in rural communities in the US, the J-1 Visa program for medical professionals presents an existing infrastructure that could be expanded to include dentistry, thus reducing educational barriers and help foreign dentists' path to practice in the US without compromising patient safety.³¹

The J-1 Visa is an existing federal visa program, which—among other offerings—allows international medical graduates (IMGs) to complete a residency or fellowship training program in the US. Following the completion of a residency program in the US, IMGs are eligible for US board certification and licensure, connecting the education achieved internationally with training in the US. Additionally, the Conrad 30 Waiver Program, enabled by federal legislation but administered at the state level, waives the usual requirement of J-1 Visa holders to return to their home country for 2 years if the participating physician commits to working in federally designated HPSAs or Medically Underserved Areas, like rural regions of the US, for at least 3 years with the eventual possibility of obtaining permanent residency.^{35, 36} As such, the J-1 Visa, if expanded to include dentistry, can be utilized as a way for FTDs to enter the workforce in rural shortage areas.

It is difficult to ascertain potential impacts of expanding the J-1 Visa program and Conrad 30 waiver to include dentistry; however, assessments of the J-1 Visa and Conrad 30 waiver for physicians exhibit promising positive effects on access in rural areas, and thus provide some insight on its potential effectiveness to improve dental access in these same regions. For states participating in the waiver program, staff reported that the program was essential to addressing provider shortages, with approximately 800 to 1,000 IMGs recruited annually through the waiver program.³⁷ Almost 60% of their J-1 Visa waiver physicians trained in primary care rather than subspecialties, a likely result of targeted recruitment as state Conrad 30 program officials set policy on whether they will recruit and accept primary care versus specialist physicians. A preference for primary care is likely because recruitment of US-born primary care physicians is difficult since many choose to specialize due to income disparities between these career paths.³⁸ In contrast, a study conducted in Nebraska found that

the visa waiver was useful for recruiting IMGs practicing in particular specialties.³⁹ However, despite the initial recruitment success of a variety of physicians, there are large concerns over retention as many of the providers move to urban areas soon after their required 3 years of HPSA practice ends.³⁷⁻³⁹ As a result, the waiver program may serve as an effective interim solution to addressing the provider shortage in these underserved rural areas and could have more potential in the long term as retention issues are addressed.³⁸

When comparing the impacts of the Conrad 30 program waiver and LRPs, both are equally essential to rural health care delivery when controlling for the 3-year requirement.³⁹ The Conrad 30 program has clearly provided some increased benefit to medical care in rural communities by removing barriers to practice for IMGs. Therefore, the program has some face validity as a strategy to alleviate some of the dental shortages in rural areas if made available to international dental graduates; however, it would require building the infrastructure to support them. State governments must be willing to support the program in order for it to be successful, while dental residency programs would likely need to expand and accept FTDs on a J-1 Visa. Additionally, any policy put forth should address the factors influencing retention, particularly methods to mitigate the impacts of negative social and personal factors that come from living in a new community, such as providing a support network for international dentists to address the sense of isolation many immigrants experience.³⁷⁻⁴⁰ Furthermore, since many come to the US with their families, they tend to have greater financial needs than the average American graduate in order to support themselves and their families.³¹ Again, this strategy has been used in other countries to address dental provider shortages in rural areas, but no policy currently in the US was found to pursue this strategy.

Retention

Recruitment of providers to rural communities is important, but retaining them over the long term is critical for rural communities to benefit in a sustained manner. The retention strategies highlighted in the systematic review⁶ all have somewhat of an effect on recruitment as well, but primarily focus on increasing rural exposure of prospective dentists and addressing the social and personal factors that influence decisions both to enter and to remain in rural areas. Common negative social factors inhibiting retention are a sense of isolation and lack of integration into rural communities and lifestyles. Strategies like promoting enrollment of students with rural upbringings, expanding rural placement programs during training, and increasing the number of dental schools in rural areas all demonstrate ways in which these factors can be addressed.

Increasing the Number of Dental Students at Universities with Rural Upbringings

The recruitment of dental students with rural upbringings taps a source of potential providers willing and able to work in rural areas, increasing the supply of dentists in the area in the long term. Research has shown rural students have strong bonds to their rural community and lifestyle, thereby lessening the adjustment period and feelings of isolation. They are also likely to be more comfortable living in a rural environment and integrating into the community and acclimating to rural life, as well as more satisfied with their professional environment.¹³

On a national scale, there is no federal policy specifically supporting the recruitment of students with rural backgrounds to dental schools or programs.⁴¹ However, there are some state laws supporting institutions recruiting prospective dental students with rural upbringings to train and practice in rural communities, such as the case of the University of Mississippi Medical Center's Mississippi Rural Dentists Scholarship Program.⁴²⁻⁴⁴ This program identifies rural college students who want to practice general or pediatric dentistry in rural communities in the state and places them into a longitudinal program.⁴³ Following the initial identification of potential students, the program helps prepare these students for dental school admissions, provides them with provisional acceptance, and keeps them involved in Mississippi's rural health communities during training – all initiatives working to funnel them to practice opportunities in rural settings and support the establishment of new practices.⁴⁵

One of the most successful programs focused on rural dentists is the Regional Initiatives in Dental Education (RIDE) program at the University of Washington. According to their website, “RIDE was funded by the Washington State Legislature in 2007 and the first cohort of RIDE students graduated in 2012. Since then, it has returned over 70% of its graduates to practice in rural and underserved areas of Washington and the region.”⁴⁶ This program built off the successful regional partnership established in 1997 between Washington, Wyoming, Alaska, Montana, and Idaho (dubbed the WWAMI program), which ensured greater access to medical education in Washington for the states without a medical school.⁴⁷ It should be noted that these programs are essentially pipeline programs but with a very specific focus on rural students, which is why they are categorized under retention strategies.

There is little available research to assess the specific impact of programs that recruit dental students from rural upbringings on the oral health outcomes in rural areas of the country.⁴⁸ However, the evidence that students with rural backgrounds are more likely to work in rural settings is fairly strong.^{49, 50} For example, a 2016 study of all practicing dental graduates of Virginia Commonwealth from 2000 through 2014 compared the practice locations of all practicing dentists with their location of residence before admission and found that graduates from rural areas were 3 times more likely to practice in a rural area compared to their counterparts from urban areas.⁵¹ Philanthropy has invested heavily in such pipeline programs, but for sustainable development, this is a programmatic area ripe for policy change. Expanding and replicating successful programs such as RIDE through investment from both the institutions and multi-state agreements that sponsor them could greatly strengthen the investment in the rural dental workforce pipeline.

Increasing Dental School Locations in Rural Locations

On a larger scale, establishing dental schools in rural locations brings the education and facilities to the community's doorstep, increasing the supply of dentists willing and able to work in rural areas because the entire educational experience is centered within the rural community. Placing dental schools in these regions gives students greater opportunities to develop social and professional networks among their peers and integrate into the community. Furthermore, rural dental schools may provide more opportunities for education and

professional development for practicing dentists (eg, as professors and researchers), while being able to access a more local and immediate professional network.

Currently there are 66 dental programs in the US; 9 of those programs opened in the last 10 years and 2 have opened in the last 5 years.⁵² Some states have chosen to increase funding to recently opened schools to help them better establish themselves and serve the community. For example, Texas passed a bill through its legislature to increase funding to the Hunt School of Dental Medicine at Texas Tech University Health Sciences Center El Paso.⁵³

Of the 9 newly-established dental schools, 5 are located in HPSAs and 4 are in Medically Underserved Areas; however, none are in an area classified as rural by the Federal Office of Rural Health Policy, US Census Bureau, or Office of Management and Budget. While these schools reside in urban centers without a federally classified rural ZIP code, they are located in states that are considered largely rural, such as Arizona, Utah, North Carolina, Illinois, and Maine. While these states also have robust urban areas to draw practitioners, the new schools have implemented community-based programs that expand the schools' reach to include surrounding rural areas.⁵² East Carolina University School of Dental Medicine enrolled its first class in 2011 with the specific goal to address the shortage of dentists in rural underserved regions across North Carolina.⁵⁴ AT Still University in Arizona established the first dental school in the state in 2007—the Arizona School of Dentistry and Oral Health—that focuses on providing clinical opportunities to serve the underserved, sending students in their final year through clinical rotations in community clinics and safety net clinics, many of which are in rural locations.⁵⁵ Their sister campus in Missouri enrolled its first class in 2013 and provides the full didactic portion of the education in Kirksville, a small town surrounded by primarily rural communities, followed by clinical training in St. Louis.⁵⁶ These schools exemplify the multiple ways to extend dental education into rural communities. Programs like these that are in smaller urban centers but include broader community experiences in rural areas as well as programs located in federally classified rural ZIP codes contribute to the goal of increasing dental school locations to improve rural access to dental care.

The lack of evidence supporting placing dental schools in rural areas as an effective strategy came as no surprise considering there are few dental schools being established in rural areas, and the examples provided are more recently established and therefore may not have been studied for long-term effects. The few existing assessments of the schools and programs in rural areas examine students' initial perceptions and decision-making, but the shift in attitudes towards rural practice, which lead to individual practice choices, must be paired with employment and economic strategies to make rural dental practice viable.⁵⁷⁻⁵⁹ Opportunities for state investment in focused educational tracks, along with the federal government and state governments funding institutions of higher learning like dental schools, can push the needle towards expanding the rural focus of dental schools in the US.

