

Oral Health and Nutrition



THE ROLE OF
DENTAL EDUCATION
IN ADDRESSING
FOOD INSECURITY,
NUTRITION, AND
HEALTH INEQUITIES

INTRODUCTION

Nutrition has the potential to prevent or exacerbate serious oral conditions that can lead to instances of childhood mortality from untreated caries (cavities) [32], poor maternal and infant outcomes from premature delivery [17], and complications of heart disease due to oral infection [11]. For these reasons and more, it is essential that nutrition programming be an integral component of dental education and practice.

Every provider in the oral health and dental field should have knowledge of and skills in nutrition. Ms. Jillian Kaye, Adjunct Clinical Instructor at NYU College of Dentistry, notes, “Dentists need to have education [in nutrition] so that they can transfer that education to their patients.” Dentists should feel confident in communicating with patients about the effect of nutrition practices on oral health and conversely the effect of oral conditions on nutrition practices.

Yet, there is a lack of adequate training in and knowledge of nutrition among dentists and dental students in the United States. Because nutrition gets little space in dental curricula and training, the majority of practicing dentists feel uncomfortable providing nutrition counseling to their patients and avoid doing so [20].

In this report, we highlight the relationship between nutrition and dentistry as it stands and the potential for future improvement. Specifically, this report demonstrates:

1. The importance of nutrition counseling in dental practice and the significant impact it can have on patient and population health, especially among those who face food insecurity.

2. The current state of nutrition education in dental schools.
3. Barriers that need to be addressed to ensure nutrition is recognized as a critical part of oral health.

To create these changes, this report proposes a variety of recommendations for policies and institutional initiatives that aim to incorporate applied nutrition education into every stage of dental education, training, and practice.

Understanding nutrition is essential to the dental field but should only be the starting point. We are calling for dental professionals to not only understand the connection between nutrition and oral health but also be able to identify food insecurity and other nutrition risk factors in order to provide appropriate guidance and referrals for at risk patients. These initiatives are especially important during this COVID-19 pandemic as millions of Americans are now facing unemployment, lack of health and dental insurance, new-found food insecurity, and a looming recession.

RELATIONSHIP BETWEEN ORAL HEALTH, PHYSICAL ILLNESS, AND NUTRITION

For many chronic illnesses and diseases, oral health, physical health, and nutrition are intertwined. To treat any aspect of these conditions, a provider must understand how oral, physical, and nutritional health work together in a mutual and non-exclusive manner.

IMPACT OF ORAL HEALTH ON PHYSICAL ILLNESS

Those aware of the relationship between oral health and physical illness tend to focus on the

association between oral infections and the increased risk of poor cardiovascular outcomes among individuals with heart disease [11]. However, the impact of oral health on physical illness goes beyond the heart and touches on almost every aspect of general wellbeing. Oral health has been linked to an increased risk of cancer, such as upper airway and digestive tract cancers in those with poor oral health [33]; lung disease, such as bacterial pneumonia caused by oral bacteria in the critically ill; and pregnancy related complications, such as pre-term delivery and low-birth-weight infants among mothers with oral infections [8].

IMPACT OF PHYSICAL HEALTH ON ORAL HEALTH

Just as oral health impacts physical health, physical health impacts oral health. In fact, oral manifestations of diseases can often be the first sign of illness [26]. This makes the role of dentists crucial to understanding many systemic illnesses. For instance, in leukemia—where malignant cells can infiltrate the gums—bleeding and ulcers in the oral cavity are a common manifestation of disease [8] and in the case of acute monoblastic leukemia, specifically, gingival hypertrophy is the main manifestation of disease [33]. Additionally, for individuals with Crohn's disease, lupus, or HIV, mouth sores and oral plaques are often the first visible sign of disease [26].

ROLE OF NUTRITION

Nutrition is critical to the relationship between oral and physical health because oral diseases impact one's ability to eat and maintain nutrition [37] and malnutrition/nutritional deficiencies impact oral and physical health [13]. One of the most commonly recognized intersections

of nutrition, oral health, and physical health is in relation to the consumption of sugars and other fermentable carbohydrates (i.e. cookies, soft drinks, breakfast cereals, and bread) which are known to cause dental caries [23].

Early childhood caries (ECC) are of particular concern to dentists as oral health in childhood is correlated with oral health in adulthood. Additionally, this highly preventable condition costs the U.S. health care system approximately \$1.5 billion each year [40].