Rural Placement Programs During Training

Rural dental externships are immersive educational experiences for dental students and residents to observe how a dental clinic or practice functions, and provides them with the opportunity to build personal and professional relationships in those communities. Rural exposure through externships is intended to increase the likelihood of dental graduates who choose to take up rural practice, thus raising the number of providers in rural areas. These externships also benefit rural communities because they supply these communities with providers in training who can administer oral health services.

Numerous institutions have created programs to place their dental students in rural areas for externship. According to a 2019 study surveying 31 US dental schools, roughly 79% of programs send their students to rural areas for extramural rotations.⁶⁰ The Health Resources and Services Administration (HRSA) also provides grants for dental school programs to incorporate externships in underserved communities; however, these grants usually focus on certain specialties and are not solely intended for rural education of dental students.⁶¹ State government entities or institutions that place or support dental students in dental HPSAs (DHPSAs), some of which are rural, may also receive funding from HRSA through the Bureau of Health Workforce.⁶²

The Yakima Valley Farm Workers Clinic system in Washington and Oregon is one example of a community health center-based training program that utilizes an externship partnership with dental programs. The system serves a primarily low-income and rural population, hosts both a pediatric and general residency training program, and many of the residents remain in these communities after their training. Similarly, the Marshfield Clinics in Wisconsin both serve the rural community and train post-graduate dental providers.⁶³

Although there is some evidence that placing health care students in rural areas for externships increases their receptivity of practicing in rural areas, extensive research on this strategy in the US is lacking. A single study conducted in 2016 was found that examines whether rural externships have an impact on practice location among dentists. The results of this study, which analyzed data collected from over a decade of surveying dental students at West Virginia University, found that students were indeed more likely to predict they would practice in rural areas following rural community rotations.⁶⁴

Policy supporting educational placements in rural communities is highly variable. While there is infrastructure in place to expand this strategy through existing HRSA funding, which supports both pre- and post-doctoral education, this funding is dwarfed by Graduate Medical Education funding, which is almost entirely unavailable to support rural dental training and provided to only a handful of institutions. Dental education programs increasing the adoption of externship sites is promising for rural exposure; however, the lack of dental practices in rural communities to serve as training sites may be a significant limitation.

Redesign

Recruiting dentists to rural areas may continue to be a struggle, especially if individuals from underserved and rural communities face barriers to entry to dental school and if the cost of dental school continues to rise. One approach to making care delivery more affordable is to redesign the workforce by utilizing other oral health care providers whose training may be more accessible and affordable despite providing a complementary set of services. Community health workers (CHWs), such as the Community Dental Health Coordinators (CDHCs), help bridge the communication gap between underserved communities and providers, demystifying and educating people on oral health care. DHs and dental therapists (DTs) have considerable scope of practice to provide preventive and restorative services, often under indirect supervision or collaborative practice agreements, depending on the state in which they practice. A redesign approach is based on the fact that the current structure for providing care and reaching patients is falling short and that greater change to the system is needed. The spread of the current care delivery network is largely urban and has not been successful in providing care to everyone in need of it, particularly those in rural communities. Redesigning not only who is providing care but also where it is received, such as through portable dental clinics, teledentistry, or school-based dental programs, are approaches being used to provide flexibility around the factors that influence practice finances and decisions.

New Dental Team Roles

Community Dental Health Coordinators (CDHCs)

CDHCs were designed after CHWs, who are members of the community they serve and provide outreach, community education, informal counseling, and help with medical case management. A CHW assists with care coordination in the community, bridging the divide between the community and the clinic. CDHCs fill this role in the oral health field, expanding access to care in rural areas and improving the community's relationship with dentistry.⁶⁵ Currently, several programs grant certifications to participants who complete a training program, many of which are administered in rural areas such as the Appalachian region, Southwestern states, and Texas.⁶⁶

According to the American Dental Association (ADA), CDHCs are currently working in 45 states, 200 students are in training, and all 50 states have created CDHC programs.⁶⁷ Several counties in Maryland, West Virginia, and Pennsylvania participate in the Regional Oral Health Pathway program, a 10-week program that trains CHWs to become CDHCs. Through this training, participants learn about good oral health and gain the techniques needed to convey its importance to their community. With their training, these CDHCs provide presentations to community members, use motivational interviewing to help individuals set oral health goals, and conduct one-on-one counseling across the region.^{66, 68} In the Southwest, the Navajo Nation leads the CDHC effort, in collaboration with organized dentistry. With access to health care facilities being a large challenge for this nation of 180,000 people covering Arizona, New Mexico, and Utah, the Community Health Representative

program has been essential, and in 2016, 80 community health representatives completed the ADA-endorsed Smiles for Life curriculum.⁶⁶ This curriculum covers good oral health habits, child and geriatric oral health, and acute dental problems, as well as providing training on dental screenings. The Smiles for Life curriculum was meant to encourage CHWs to understand how oral health affects their everyday work, increase their interactions with CDHCs, and encourage them to continue their training to become CDHCs themselves.⁶⁹ Two Arizona colleges offer CDHC training.⁷⁰ The National Rural Health Association also used the Smiles for Life curriculum to train existing CHWs in Texas who do most of their work in “colonias” along the US-Mexico border as part of the National Rural Oral Health Initiative.⁶⁶

The Appalachian and Southwest regions have had promising results from their CDHC programs. In Appalachia, CDHCs have provided oral and dental services information to more than 2,000 consumers, and over 500 staff members serve adults with disabilities.⁶⁶ Arizona has continued to expand their CDHC program from their 2006 pilot program, and by 2017, there were 4 schools with CDHC programs with more scheduled to open in the following year.⁶⁷ In 2012, the ADA evaluated their pilot study on CDHCs, which involved the training of 3 cohorts at urban (University of California, Los Angeles and Temple University) and rural-adjacent (University of Oklahoma and AT Still University’s Arizona School of Dentistry and Oral Health) universities. One case study from their evaluation of a rural single-dentist practice found that just one CDHC drastically improved the practice’s productivity. Furthermore, most of the participants in the program continue to work in rural areas. These CDHCs now provide services in hard-to-reach locations like rural tribal community health centers and pre-school and elementary school outreach programs, and their efforts have helped decrease the rate of missed appointments.⁷¹

Dental Therapy

New Zealand initiated the training and deployment of DTs in 1921. Since then, more than 50 countries (eg, the United Kingdom, Australia, Canada, Malaysia) have implemented DTs into their oral health systems, and the research across these countries has shown improvements in preventing tooth loss, treating dental caries, and performing restorations, to name a few of the practices within their internationally varying scope. Studies following these countries have also observed comparable results between DTs and dentists.^{72, 73}

The US Surgeon General report *Oral Health in America*, released in 2000, is often cited for inspiring the dental therapy movement in the US as it highlights the widespread oral health disparities across the country.⁷² The creation of an additional primary dental care provider for dental services (eg, oral exams, cleanings, restorations, and extractions) that functions under the supervision of a dentist would help expand the capacity of the dental practice, thus serving as a solution for nonexistent dental care in underserved areas, particularly in rural areas where dental care is inaccessible.^{74, 75} As of the writing of this report, there are 12 states that have authorized some form of dental therapy: Alaska, Minnesota, Washington, Oregon, Vermont, Maine, Arizona, Michigan, New Mexico, Idaho, Nevada, and Connecticut. Importantly for rural dental care, many of these states’ dental therapy laws have a tribal focus, addressing some of the least met rural population needs in the country.

Alaska

Alaska's implementation of dental therapy in 2003 was a tribal-led project driven by the Alaska Native Tribal Health Consortium (ANTHC).⁷⁶ Much of Alaska's Native population live in remote villages, and previous efforts by ANTHC to recruit dentists to these areas, like the Yukon-Kuskokwim (YK) Delta, were unsuccessful.⁷⁴ Seeing the success of DTs in other countries, the ANTHC saw a viable solution to expand dental care to these remote rural areas and were able to build their own infrastructure through the federal Community Health Aide Program (CHAP).⁷⁴ Four years after the first cohort went to New Zealand for training, a US-based program was created along with externships at training sites across the state. This program trains students on routine dental services and provides them with culturally appropriate education for working in tribal settings. Program recruitment focuses on individuals who have previous experience (eg, as dental health aides) and who already have strong community ties to the regions in which they work, which addresses both the personal and professional factors of integration within the rural community and new employment opportunities.^{77, 78}

In 2012, there were over 50 DTs practicing in Alaska, covering 12 of Alaska's tribal health care organizations. According to the Alaska Oral Health Plan, DTs have assisted in a variety of community efforts to improve oral health in villages and tribal communities, like supporting community water fluoridation and providing education on oral hygiene and dietary issues that affect the prevalence of dental decay, a major issue in the Alaska Native population. ANTHC focused on promotion of dental therapy practice specifically in remote rural areas of the region where many Alaska Native communities reside.⁷⁷ Two independent studies found favorable outcomes as a result of the dental therapy program. In 2011, the Research Triangle Institute (RTI) conducted an evaluation on the first 3 classes of Alaskan DTs trained in New Zealand. They found that although there were difficulties with patients maintaining their appointments, something that may be attributed to the perception of when dental care is needed, DTs performed good work with few deficiencies.^{79, 80} A 2018 evaluation of DTs focused on the YK Delta region, a remote area where residents often had to travel to Bethel for any sort of dental care. The evaluation, which covered data collected from the program's initiation in 2006 through 2015, found favorable outcomes as a result of the dental therapy program.⁸¹ The advent of these promising outcome studies in Alaska, alongside the evidence of DTs' effectiveness in improving oral health care access in rural communities in other countries, provided the momentum for dental therapy legislation to begin passing throughout the US.

Minnesota

In 2009, Minnesota became the first state government to pass legislation approving the practice of DTs. The legislation outlined some restrictions for dental therapy practice, specifically "to serve low-income, uninsured and underserved patients, or practice in a Dental Health Professional Shortage Area."⁸² The practice settings mentioned in the legislation that serve the low-income and underserved populations refer to FQHCs; assisted living facilities; medical facilities; military and veteran administration facilities; and private practices if at least 50% of the patient population is enrolled in Medicaid, has a disability or chronic condition, or is low-income and does not have dental coverage.⁷⁶

Currently, there are 2 programs graduating DTs: Metropolitan State University/Normandale Community College and the University of Minnesota School of Dentistry. A 2018 brief from the Minnesota Department of Health and Minnesota Board of Dentistry reported 86 licensed DTs working across 54 different sites.⁸² Fifty-nine percent of DTs are employed in the greater Twin Cities metro area, and 41% are employed outside of the metro area. For rural communities, care is provided via 370 mobile dental sites via “schools, Head Start programs, community centers, VA facilities, and nursing homes.”⁸³

The state Department of Health and the Board of Dentistry conducted an evaluation of the early impact of DTs in 2014 and found improvements across 3 of the 5 outcomes to assess impact: greater numbers of patients served, reduction in waiting times, and decreased travel time for patients. With the addition of DTs, rural areas were almost 2 times more likely to experience a reduction in wait times in comparison to urban areas. One rural clinic director stated that the clinic no longer had a waiting list with the addition of a DT. While rural areas continued to have longer wait times than urban areas, the change in travel time was most notably seen in rural areas.⁸⁴

Washington and Oregon

In the Pacific Northwest, both Washington and Oregon are further examples of tribes adopting DTs. Both states have sent their DTs to be trained in Alaska while they build their own local programs.

The Swinomish Tribe in Washington authorized DTs in 2015, followed by state legislation approving tribal use of DTs in 2017.^{85, 86} Specifically, Washington authorized DTs through CHAP, the same federal legislation that ANTHC used to implement DTs in Alaska. This restricts DT services to tribal reservations or other institutions operated by an Indian health program or urban Indian organization; however, they are exempt from the licensing requirements for other dental professions.

Similarly, the Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians (CTCLUSI) and the Coquille Indian Tribe are participating in Oregon’s dental therapy pilot program, which started in 2011 as part of a state law promoting dental pilot projects to improve the state’s oral health system. With this law, CTCLUSI was also able to hire their first DT in 2017 to practice in Oregon’s tribal communities.⁸⁷ Although Oregon has not passed any legislation to license DTs across the state, Pacific University School of Dental Hygiene Studies has partnered with Willamette Dental Group, a large group dental practice, to start another dental pilot project for dental therapy education and training for those holding an Oregon dental hygiene license, which is set to start in 2020.⁸⁸

Maine and Vermont

The Maine State Legislature in 2014 and Vermont General Assembly in 2016 authorized the practice of DTs. Both states, primarily rural, only allow those already holding a dental hygiene license to qualify for dental

therapy licensure; however, the states differ in their restrictions (or lack thereof) on practice settings.^{84, 89} In Maine, DTs may only practice in DHPSAs, hospitals, public schools, FQHCs, other public health and underserved areas, or in practices where 50% of the patients are on Medicaid or are underserved adults.⁸⁴ In Vermont, there are no restrictions on practice settings; instead, recommendations will be based on the geographic distribution of dental providers/other DTs.⁸⁹

There are currently no training programs in place in either state, though one is under development at Vermont Technical College. Any programs created will need to follow CODA standards, which were released in 2015. For Vermont, existing legislation includes requirement for education to be from a CODA-accredited institution.⁸⁹ Maine revised its legislation in 2019 to include language requiring CODA-accreditation, since the original legislation was passed before the standards were released, and also stipulates that DTs must hold a master's degree in dental therapy, whereas Vermont has no degree requirements written in its legislation.^{90, 91}

Arizona, Michigan, New Mexico, Idaho, Nevada, and Connecticut

Over the past year, the momentum of the dental therapy movement has increased with Arizona, New Mexico, Michigan, Idaho, Nevada, and Connecticut passing legislation approving dental therapy practice in these states. Several of the more rural states had strong tribal support for these initiatives (Arizona, New Mexico, Idaho, Nevada). Many of these states also had the support of their state DH associations (Arizona, Michigan, New Mexico, Nevada, Connecticut), and require a dental hygiene degree or licensure in order to practice as a DT.

Within the legislation, each of these states also outlined practice setting or patient population restrictions similar to the previous states. Across the board, all of these states permit DTs to practice in FQHCs, FQHC look-alike facilities, and tribal facilities run by the Indian Health Service or by Section 638.⁹²⁻⁹⁵ In addition, some states delineate that the clinics at which DTs are employed must provide care to low-income and underserved individuals or be referred by a community health center.^{92, 93} Other states specify the exact percentage of underserved patients DTs must serve, using language similar to Minnesota's and Maine's legislation. In the Nevada legislation, rural health clinics are specifically listed as one of the settings where DTs can practice in the state.^{94, 95}

Expanding Scope of Practice

Direct Access for Dental Hygienists (DHs)

Dental hygiene is one of the fastest growing professions in the US and is an integral component of the oral health workforce team, focusing on preventive care and identifying oral diseases when they are still manageable. Expanding hygienists' abilities and scope of practice through direct access—allowing DHs to perform

treatments and maintain the patient-provider relationship without the presence of a dentist—is another potential avenue to address oral health disparities in rural areas of the country.⁹⁶

Before direct access made its way into legislation and regulation, some hygienists had their own practices in the 1970s and 80s along the west coast of the US.⁹⁷ In 1984, Washington was the first state to pass direct access legislation, and now a total of 42 states have passed some form of legislation approving direct access for DHs. State policy on dental hygiene scope of practice has been quite variable.⁹⁸ In California, legislation for direct access did not pass until 1998, though DHs were practicing independently through a pilot project, which was approved in 1981 through the Health Manpower Pilot Project Act of 1972.^{97, 99} The outcomes of this pilot helped move along the passage of direct access legislation, creating the advanced licensure of Registered Dental Hygienists in Alternative Practice (RDHAPs), DHs with specialized training to practice outside of a traditional dental office, primarily providing preventive care.⁹⁶ As of 2011, 294 RDHAPs were licensed, of which 287 are actively licensed.⁹⁹

For direct access, licensing and practice requirements for direct access vary between states. For initial licensure, most states require 2-3 years of clinical experience while others also include further higher education requirements (eg, bachelor's degree) and additional accredited training. Some states have chosen to enact policy with more minimal requirements, at most requiring liability insurance, patient consent, and/or a collaboration agreement with a dentist. Similar to some dental therapy legislation, direct access legislation specifies allowed practice environments and income requirements for patients that can be treated by direct access DHs. These practice environments limiting direct access DHs to practice in FQHCs, mobile dental health programs, community centers, tribal clinics, and schools, which some argue helps ensure that DHs practice in underserved areas. Each state determines patient income requirements based on a certain percentage of the federal poverty level or other low-income indicators like patients with public insurance. The 8 states that have not permitted direct access to DHs are North Dakota, New Jersey, Delaware, North Carolina, Alabama, Mississippi, Louisiana, and Hawaii. The District of Columbia has also not permitted direct access.⁹⁶

The evidence on the safety and effectiveness of direct access is fairly strong.¹⁰⁰ Several studies demonstrate that in states with direct access, underserved communities' access to oral health care has expanded. According to a study conducted in Kansas, where about 31% of the population lives in 58 counties classified as "rural," hygienists had the flexibility to develop their practice in almost any location.^{101, 102} In these areas where the need is great and hygienists have more autonomy, DHs have the opportunity for greater professional development without having to invest in a dental degree, an enabling factor for deciding whether to practice in rural areas. A study of a single, unsupervised hygienist clinic in rural Missouri found that over 80% of 2- to 8-year-olds were receiving all of their oral health care from this clinic, having no prior dental visits with other oral health providers, further demonstrating the potential of this strategy if more state policy were to support greater scope and access of DHs.¹⁰³ Much of the state legislation currently in place implements requirements to serve patients on Medicaid and/or practice in community and public health centers, and these patients have a greater ability to receive care because the cost is more affordable with DHs compared to care from

dentists. An evaluation of California's pilot project found that independent practice of DHs provided greater access to care, consistently attracted new patients, and charged lower fees.⁹⁹ California's RDHAPs were also more likely to serve underrepresented minorities and expressed a stronger commitment to improve access to care for underserved communities.¹⁰⁴ Results from a survey of independently practicing DHs in Kansas further supports these findings that DHs have greater motivation to provide care for targeted populations despite minimal reimbursement.¹⁰¹

The evaluation of the California pilot determined that independent practice of DHs did not increase the risk to health and safety of the public and ultimately provided more accessible and affordable care. Furthermore, the evaluation determined that in many cases, outcomes surpassed those available in dental offices in quality and patient satisfaction.¹⁰⁵ In addition, DHs in public health programs have improved access to care and quality of life for school-aged children in rural and socioeconomically disadvantaged communities, with most of the children either on Medicaid or uninsured.¹⁰⁶ Not only is the access to oral health care improved for rural communities, the caliber of care is as safe as similar care provided by dentists. The evidence in support of expanding scope of practice is strong, showing that in HPSAs, the underserved populations experience stronger effects of enhanced scope of practice laws, like direct access, on dental care utilization than for the full population.⁷⁰