Because of the strong association between diets high in fermentable carbohydrates and ECC, dietary advice is one of the most important methods of preventing this condition. Yet, it is one of the least commonly used methods of prevention [20]. When childhood caries are not prevented or adequately treated, children often must undergo dental surgery, frequently with general anesthesia. The use of general anesthesia carries its own potential risk for health complications as well as high medical costs [27].

Nutrition's impact on health goes beyond the oral cavity to also involve systemic and chronic illness [23]. A notable chronic illness in this relationship is diabetes mellitus. Without nutritional counseling, individuals living with diabetes may struggle to maintain glycemic control, increasing the risk of periodontitis and systemic infections [8]. Furthermore, periodontitis leads to increased inflammation and more difficulty in achieving glycemic control [35].

Many oral conditions, including gingivitis, severe caries, oral infections, and oral cancers, negatively impact an individual's quality of life [34]. This manifests as debilitating pain, psychological challenges, and oral discomfort lead-

ing to an inability to gain adequate or appropriate nutrition [18]. Nutrient deficiencies such as vitamin C, vitamin K, and B12 deficiencies can further manifest in the oral cavity as inflamed and bleeding gums [37]. When individuals are not able to attain proper nutrition, their immune systems are also impaired, placing them at increased risk for periodontal disease/infection as well as systemic infection [14].

ORAL HEALTH AND NUTRITION IN UNDERSERVED COMMUNITIES

Although understanding the role of nutrition in oral health is important for all patients, this understanding is especially important for marginalized communities. These communities not only face challenges in accessing dental care but also in accessing nutritious food, leading to food insecurity [30].

Food insecurity is highly correlated with nutrition and has been linked to worse oral and physical health outcomes [21]. The process that underlies this connection stems from the need for those who face food insecurity to utilize strategies to cope with poor access to nutritious food or lack of adequate funds to purchase nutritious food [28]. This often leads to financial tradeoffs that result in individuals reserving their finances for other needs (i.e. rent, school fees, medication, preventive dental care) rather than nutritious food [28].

Additionally, many underserved individuals live in environments with high densities of fast-food restaurants and small corner stores and low densities of supermarkets with fresh produce [39]. This community make-up results in reduced availability of quality fruits and vegetables and increased availability of food contain-

ing fermentable carbohydrates. This nutritional deficit results in higher rates of oral conditions such as dental caries in this population [7]. The poor diet linked to food insecurity also exacerbates chronic illnesses that are related to diet such as diabetes and obesity [28].

Race and ethnicity are also important sociodemographic indicators of poor oral health and food insecurity in the U.S. Ethnic and racial minorities disproportionately experience food insecurity and poor oral health outcomes [15]. Studies have found that non-Hispanic black and Hispanic households are twice as likely to experience food insecurity than their Caucasian counterparts [31]. According to the 2015 National Health and Nutrition Examination Survey (NHANES), non-Hispanic black and Hispanic children are also more likely to have untreated caries than their counterparts [19].

The impacts of poverty, food insecurity, and race/ethnicity on oral health do not occur in silos. As observed by Dr. Michael Monopoli, former President of the American Association of Public Health Dentistry and current Executive Director of Grant Strategy at DentaQuest Partnership for Oral Health Advancement, “All of these structural barriers together affect a chance at robust nutrition and oral health.” If dentists are not well enough equipped with the skills to apply an awareness of nutrition’s impact on oral health in the care they provide for the general population, they will be at a loss to holistically care for those who face greater risks of poor oral health outcomes due to financial barriers, food insecurity, and racial/ethnic discrimination. Oral health practitioners should therefore not only have knowledge of nutrition’s influence on patient health but also the ability to screen for food insecurity and connect

patients to responsive services in their communities.

CURRENT STATE OF NUTRITION IN DENTAL EDUCATION

According to Monopoli, “It all starts in dental school.” Indeed, over the past three decades, research on the critical role of nutrition in oral health has led to a number of influential publications that aim to push the dental field into a greater focus on diet and nutrition knowledge among its students and professionals. Two of the most notable publications are the 1995 Institute of Medicine (IOM) study titled *Dental Education at the Crossroads* [22] and the 2000 U.S. Surgeon General’s report, *Oral Health in America* [1]. The IOM report was the first of its kind to address the mission of dental schools across many sectors and to provide recommendations on dental school curricula [24]. It was the first to state that poor dietary choices impact oral health, with subsequent reports calling for health care providers to utilize nutrition counseling in their efforts to address diet-related disease [23]. The 2000 Surgeon General’s report took the work of IOM a step further. This report, which aimed to expand the nation’s understanding of oral health as essential to general health and well-being, specifically stated that diet and nutrition are critical factors in the development and progression of oral disease [37].