Utilizing Physicians and Other Non-Dental Providers

The expansion of Medicaid in many states due to the passage of the Affordable Care Act has provided children and some adults with improved dental and medical coverage.¹⁰⁷⁻¹⁰⁹ However, this increased coverage does not solve the glaring issue of dental shortages in many areas, particularly rural areas, across the country.^{110, 111} In contrast, there are greater supplies of physicians than dentists in low-income and rural communities.¹⁰⁷ Infants and young children see their pediatrician more often than a dentist, and utilizing these physicians as one solution to providing basic preventive oral health services (POHS)—like fluoride varnishes, oral examinations, and screenings—is a well-supported initiative both nationally and worldwide.^{107, 108, 111-116} Even the US Preventive Services Task Force recommends that primary care clinicians apply fluoride varnish at the time of primary tooth eruption for infant and children and prescribe oral fluoride supplements if the local water supply is deficient in fluoride.¹¹⁷ This allows physicians to reduce the progression of chronic dental illnesses like caries, counteracting the general practice of palliative care for dental pain. It is also one step closer to providing an integrated medical home that includes oral health with the rest of the body.¹¹⁸

Physicians and dentists are mutually supportive of adding preventive dental services in medical settings, and by 2011, 42 states adopted some form of policy to support preventive dental services provisions by non-dental health care professionals, but only 9 states included a comprehensive set of services, the most common being fluoride varnish.^{112, 119, 120} In 2017, all 50 states plus Washington DC allowed Medicaid reimbursement payments to medical providers for preventative dental care.¹²¹

Allowing physicians—as well as nurses or DHs, if the law allows supervision by a physician—to provide POHS in this setting increases access to oral health services and improves the oral health of patients. North Carolina is considered to be at the forefront of implementing physicians into the realm in oral health, as it was one of the first states to support POHS for young children through primary care.¹¹⁵ The state started a reimbursement program in 2000 where physicians could be reimbursed for a maximum of 6 visits in which POHS were provided in primary care settings during a child's first 3 years, and, as more physicians received training, the number of visits involving POHS increased over the first 7 years of the program.¹²² An assessment of the effects of physician-based POHS in North Carolina found that for children on Medicaid, those who had at least 4 medical visits with POHS before their third birthday had fewer caries than those who did not receive those services. This provides some of the first evidence that POHS provided by physicians in primary care settings with supportive Medicaid reimbursement policy reduces dental caries for children.¹¹⁶

In addition to North Carolina, other states such as Maine, Iowa, and Michigan have also reported success. The Maine-Dartmouth Family Medicine Residency (MDFMR) program in rural Fairfield has been running oral health training to fill oral health care gaps left by a shortage of dentists, which is particularly prominent in rural parts of the state.^{123, 124} According to the founder of the oral health program, MDFMR had seen more than 2,300 patients for oral health needs in the first 6 years, identifying cancers, lesions, and other oral health issues. Most of these patients are uninsured or on public insurance, turned away from dentists because they are unable to pay or because the dentist is not taking new patients.¹²⁴ The Early Smile Program in rural Iowa has had great success utilizing school nurses and home health nurses to do oral exams and apply fluoride varnishes. The program, which focuses on children from infancy to 8 years, is centered in 12 rural counties where, similar to Maine, dentists are sparse and are often not taking new patients. Within the first 3 years, approximately 5,400 children received oral exams and preventive services.¹²⁴ In Michigan, Medicaid policy recommends that well-child visits with primary care physicians include POHS. Preliminary results assessing the quality of these types of services, covering 387 primary care physicians across 93 clinics showed “meaningfully and significantly” improved rates in all 3 POHS at 9- and 12-month well-child visits. The improvements increased 70 to 80 percentage points above the pre-training baseline period.¹²⁵ Even Australia has seen positive results with similar programs. In rural parts of the country, oral health starter kits were provided to mothers and infants from physicians in the intervention arm of one study. The results showed that there were less caries found in children in the intervention arm than in the control arm at the time of the first 2 examinations.¹²⁶

Although most of the existing studies have a broader focus on the impacts to all underserved communities, the results suggest that there is potential for this strategy to be effective in rural areas, provided that the infrastructure to support it is in place. More support for physicians to receive oral health-related training is essential; physicians often cite a lack of training during residency and administrative barriers as difficulties to implementing oral health services into practice.^{107, 111, 127} There are some programs in place, such as the aforementioned MDFMR program, which started in 2005, to look to for guidance on expanding this strategy.^{108, 128} MDFMR trains primary care doctors to screen children for dental caries, apply fluoride varnish, evaluate and treat dental pain in adult patients, and perform simple tooth extractions.¹²⁸ Additionally, University of New

Mexico allows medical residents to participate in a year-long residency program for dentists if they wish to receive further oral health training.¹⁰⁸ This care redesign strategy also exemplifies how federal and state policy, like Medicaid reimbursement, can align with strong evidence-based care to improve oral health access in rural communities.

Local Infrastructure for Rural Care Delivery

A common theme across the recruitment and retention strategies is a focus on the individual personal choice, such as changing attitudes or increasing exposure. However strongly an individual desires to work in a rural community, there remains the economic challenge of operating a very expensive business. While the following examples are by no means exhaustive, they represent additional approaches to care redesign that can be paired with workforce strategies to improve access to dental care for rural populations. These approaches help with reducing the financial risk as well as professional isolation that may come with a traditional dental practice in a rural community. A recent compendium of innovations in oral health care highlights all the best practices in many of these areas, so this report simply focuses on the rural-specific implications.¹²⁹

Portable Dental Clinics & Teledentistry

Mobile dental health services have been used to provide support to people in areas with significant barriers to access. They offer an access point for patients who are unable to travel to a dentist, due to time or physical limitations, or who live in areas with a shortage of oral health providers. Mobile dental clinics can be used to temporarily increase the supply of oral health professionals in a given area and increase access to oral health services while allowing dentists to remain in their original practice. For the workforce, this strategy may prevent the feelings of social isolation and lack of integration in rural lifestyle, sidestepping these negative personal factors that may come with practicing in rural communities.

OHWRRC researchers found that dental institutions (ie, a dental school or clinic) conducted most implementations of portable dentistry clinics, though often the service area of these mobile dental programs was multi-county, state, or multi-statewide. A large number of the mobile dental programs were nonprofits. Notably, there were some partnerships between local government and institutions at the county level. Nearly all states had at least one mobile clinic serving some portion of its residents, with roughly half of states serving rural areas, and approximately a quarter targeting rural populations.¹³⁰ There do not currently exist any federal policies that promote or regulate the development of mobile dental clinics.^{41, 126} Alternatively, some states have laws or regulations applicable to mobile dental clinics.¹³⁰ These regulations generally cover registration, process, and best practice for business and hygiene.

Telehealth can be used alone or paired with mobile services to extend care further and allow the workforce more flexibility in providing prevention, diagnosis, and referral services. Teledentistry in particular has been paired with new workforce models and scope of practice changes.¹³¹ Telehealth has been extensively re-

searched and reported on as a viable option to extend care into rural communities in both the medical and dental field.¹³² Telehealth is a strategy that is only expected to continue to spread given the novel coronavirus pandemic.

School-Based Dental Programs for Schools in Rural Areas

School-based dental programs provide children and adolescents greater access to dental care. These programs offer comprehensive and preventive services, including sealants, fluoride varnish, and screenings. School-based dental programs are an effective way to provide kids with care because they are located in schools, places in which the large majority of minors have access. School-based dental programs can be useful in rural areas by providing a single familiar location for students, who tend to live further apart in rural communities, to receive reliable dental care. They are often paired with workforce strategies such as direct access hygiene and may also be paired with technology such as teledentistry.

Federal and state entities often fund private organizations, usually nonprofits, who run the school-based dental programs. For example, the Centers for Disease Control and Prevention provides 20 state health departments with funding to support their oral health programs, including managing school sealant programs, through the Partner Actions to Improve Oral Health Outcomes (DP-1811).^{133, 134} HRSA, through its School-Based Comprehensive Oral Health Services Program, provides grants for organizations looking to integrate oral health services into existing school-based health centers that are not FQHCs.^{135, 136} Other programs like Head Start programs and school-based health centers (SBHCs) are located in schools across the US and provide comprehensive dental care to students.¹³⁷ Head Start programs fund institutions focused on communities of interest, like rural communities, whereas SBHCs are sponsored by or managed by FQHCs under the Social Security Act but also have a variety of other funders, including local health departments, school systems, nonprofit organizations, and hospitals or medical centers.^{138, 139} The Ford Family Foundation is one such nonprofit organization that awards grants to SBHCs that provide dental services in rural areas.¹⁴⁰ At the state level, 30 states have an oral health plan. Of those states, 25 include school-based dental care, 18 include school-based dental sealant programs, 18 include school-based topical fluoride treatment, and 16 include school-based screening programs. For states without oral health plans, 9 have school-based dental care, 9 have school-based dental sealant programs, 4 have school-based topical fluoride treatment, and 7 have school-based screening programs. Additionally, private organizations serve school systems in states without oral health plans, supporting school-based dental programs. In Alabama, for example, some of its school systems are served by private institutions like Health Establishments at Local Schools.¹⁴¹

Though the literature review produced case studies of school-based dental programs in rural areas, it did not produce any research analyzing the effectiveness of those programs. There does exist ample data on the demographics served by school-based sealant programs.

Federal and state investment in Rural Health Clinics, rural community health centers, as well as Indian Health Service clinics and other community health centers forms the care delivery basis for placements by dental loan repayment, are the partners for dental education, and often the sole source of care. Without these sites to partner with for education and care delivery, access to care in many rural communities would be nonexistent.¹⁴²

DISCUSSION

Rural communities in the US face a host of challenges when it comes to accessing high quality and sustainable health care services, including oral health care.¹⁴³ The state and federal government have an important role to play in creating regulatory and fiscal environments that can improve access for rural communities.¹⁴⁴ This report sought to examine the alignment of policy and infrastructure in the US with evidence-based workforce strategies to increase access to oral health services for rural populations. Starting from a systematic review of rural workforce strategies, this report presents a comprehensive scoping review of the use and evidence behind these key strategies in the US health policy context.

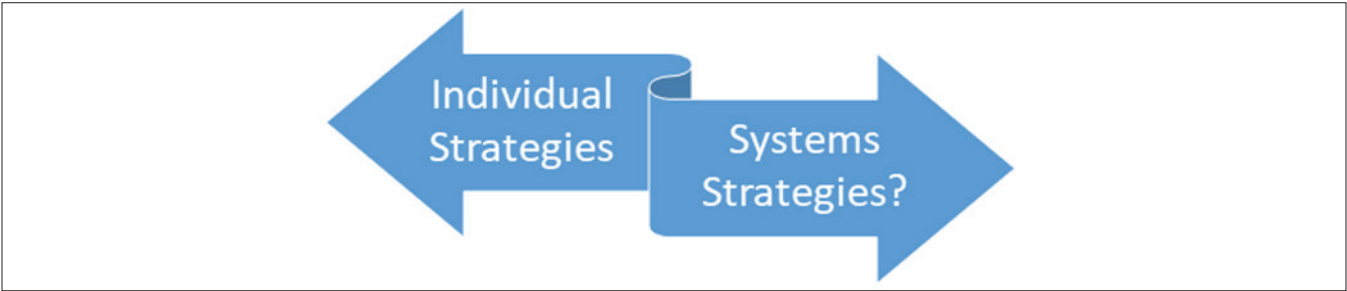
The Godwin et al 2014 systematic review's main finding was a lack of "comprehensive or definitive research into the influences on the work movement decisions made by dental practitioners," and the studies they did find found no definitive evidence about the long-term recruitment and retention of dental practitioners to rural communities.⁶ Not surprisingly, our analyses found that while many of the most popular recruitment approaches, such as LRPs, show immediate impact, they lack a strong empirical basis for long-term success. Because the US lacks central health workforce planning, the strategies used to recruit dentists to rural communities tend to focus on individual incentives, usually financial. These approaches certainly show strong evidence of a short-term effect of producing a workforce willing to work in underserved areas, but the evidence specific to rural placements is difficult to disentangle from broader definitions of "underserved." An incentive not being used, but with some evidence of effectiveness in the medical field, are incentives to recruit FTDs. In essence, this is a service obligation somewhat akin to a scholarship program, just with different incentives (J-1 Visa and return waiver instead of tuition). This strategy would have to be paired with changes in education policy (such as mandatory residency programs) and immigration policy, and as such is politically unlikely. The recruitment incentive of increased payment for services is generally not found to be in use in the US, and Medicaid rates for dental services are notoriously low. The primarily private delivery and payment system, and lack of dental coverage mandated in government payment programs except for children under Medicaid (which is where the only evidence of effective programs was found), make this strategy harder to operationalize at the state or federal policy level. The strongest evidence to inform recruitment (and retention) efforts to rural areas was found in efforts that combined multiple approaches into a pipeline program with an explicit rural focus. By addressing multiple factors that exist across those that are personal, professional, and finan-

cial, these programs have shown their combined impact at a high and sustainable level. Unfortunately, there are few of these in practice.

The strategies which were primarily for retention (although must include a recruitment component in order to have an effect on retention) that we examined were recruiting rural students, locating dental schools in rural communities, and training rotations in rural communities. The factor with the most evidence that seems to be shared across studies for long-term retention is the impact of enjoying rural lifestyles, which is related to good personal relationships and a sense of integration into the community.⁶ Addressing these factors is inherently personal and tied to strategies of recruiting from rural communities and to some extent providing training opportunities in those areas. This aligns with broader evidence across rural health care that finds the most consistent factor related to rural practice choice is growing up in a rural community.¹³ While the regional pipeline programs may include rural student recruitment as a component, there is little state or federal policy with this specific focus.

What there is more evidence of in the past 2 decades comes from the policies and programs of educational training institutions. For example, outside of pipeline programs, moving to a holistic review admissions process may help identify students with a rural background. There has been a larger increase in community-based dental education, which provides exposure to rural practice, although empirical evidence that only changing dental students' perceptions actually leads to increased practice in a rural community is weak. Reinforcing rural interest must be paired with stable employment opportunities for dentists in rural communities that are now lacking, where, for example, physicians can be employed without the additional cost of setting up a practice. Similar to our findings in the recruitment strategies, the retention approaches that combine multiple efforts seem to have greater potential for long-term success. In particular, the new dental schools that recruit from, are located near, and have a mission specifically to serve rural communities are notable.

FIGURE 1. Continuum of Approaches



The current literature and policy focus remains on understanding and trying to modify personal factors related to dentists' individual choice through lifestyle and financial approaches. The assumption behind many of these mechanisms is that the solo, independent practitioner model is what is desired in these communities. Largely absent from the suite of evidence-based solutions are structural approaches that take into account the changing model of care delivery (Figure 1). In our review, there was strong evidence around the changing

nature of the dental team as well as the care setting innovations as “redesign” strategies ripe for state and federal investment to increase access to dental care in rural settings. In particular, the workforce redesign approaches that include new team members or expanding scope and roles of existing team members has been extensively studied and found to be beneficial. Yet, most of these are not paired with rural-specific infrastructure and access strategies, all of which have strong evidence of impact, which might make them even more successful in the future. There are clear policy implications for improving evidence-based resource allocation and aligning state scope of practice policy for rural dental access.

LIMITATIONS

This study has several limitations. We were restricted to reviewing literature and documents from existing programs where it was available. While our scoping review was comprehensive, we may have missed relevant programs if there is no publicly available information. Also, the lack of evidence due to minimal studies does not indicate lack of efficacy, simply that we cannot find strong studies.

CONCLUSION

The strategies used to recruit and retain dental providers to rural communities need to be strengthened beyond individual incentives through sustained, strategic investment in programs and infrastructure. This should include strong rural workforce planning in partnership with federal and state investment in care delivery and dental education around innovative redesign strategies.



REFERENCES

REFERENCES

1. Hart LG, Salsberg E, Phillips DM, Lishner DM. Rural health care providers in the United States. *J Rural Health*. 2002;18:211-322. doi: 10.1111/j.1748-0361.2002.tb00932.x.
2. Skillman SM, et al. The challenge to delivering oral health services in rural America. *J Public Health Dent*. 2010;70(1)(suppl 1):S49-S57.
3. Wright B, Damiano PC, Bentler SE. Implementation of the Affordable Care Act and rural health clinic capacity in Iowa. *J Prim Care Community Health*. 2015;6(1):61-65.
4. Patterson DG, Andrilla HA, Schwartz MR, Hager L, Skillman SM. *Assessing the Impact of Washington State's Oral Health Workforce on Patient Access to Care*. Seattle, WA: Center for Health Workforce Studies, University of Washington; 2017.
5. Hartley D. Rural health disparities, population health, and rural culture. *Am J Public Health*. 2004; 94(10):1675-1678.
6. Godwin DM. Dental practitioner rural work movements: a systematic review. *Rural Remote Health*. 2014;14(3):2825.
7. Freeman R. Dental therapists/hygienists working in remote-rural primary care: a structured review of effectiveness, efficiency, sustainability, acceptability and affordability. *Int Dent J*. 2013;63(2):103-12.
8. Naughton DK. Expanding oral care opportunities: Direct access care provided by dental hygienists in the United States. *J Evid Based Dent Pract*. 2014;(suppl14):S171-S182.
9. Biordi DL. Improving access and provision of preventive oral health care for very young, poor, and low-income children through a new interdisciplinary partnership. *Am J Public Health*. 2015;105(suppl 2):S23-S29.
10. Holwager D. The community dental health coordinator: Beyond the pilot study. *J Indiana Dent Assoc*. 2015;94(3):14-15.
11. Senturia K. Dental health aides in Alaska: A qualitative assessment to improve paediatric oral health in remote rural villages. *Community Dent Oral Epidemiol*. 2018;46(4):416-424. doi: 10.1111/cdoe.12385.
12. Grobler L, Marais BJ, Mabunda S. Interventions for increasing the proportion of health professionals practising in rural and other underserved areas. *Cochrane Database Syst Rev*. 2015;6:CD005314. doi: 10.1002/14651858.CD005314.pub3.
13. Hempel S, Gibbons MM, Ulloa JG, et al. *Rural Healthcare Workforce: A Systematic Review*. Washington DC: Department of Veterans Affairs (US). December 2015.
14. National Health Service Corps Scholarship Program. Health Resources and Services Administration (HRSA) National Health Service Corps website. <https://nhsc.hrsa.gov/sites/default/files/NHSC/scholarships/nhsc-scholarship-fact-sheet.pdf>. Published April 2019. Accessed September 22, 2020.
15. Pathman DE, Konrad TR. Growth and changes in the National Health Service Corps (NHSC) workforce with the American Recovery and Reinvestment Act. *J Am Board Fam Med*. 2012; 25(5):723-733.
16. KIND Grants page. Kansas Dental Association website. <https://www.ksdental.org/resources/kind-grants>. Accessed December 1, 2019.
17. State and federal loan forgiveness programs. American Dental Education Association website. <https://www.adea.org/advocacy/state/loan-forgiveness-programs.aspx>. Accessed July 14, 2020.
18. Renner DM, Westfall J, Wilroy LA, Ginde A. The influence of loan repayment on rural healthcare provider recruitment and retention in Colorado. *Rural Remote Health*. 2010;10(4):1605.
19. Daniels ZM, Vanleit BJ, Skipper BJ, Sanders ML, Rhyne RL. Factors in recruiting and retaining health professionals for rural practice. *J Rural Health*. 2007;23(1):62-71.