The call for the recognition of the impact of nutrition on oral health has not gone unheeded by the dental community. Several dental and diet-related professional organizations—including the American Dental Association (ADA), the American Dental Hygienists Association (ADHA), the American Academy of Pediatric

Dentistry (AAPD), and the Academy of Nutrition and Dietetics—have published nutrition guidelines for dental practice [13]. For instance, in 2003, the Academy of Nutrition and Dietetics [formerly the American Dietetic Association (ADA)]—the world’s largest organization of food and nutrition professionals [2]—created a position statement, saying, “It is the position of the American Dietetic Association (ADA) that nutrition is an integral component of oral health. The ADA supports the integration of oral health with nutrition services, education, and research. Collaboration between dietetics and dental professionals is recommended for oral health promotion and disease prevention and intervention” (Touger-Decker & Mobley, 2003, p. 615). Following this statement, in 2015, the American Dental Association (further referred to as ADA) passed a resolution encouraging dentists to remain current on the diet and nutrition counseling recommendations drafted by the association [25] [12].

Another influential organization, especially as it relates to dental education, is the American Dental Education Association (ADEA). This organization represents the field of academic dentistry and provides recommendations on how dental education should be structured and which competencies students entering the dental profession should meet [13]. Of note, nutrition took a prominent role in the ADEA’s 2015 report, which listed nutrition counseling as an essential skill for newly graduated dentists [13] [5].

Although dental associations have publicly recognized the role of diet and nutrition in oral health, the educational standards and credentialing requirements of the field have not followed suit. The Commission on Dental Ac-

creditation (CODA) partners with the U.S. Department of Education to determine the standards that dental schools and programs must meet to be accredited [16]. Although dental schools may opt out of accreditation, doing so means they forfeit federal financial aid and that their students face obstacles in applying to advanced dental programs and obtaining professional licensure [6]. Therefore, most dental schools and programs in the U.S. work to meet the standards required by CODA [16]. However, they have no incentive to go beyond these standards in the education provided to students.

CODA currently does not list specific accreditation standards that require dental schools to provide nutrition education to their students [13]. Although nutrition education is implied by the requirement that students gain competency in applied biomedical knowledge as well as health promotion and disease prevention, the lack of specification around nutrition education means that dental programs do not need to provide nutrition training [13]. In contrast, dental hygiene programs are required by CODA to meet specific nutrition education requirements in order to be accredited and are thus driven to provide nutrition related training [13].

Similar gaps exist in dental licensing exams, which can be key drivers of dental curricula. The Joint Commission on National Dental Examinations (JCND) is charged with administering licensing exams to dental students as well as dental hygiene students [29]. Again, the National Board Dental Examination (NBDE) for dental students does not specifically cover nutrition; whereas, the National Board Dental Hygiene Examination (NBDHE) for dental hygiene students does have specific questions related to nutrition [30].

These differences in student examination and accreditation requirements for dental and dental hygiene programs demonstrate the belief that dental hygienists, rather than dentists, are responsible for providing patients with nutrition care [13]. Although dental hygienists play invaluable roles in oral health, research has shown that a patient's experience with their dentist has a particularly powerful impact on their level of oral health literacy and use of dental services [6]. Therefore, it remains critical that dentists, in addition to dental hygienists, have the knowledge to provide nutrition counseling to their patients and have the opportunity to apply counseling in their training.

Overall, there is a clear divide between what dental associations like ADA and ADEA believe are essential nutrition skills for students entering the dental profession and what accrediting and credentialing bodies (CODA and JCND, respectively) require dental schools to teach their students and therefore, what students believe is valuable to their education [14]. This mismatch means that students are not being asked to learn or tested on the nutrition knowledge that their experienced dental colleagues believe is valuable in practice. Because of the lack of nutrition education in dental school accreditation requirements, schools are not incentivized to teach their students about oral health and nutrition. Similarly, because of the lack of testing, dental students are not incentivized to recognize nutrition as their responsibility and its impact on their patients.