20. Bailit HL, Formicola AJ, Herbert KD, Stavisky JS, Zamora G. The origins and design of the dental pipeline program. *J Dent Educ*. 2005; 69(2):232-238.
21. Price SS, Brunson WD, Mitchell DA, Alexander C. Increasing the enrollment of underrepresented minority dental students: experiences from the dental pipeline program. *J Dent Educ*. 2007;71(3):339-347.
22. Robert Wood Johnson Foundation (RWJF) and The California Endowment (TCE) Dental Pipeline Evaluation National Evaluation Team. The dental pipeline program evaluation: Findings, best practices, and future directions for community-based dental education. Presented at ADEA Symposium March 16, 2009.
23. The power of a hometown scholars endorsement. AT Still University website. <https://www.atsu.edu/hometown-scholars#the-power-of-a-hometown-scholars-endorsement>. Accessed July 19, 2020.
24. National Network for Oral Health Access. NNOHA health center workforce survey analysis of 2018 results. Published September 2018. http://www.nnoha.org/nnoha-content/uploads/2018/10/Workforce-Survey-2018_Final-report.pdf. Accessed September 16, 2020.
25. Hall DJ, Garnett ST, Barnes T, Stevens MR. Drivers of professional mobility in the northern territory: dental professionals. *Rural Remote Health*. 2007;7(1):655.
26. Silva M, Phung K, Huynh W, Wong H. Factors influencing recent dental graduates' location and sector of employment in Victoria. *Aust Dent J*. 2006;51(1):46-51.
27. Access to Baby and Child Dentistry website. <http://abcd-dental.org/>. Accessed September 17, 2019.
28. The Pew Center on the States. Washington's ABCD program: Improving dental care for Medicaid-insured children. Published June 2010. https://www.pewtrusts.org/~media/legacy/uploadedfiles/pes_assets/2010/abcdbriefwebpdf.pdf. Accessed September 16, 2020.
29. Nagahama SI, Fuhrman SE, Moore CS, Milgrom P. Evaluation of a dental society-based ABCD program in Washington state. *J Am Dent Assoc*. 2002;133(9):1251-1257.
30. Raja Z, Wides C, Kottek A, Gates P, Mertz E. *The evolving pipeline of hispanic dentists in the United States: practice and policy implications*. Rensselaer, NY: Oral Health Workforce Research Center, Center for Health Workforce Studies, School of Public Health, SUNY Albany; August 2017.
31. Pannu V, Thompson AL, Pannu DS, Collins MA. Education for foreign-trained dentists in the United States: currently available findings and need for further research. *J Dent Educ*. 2013;77(11):1521-1524.
32. Foreign-Educated Dentists page. American Dental Education Association website. https://www.adea.org/GoDental/Non-traditional_Applicants/Foreign-educated_dentists.aspx. Accessed July 29, 2019.
33. ADEA CAAPID page. American Dental Education Association website. <https://www.adea.org/CAAPIDapp/>. Accessed July 31, 2019.
34. Roadmap to US dental school for foreign trained dentists. University of Illinois at Chicago College of Dentistry website. <https://dentistry.uic.edu/blog/roadmap-to-us-dental-school-foreign-trained-dentists>. Published February 1, 2019. Accessed July 19, 2019.
35. Gupta N, Vujicic M, Blatz A. Opioid prescribing practices from 2010 through 2015 among dentists in the United States: What do claims data tell us? *J Am Dent Assoc*. 2018;149(4):237-245. doi: 10.1016/j.adaj.2018.01.005.
36. Rural J-1 Visa Waiver page. Rural Health Information Hub website. <https://www.ruralhealthinfo.org/topics/j-1-visa-waiver>. Accessed August 15, 2019.
37. Patterson DG, Keppel G, Skillman SM. *Conrad 30 Waivers for Physicians on J-1 Visas: State Policies, Practices, and Perspectives*. Final Report #157. Seattle, WA: WWAMI Rural Health Research Center, University of Washington; March 2016.

38. Kochar MS. The J-1 visa waiver program for rural Wisconsin. *WMJ*. 2006;105(7):13.
39. Opoku ST, Apenteng BA, Kan GL, Palm D, Rauner T. A Comparison of the J-1 visa waiver and loan repayment programs in the recruitment and retention of physicians in rural Nebraska. *J Rural Health*. 2015;31(3):300-309.
40. Crouse BJ, Munson RL. The effect of the physician J-1 visa waiver on rural Wisconsin. *WMJ*. 2006;105(7):16-20.
41. 116th Congress (2019-2020). Congress.gov website. <https://www.congress.gov/browse>. Accessed November 22, 2019.
42. Mutlu I, Abubaker AO, Laskin DM. Narcotic prescribing habits and other methods of pain control by oral and maxillofacial surgeons after impacted third molar removal. *J Oral Maxillofac Surg*. 2013;71(9):1500-3.
43. Mississippi Rural Dentists Scholarship Program. The University of Mississippi Medical Center website. <https://www.umc.edu/Office%20of%20Academic%20Affairs/For-Students/Academic%20Outreach%20Programs/Mississippi%20Rural%20Dentists%20Scholarship%20Program/Mississippi%20Rural%20Dentists%20Scholarship%20Program.html>. Accessed November 22, 2019.
44. State of Mississippi. *House Bill No 776. Updates to Mississippi Rural Dentists Scholarship Program in Mississippi Code of 1972*. <http://billstatus.ls.state.ms.us/documents/2013/pdf/HB/0700-0799/HB0776SG.pdf>. Published July 1, 2013. Accessed September 22, 2020.
45. Program Phases. The University of Mississippi Medical Center website. <https://www.umc.edu/Office%20of%20Academic%20Affairs/For-Students/Academic%20Outreach%20Programs/Mississippi%20Rural%20Dentists%20Scholarship%20Program/Program%20Phases/Program%20Phases.html>. Accessed November 22, 2019.
46. UWSOD Regional Initiative in Dental Education. The University of Washington School of Dentistry website. <https://dental.washington.edu/ride/>. Accessed July 19, 2020.
47. WWAMI: A Five-state medical education creating national impact. The University of Washington School of Medicine website. <https://www.uw-medicine.org/school-of-medicine/md-program/wwami>. Accessed July 19, 2020.
48. McFarland KK, Reinhardt JW, Yaseen M. Rural dentists of the future: dental school enrollment strategies. *J Dent Educ*. 2010;74(8):830-835.
49. McFarland KK, Reinhardt JW, Yaseen M. Rural dentists: does growing up in a small community matter? *J Am Dent Assoc*. 2012;143(9):1013-1019.
50. Tchia K, Lim L, See N, Parikh S, Croker F, Woolley T. Do rurally focussed dental programs produce regional and rural dentists? An exploratory cross-sectional survey examining Australian dental graduates of 2015. *Aust J Rural Health*. 2019;27(6):574-576.
51. Vujicic M, Sarrett D, Munson B. Do dentists from rural areas practice in rural areas? *J Am Dent Assoc*. 2016;147(12):990-992.
52. The Keen Dentist. Two new US dental schools are set to open. <http://www.thekeendentist.com/two-new-dental-schools-set-open/>. Published September 12, 2017. Accessed September 4, 2019.
53. Peregrino D. Texas Lawmakers Approve Funding for Hunt School of Dental Medicine at TTUHSC El Paso. The Texas Tech University Health Sciences Center El Paso website. <http://eptechview.ttuhsc.edu/ttuhsc-el-paso/texas-lawmakers-approve-funding-for-hunt-school-of-dental-medicine-at-ttuhsc-el-paso/>. Accessed September 4, 2019.
54. School of Dental Medicine: Mission vision and values. East Carolina University website. <https://www.ecu.edu/cs-dhs/dental/missionVisionValues.cfm>. 2020. Accessed July 19, 2020.
55. Clinical rotations. AT Still University Arizona School of Dentistry and Oral Health website. <https://www.atsu.edu/arizona-school-of-dentistry-and-oral-health/about-asdoh/clinical-rotations>. Accessed July 19, 2020.

56. About MOSDOH page. AT Still University Missouri School of Dentistry and Oral Health website. <https://www.atsu.edu/missouri-school-of-dentistry-and-oral-health/about-mosdoh/dental-school-of-the-future>. Accessed July 19, 2020.
57. Howell SEI. Attitudes and behaviors regarding public health of dental school graduates from AT Still University. *J Dent Educ*. 2020;84(6):681-687.
58. Altman DS, Alexander JL, Woldt JL, Hunsaker DS, Mathieson KM. Perceived influence of community oral health curriculum on graduates' dental practice choice and volunteerism. *J Dent Educ*. 2013;77(1):37-42.
59. ECU: More dentists for rural NC. The Higher Ed Works website. <https://www.higheredworks.org/2018/05/ecu-dentists-rural-nc/>. Accessed July 19, 2020.
60. Smith PD, Mays KA. Dental students' non-clinical learning during community-based experiences: a survey of US dental schools. *J Dent Educ*. 2019;83(11):1289-1295.
61. Find grants. Health Resources and Services Administration website. <https://data.hrsa.gov/tools/find-grants>. Accessed November 22, 2019.
62. Oral Health in Rural Communities - Funding & Opportunities. Rural Health Information Hub website. <https://www.ruralhealthinfo.org/topics/oral-health/funding>. Accessed November 22, 2019.
63. Clinic M. General Dentistry Goals and Objectives. Marshfield Clinic Division of Education website. <https://www.marshfieldclinic.org/education/ResidentsAndFellows/Pages/dentistryobjectives.aspx>. Accessed July 2010.
64. Shannon CK, Price SS, Jackson J. Predicting rural practice and service to indigent patients: survey of dental students before and after rural community rotations. *J Dent Educ*. 2016;80(10):1180-1187.
65. Grover J. Community Dental Health Coordinator Program. National Network for Oral Health Access website. https://www.nnoha.org/nnoha-content/uploads/2017/12/Workforce-Innovation_Grover.pdf. Accessed July 10, 2019.
66. Lukens J. Community health workers get trained to reduce oral health disparities. Rural Health Information Hub website: Rural Monitor. <https://www.ruralhealthinfo.org/rural-monitor/chw-oral-health/>. Published March 15, 2017. Accessed May 22, 2019.
67. Manchir M. Community dental health coordinator programs expand. American Dental Association website. <https://www.ada.org/en/publications/ada-news/2017-archive/march/community-dental-health-coordinator-programs-expand>. Published March 20, 2017. Accessed July 10, 2019.
68. Regional oral health pathway. Rural Health Information Hub website. <https://www.ruralhealthinfo.org/project-examples/815>. Accessed May 22, 2019.
69. Manchir M. Organized dentistry brings oral health awareness to health workers in Navajo Nation. The American Dental Association website. <https://www.ada.org/en/publications/ada-news/2016-archive/july/organized-dentistry-brings-oral-health-awareness-to-health-workers-in-navajo-nation>. Published July 15, 2016. Accessed May 22, 2019.
70. Chen J, Meyerhoefer CD, Timmons E. The effects of dental hygienist scope of practice and autonomy on dental care utilization. The SSRN website. <https://ssrn.com/abstract=3635762>. Published July 17, 2020. Accessed September 23, 2020.
71. Breaking down barriers to oral health for all Americans: the community dental health coordinator. American Dental Association website. http://www.ada.org/~media/ADA/Advocacy/Files/ADA_Breaking_Down_Barriers-Community_Dental_Health_Coordinator.ashx. Published October 2012. Accessed September 17, 2020.
72. Nash DA, Friedman JW, Kardos TB, et al. Dental therapists: a global perspective. *Int Dent J*. 2008;58(2):61-70.
73. Nash DA, Friedman JW, Mathu-Muju KR, et al. A review of the global literature on dental therapists. *Community Dent Oral Epidemiol*. 2014;42(1):1-10.

74. Lenaker D. The Dental Health Aide Therapist Program in Alaska: An Example for the 21st Century. *Am J Public Health*. 2017;107(S1):S24-S25.
75. Minnesota Dental Therapy Association. What We Do. The Minnesota Dental Therapy Association website. <http://www.mndta.org/what-we-do>. Accessed June 13, 2019.
76. Nash DA, Mathu-Muju KR, Friedman JW. The dental therapist movement in the United States: a critique of current trends. *J Public Health Dent*. 2018;78(2):127-133.
77. Williard M. Dental health aide program improves access to oral health care for rural Alaska native people. The Agency for Healthcare Research and Quality website. <https://innovations.ahrq.gov/profiles/dental-health-aide-program-improves-access-oral-health-care-rural-alaska-native-people>. Accessed June 3, 2019.
78. Webster LR, Grabois M. Current regulations related to opioid prescribing. *PM R*. 2015;7(11 Suppl):S236-S247.
79. Bader JD. Clinical technical performance of dental therapists in Alaska. *J Am Dent Assoc*. 2011;142(3):322-326.
80. Wetterhall S. Cultural context in the effort to improve oral health among Alaska Native people: the dental health aide therapist model. *Am J Public Health*. 2011;101(10):1836-1840.
81. Chi DL. Dental therapists linked to improved dental outcomes for Alaska Native communities in the Yukon-Kuskokwim Delta. *J Public Health Dent*. 2018;78(2): 175-182.
82. Dental Therapist (DT) and Advanced Dental Therapist (ADT). Emerging Health Professions. The Minnesota Department of Health website. <https://www.health.state.mn.us/facilities/rural-health/emerging/dt/index.html>. Accessed June 3, 2019.
83. Minnesota Department of Health., Minnesota Board of Dentistry. Dental Therapy in Minnesota. The Minnesota Department of Health website. <https://www.health.state.mn.us/data/workforce/oral/docs/2018dtb.pdf>. Accessed June 10, 2019.
84. Minnesota Department of Health, Health Policy Division, Office of Rural Health and Primary Care; Minnesota Board of Dentistry. Early Impacts of Dental Therapists in Minnesota. The Minnesota Department of Health website. https://mn.gov/boards/assets/2014DentalTherapistReport_tcm21-45970_tcm21-313376.pdf. Published February 2014. Accessed September 22, 2020.
85. American Dental Education Association. Washington State Signs Into Law Dental Health Aide Therapy Bill. ADEA State Update 2017. The American Dental Education Association website. <https://www.adea.org/Blog.aspx?id=36283&blogid=20132>. Accessed June 3, 2019.
86. Main M. Dental Therapists in Region X Focus on Tribal Health. The University of Washington School of Public Health website. <https://depts.washington.edu/nwbfch/Alaska-DHAT-dental-therapy-tribal-communities-Washington-Oregon>. Accessed June 3, 2019.
87. Grant J. Tribes Hire Oregon's First Dental Therapist. The PEW Charitable Trusts website. <https://www.pewtrusts.org/en/research-and-analysis/articles/2017/08/15/tribes-hire-oregons-first-dental-therapist>. Accessed June 10, 2019.
88. Coplen A. Pacific University to launch dental therapy pilot. *Bulletin of Dental Education*. The American Dental Education Association website. <https://www.adea.org/BDEBlog.aspx?id=40253&blogid=27619>. Accessed June 10, 2019.
89. Surgeon General's Advisory on Naloxone and Opioid Overdose. The US Department of Health & Human Services website. <https://www.surgeongeneral.gov/priorities/opioid-overdose-prevention/naloxone-advisory.html>. Updated April 5, 2018. Accessed June 12, 2018.
90. State of Maine. Chapter 429 Public Law: *An Act To Revise the Laws Regarding Dental practices*. <http://www.mainelegislature.org/legis/bills/get-PDF.asp?paper=HP1086&item=3&snum=127>. Published April 5, 2016. Accessed September 21, 2020.

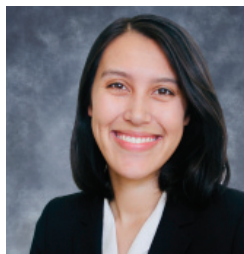
91. State of Maine. Chapter 388 Public Law: *An Act To Align the Laws Governing Dental Therapy with Standards Established by the American Dental Association Commission on Dental Accreditation*. <https://legiscan.com/ME/text/LD1441/2019>. Published June 19, 2019. Accessed September 21, 2020.
92. State of Idaho. Chapter 221 Session Law: *Amends existing law to provide for dental therapists, in Idaho Statutes*. <https://www.billtrack50.com/Bill-Detail/1074749>. Published March 25, 2019. Accessed September 21, 2020.
93. State of Arizona. Chapter 296. *Dental therapy; regulation; license, in Arizona Revised Statutes*. <https://legiscan.com/AZ/bill/HB2235/2018>. Published May 16, 2018. Accessed September 21, 2020.
94. State of Vermont. Title 26: Professions and Occupations. Chapter 12: *Dentists, Dental Therapists, Dental Hygienists, and Dental Assistants*. Vermont General Assembly website. <https://legislature.vermont.gov/statutes/fullchapter/26/012>. Accessed September 21, 2020.
95. State of Nevada. 80th (2019) Session: SB366. Chapter 532. *An act relating to dental care; establishing the profession of dental therapy governed by the Board of Dental Examiners of Nevada; revising provisions relating to dentistry and dental hygiene; providing penalties; and providing other matters properly relating thereto*. <https://www.leg.state.nv.us/App/NELIS/REL/80th2019/Bill/6665/Overview>. Published March 19, 2019. Accessed September 21, 2020.
96. Direct Access page. The American Dental Hygiene Association website. <https://www.adha.org/direct-access>. Accessed June 20, 2019.
97. Naughton DK. Expanding oral care opportunities: Direct access care provided by dental hygienists in the United States. *J Evid Based Dent Pract*. 2014;14:171-182.e1.
98. Variation in Dental Hygiene Scope of Practice by State. Oral Health Workforce Research Center website. <http://www.oralhealthworkforce.org/wp-content/uploads/2019/01/Single-Page-Layout-Final-2019.pdf>. Updated January 2019. Accessed July 19, 2020.
99. Mertz E, Glassman P. Alternative practice dental hygiene in California: past, present, and future. *J Calif Dent Assoc*. 2011;39(1):37-46.
100. Langelier M, Continelli T, Moore J, Baker B, Surdu S. Expanded scopes of practice for dental hygienists associated with improved oral health outcomes for adults. *Health Affairs* (Millwood). 2016;35(12):2207-2215.
101. Mitchell TV, Peters R, Gadbury-Amyot CC, Overman PR, Stover L. Access to care and the allied oral health care workforce in Kansas: Perceptions of Kansas dental hygienists and scaling dental assistants. *J Dent Educ*. 2006;70(3):263-278.
102. Delinger J, Gadbury-Amyot CC, Mitchell TV, Williams KB. A qualitative study of extended care permit dental hygienists in Kansas. *J Dent Hyg*. 2014;88(3):160-172.
103. Squillace J. Study of a rural practice dental hygienist in a public health setting: analysis of an administrative dataset. *J Health Care Poor Underserved*. 2012;23(2):739-751.
104. Mertz E, Bates T. *Registered Dental Hygienists in California: Regional Labor Market Chart Book*. Center for the Health Professions, University of California, San Francisco: San Francisco, CA; 2008. <https://healthforce.ucsf.edu/publications/registered-dental-hygienists-california-regional-labor-market-chart-book>.
105. Freed JR, Perry DA, Kushman KE. Aspects of quality of dental hygiene care in supervised and unsupervised practices. *J Public Health Dent*. 1997;57(2):68-75.
106. Olmsted JL. Public health dental hygiene: an option for improved quality of care and quality of life. *J Dent Hyg*. 2013;87(5):299-308.
107. Cohen LA. Expanding the physician's role in addressing the oral health of adults. *Am J Public Health*. 2013;103(3):408-412.
108. Manski RJ, Hoffmann D, Rowthorn V. Increasing access to dental and medical care by allowing greater flexibility in scope of practice. *Am J Public Health*. 2015;105(9):1755-1762.