PRIMARY BARRIER TO NUTRITION INCORPORATION IN DENTAL EDUCATION— CURRICULA AND TESTING

There is agreement within the medical field overall and the dental field specifically that nutrition education is needed in dentistry, even within already full curricula and practices. In fact, efforts to develop applied nutrition programming (i.e. screening, counseling, referring to specialists) for dental students began in the 1960s [13]. Though there is agreement around the need for nutrition programming, there is disagreement on how it should be implemented [23]. Perceptions of what qualifies as the basic nutrition content that should be provided to students varies among institutions and there is no consensus on what should be incorporated into a dental nutrition course [23]. This has led to gaps in adequate nutrition training for many members of the dental community. These gaps have prevented dental professionals from implementing practices to address the connection between nutrition and oral health. The ADEA once filled the role of providing curricular guidelines on nutrition for dental students but later moved away from this role in favor of allowing each school to set its own guidelines [14]. This increased flexibility has led to essential aspects of dental education, like nutrition, falling to the wayside at most dental institutions.

Even among programs that provide nutrition education, dentists are not adequately trained in the components of applied nutrition needed for practice. A study conducted by ADEA in 2011 found that among 24 dental schools, the mean number of hours spent on nutrition education was approximately 16 hours (compared to 47 among dental hygienists) with approximately 0 of those hours being from clinical/applied training (compared to 9.3 among hygienists) [13]. This lack of applied training is especially concerning because nutrition is most utilized in direct patient counseling, referring

to nutrition specialists, and in recognizing the nutritional patterns/disorders that put patients at increased risk for poor oral health outcomes [23]. The lack of applied nutrition training, even in the presence of didactic teaching, leads to gaps in knowledge of nutrition among dental students that manifest as lack of confidence in using nutrition-based interventions in practice [23]. In fact, a study conducted by McKinney et, al. found that only 1/3 of dentists feel confident in providing nutrition counseling although the majority had some nutrition education [20].

This lack of clinical/applied training and minimal didactic training amongst dental students emphasizes the importance of testing and accreditation standards in the field of dental education [3]. As can be seen from the number of hours spent in nutrition training in dental hygiene programs compared to dental schools, when a topic is on the licensing exam, it will receive more emphasis in teaching. The same can be said about accreditation requirements.

OTHER BARRIERS TO NUTRITION INCORPORATION IN DENTAL EDUCATION

Although accreditation and testing practices are particularly critical barriers to adequately incorporating nutrition into dental education, other barriers to success must also be considered. One such barrier is the **lack of qualified nutrition instructors in dental schools**. The majority of dental nutrition curricula are taught by biochemistry or basic science faculty [13] with only 28% of programs reporting having a registered dietician nutritionist (RDN) provide any nutrition education [36]. As stated by Dr. Carole Palmer, Professor Emeritus of Nutrition and Oral Health Promotion at Tufts School of

Dental Education, “Most people who teach [nutrition in dental schools] are not educators; they are content specialists.” Because basic science instructors are not able to convey the clinical application of nutrition to oral health, students will not see the value in learning it [13]. Therefore, there is value in interprofessional collaboration between basic scientists and clinicians, like Dr. Palmer, in educating students.

Unlike in medical school where the concept of a physician nutrition specialist has been recognized and dietitians play a role in medical care, there is a lack of dietician dental specialists or dentists with specialized training in nutrition [36]. This lack of oral health and nutrition specific professionals not only leads to a deficit in qualified instructors of nutrition in dental programs but also a deficiency in dietitians on dental teams—all the more reason why it is critical that dentists have an understanding of and can utilize nutrition in their own practices [13].

As with many aspects of health care, **time and finances** also serve as major barriers to the successful incorporation of nutrition into dental education. Many dental programs are calling for student credit hours to be reduced due to already crowded curricula. This forces administrators to prioritize what is perceived as “more important” content—that which is necessary for testing and accreditation—above “less important” content, such as nutrition [23]. This causes the already insufficient amount of time spent on nutrition education to be further reduced. Additionally, there is a lack of funding for nutrition faculty, nutrition curricular development, and evidence-based research on the effectiveness of nutrition-based interventions in dental practice [13]. Unlike the medical field where programs have access to nutrition-based fund-

ing through the Nutrition Academic Award Program, the dental field does not have a similar source of funding [36].

Another critical barrier is the **lack of reimbursement for dental nutrition counseling and care by insurance companies** [20]. In 2018, ADA recommended that U.S. states develop oral health insurance plans that include nutrition related care and develop well defined guidelines that encourage reimbursement for nutrition counseling [12]. However, many insurance companies still do not accept or reimburse for the dental billing code related to nutritional counseling [20]. Although private dental insurers are more likely to cover nutritional counseling, this is not true across all private insurers, and coverage is especially lacking in public insurance [20]. Because most states do not provide dental coverage for adults on Medicaid, data on dental nutritional counseling within this population is often variable [10]. However, even among children, who generally receive dental coverage under Medicaid, only 4 states reimbursed for pediatric dental nutrition counseling in 2017 [4]. Sadly, as stated by Dr. Monopoli, “Oral health is undervalued. If it were valued, it would be paid for. There are hardly any [insurance] programs that pay for it.”