109. Affordable Care Act, dental benefits examined. The American Dental Association website. <https://www.ada.org/en/publications/ada-news/2013%20Archive/august/affordable-care-act-dental-benefits-examined>. Accessed July 22, 2019.
110. In search of dental care: Two types of dentist shortages limit children's access to care. The PEW Charitable Trusts website. https://www.pewtrusts.org/~media/legacy/uploadedfiles/pes_assets/2013/Insearchofdentalcarepdf.pdf. Accessed July 10, 2019.
111. Emmanuel M, Thompson L, Catalanotto F. The role of pediatric trainees in addressing oral health disparities in children. *Pediatrics*. 2018;141(5):e20174265.
112. Manchir M. Family physicians' group backs oral health primary care plan. American Dental Association Website: ADA News. <https://www.ada.org/en/publications/ada-news/2016-archive/january/family-physicians-group-backs-oral-health-primary-care-plan#>. Published January 12, 2016. Accessed June 11, 2019.
113. Barnett T, Hoang H, Stuart J, Crocombe L. Non-dental primary care providers' views on challenges in providing oral health services and strategies to improve oral health in Australian rural and remote communities: a qualitative study. *BMJ Open*. 2015;5(10):e009341.
114. Rabiei S, Mohebbi SZ, Patja K, Virtanen JI. Physicians' knowledge of and adherence to improving oral health. *BMC Public Health*. 2012;12:855.
115. American Academy of Pediatrics. Policy Statement. Maintaining and improving the oral health of young children. *Pediatrics*. 2014;134(6):1224-1229. doi:10.1542/peds.2014-2984.
116. Kranz AM, Preisser JS, Rozier RG. Effects of physician-based preventive oral health services on dental caries. *Pediatrics*. 2015;136(1):107-114.
117. Moyer VA. Prevention of dental caries in children from birth through age 5 years: US preventive services task force recommendation statement. *Pediatrics*. 2014;133(6):1102-1111.
118. Atchison KA, Rozier RG, Weintraub JA. Integration of oral health and primary care: communication, coordination and referral. *NAM Perspectives*. 2018. Discussion Paper, National Academy of Medicine, Washington, DC.
119. Clark MB, Slayton RL. Fluoride use in caries prevention in the primary care setting. *Pediatrics*. 2014;134(3):626-633. doi: 10.1542/peds.2014-1699.
120. Clark MB, Slayton RL. Fluoride use in caries prevention in the primary care setting. *Pediatrics*. 2014;134(3):626-633.
121. Reimbursing physicians for fluoride varnish. Pew Charitable Trusts website. <https://www.pewtrusts.org/en/research-and-analysis/articles/2011/08/29/reimbursing-physicians-for-fluoride-varnish>. Published August 29, 2011. Accessed September 22, 2020.
122. Rozier RG, Stearns SC, Pahel BT, Quinonez RB, Park J. How a North Carolina program boosted preventive oral health services for low-income children. *Health Affairs (Millwood)*. 2010;29(12):2278-2285.
123. Zezima K. Short of dentists, Maine adds teeth to doctors' training. The New York Times website. <https://www.nytimes.com/2009/03/03/us/03dentist.html>. Published March 2, 2009. Accessed September 22, 2020.
124. Helseth C. Finding new ways to meet oral health needs in rural areas. Rural Health Information Hub website: The Rural Monitor. <https://www.ruralhealthinfo.org/rural-monitor/oral-health-needs-in-rural-areas/>. Published August 17, 2010. Accessed July 22, 2019.
125. Kirk CD, Goodson S, Armijo D, et al. Transforming the primary care oral health landscape through quality improvement. *Pediatrics*. 2018;142(1):426-426.
126. Neumann AS, Lee KJ, Gussy MG, et al. Impact of an oral health intervention on pre-school children < 3 years of age in a rural setting in Australia. *J Paediatr Child Health*. 2011;47(6):367-372.

127. Sams LD. Adoption and implementation of policies to support preventive dentistry initiatives for physicians: a national survey of Medicaid programs. *Am J Public Health*. 2013;103(8):e83-e90.
128. Dental Care. The Maine-Dartmouth Family Medicine Residency website. <https://www.maine-dartmouth.org/our-programs/family-medicine-resident-training/unique-opportunities/dental-care/>. Accessed July 22, 2019.
129. Keough L, Clifford M, Langelier M, Goodwin N, Melnik T. *Compendium of Innovations in Oral Health Service Delivery*. Rensselaer, NY: Oral Health Workforce Research Center, Center for Health Workforce Studies, School of Public Health, SUNY Albany; February 2020.
130. ADI Mobile Health. Mobile health clinic state and federal laws & regulations. <http://adi-mobilehealth.com/wp-content/uploads/2017/01/Mobile-Health-Clinic-Regulations-Federal-State.pdf>. Accessed November 22, 2019.
131. Glassman P, Harrington M, Mertz E, Namakian M. The virtual dental home: Implications for policy and strategy. *J Calif Dent Assoc*. 2012;40(7):605-611.
132. Langelier M, Rodat C, Moore J. *Case Studies of 6 Teledentistry Programs: Strategies to Increase Access to General and Specialty Dental Services*. Rensselaer, NY: Oral Health Workforce Research Center, Center for Health Workforce Studies, School of Public Health, SUNY Albany; December 2016.
133. CDC-funded programs. Centers for Disease Control and Prevention website. https://www.cdc.gov/oralhealth/funded_programs/cooperative_agreements/index.htm. Accessed September 23, 2020.
134. Oral health program plans. Centers for Disease Control and Prevention website. https://www.cdc.gov/oralhealth/funded_programs/oh_plans/index.htm. Published November 6, 2019. Accessed December 4, 2019.
135. HRSA awards \$2.3 million to integrate oral health care into school-based health centers. Health Resources and Services Administration website. <https://www.hrsa.gov/about/news/press-releases/2011-09-27-oral-health.html>. Published September 27, 2011. Accessed September 22, 2020.
136. School-based health center grant awards. Health Resources and Services Administration website. <https://www.hrsa.gov/about/news/2012-tables/2012-12-18-school-based-awards.html>. Published December 19, 2012. Accessed November 22, 2019.
137. Head Start Center Locator. Head Start/Early Childhood Learning & Knowledge Center (ECLKC) website. <https://eclkc.ohs.acf.hhs.gov/center-locator>. Accessed November 22, 2019.
138. The School-based health alliance child health and education mapping tool: Washington, DC. School-Based Health Alliance website. <http://www.sbh4all.org/sbhadb/maps/index.php>. Accessed November 22, 2019.
139. Federally Qualified Health Centers. The Health Resources & Services Administration website. <https://www.hrsa.gov/opa/eligibility-and-registration/health-centers/fqhc/index.html>. Accessed November 22, 2019.
140. Grants without deadlines. At the California School-Based Health Alliance website. <https://www.schoolhealthcenters.org/start-up-and-operations/funding/grants-without-deadlines/>. Accessed November 22, 2019.
141. Health Establishments at Local Schools. Frequently asked questions. The Heals Inc website. <http://www.healsinc.org/faq/>. Accessed November 22, 2019.
142. Langelier M, Surdu S, Rodat C. *Survey of Federally Qualified Health Centers to Understand Participation with Dental Residency Programs and Student Externship Rotations*. Rensselaer, NY: Oral Health Workforce Research Center, Center for Health Workforce Studies, School of Public Health, SUNY Albany; December 2016.
143. Weil AR. Rural health. *Health Affairs* (Millwood). 2019;38(12):1963.

144. Skinner E. Boosting oral health care in rural communities. National Conference of State Legislatures (NCSL) website. <https://www.ncsl.org/research/health/boosting-oral-health-care-in-rural-communities.aspx>. Published July 2020. Accessed September 22, 2020.

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