RECOMMENDATIONS: THE WAY FORWARD

There are many barriers to incorporating nutrition into dental education and practice; however, with key initiatives, there is a path forward. We recommend the following initiatives for the dental field to overcome these barriers.

1. Clearly incorporate nutrition education requirements into dental school accred-

itation within the Commission on Dental Accreditation (CODA) standards and the Joint Commission on National Dental Examinations (JCNDE) dental student licensing examinations [14]—This recommendation addresses two of the biggest barriers to incorporating nutrition into dental education and practice and thus will have a particularly important impact in driving change. Additionally, this recommendation is feasible as it can be implemented internally within the dental accrediting and credentialing bodies without the need for involvement of other entities outside the dental field.

2. The American Dental Education Association (ADEA) and American Dental Association (ADA) create clear curricular guidelines and consensus statements on how the interplay between nutrition, food insecurity, and oral health should be incorporated into dental education [13] —Current statements say that dentists should recognize the role that food security plays in oral health and nutrition and advocate for the incorporation of nutrition into dental education but do not discuss methods of incorporation. These statements and guidelines should not only address the need for nutrition in dental education but also discuss methods for its incorporation in the dental student and professional community. An added benefit of this recommendation is that as more guidelines and consensus statements are created, accrediting and credentialing bodies will be pushed to address nutrition in their own work.
3. Dental professional bodies create and promote continuing nutrition education for practicing dental professionals, especially in regard to addressing issues of food inse-

curity—Many practicing dentists who have completed their formal education continue to feel inadequately trained in nutritional aspects of dentistry, especially related to food insecurity. In addition, there is a lack of nutrition content in the continuing education resources provided by the ADA and other dental professional groups [9]. Therefore, guidelines and resources should be created to support dental professionals. They should include but not be limited to: a) providing resources to patients regarding the importance of nutrition in oral health; b) screening patients for food insecurity and connecting food insecure patients to appropriate nutrition resources; and c) maintaining records of patients screening positive for food insecurity, the resources recommended, and whether patients are connected to resources. Furthermore, guidelines should encourage practicing dentists to partner with communities in addressing the structural and systemic processes that lead to inequities in food security and access to oral health care.

4. Insurers adequately reimburse nutrition services within dental payment systems —This recommendation is critical to the incorporation of nutrition services into dental practice. As stated by Dr. Palmer, “If you get paid for something, you’ll do it.” Reimbursement for nutrition counseling should therefore focus on improvements within the current payment system while also looking to future payment models by:
 - Adequately reimbursing nutrition services within current fee-for-service (FFS) dental payment systems, and
 - Considering value-based payment systems as a way to incentivize den-

tists to incorporate nutrition counseling into their services while providing adequate reimbursement. Unlike FFS, which pays clinicians based on the number and type of procedures they perform, value-based models reimburse clinicians based on the quality, rather than volume, of care provided [38]. Because value-based care emphasizes preventive oral health management and nutrition counseling is a form of high-value, preventive care, shifting towards value-based models could promote the provision of nutrition services within the dental profession.

5. Foster interdisciplinary collaboration around nutrition and patient care—As discussed, there is a synergistic relationship between oral health, physical health, and nutrition. Interdisciplinary education and practice allow dental students to understand the roles of other medical colleagues regarding nutrition and how all professions work together to care for the whole patient [23]. In fact, at some dental schools, interdisciplinary collaboration allows dental students to be taught alongside nutrition students and to learn from nutrition initiatives and best practices already undertaken in medical education [14].
6. Dental schools appoint at least one faculty member trained in nutrition (registered dietitian nutritionist or dentist) to guide the development of nutrition curricula [36] — Curricula guided by faculty with nutritional knowledge will allow students to better understand the value of nutrition and how it is utilized by practicing clinicians.

CONCLUSION

Dentists have the potential to play a key role in the prevention and mitigation of oral and systemic disease through nutrition screening, counseling, and referral to appropriate services. However, the systems that train and license dentists have not fostered an environment in which this can be accomplished. Key barriers preventing nutrition from becoming an essential part of dental student education include the lack of nutrition components in dental school accreditation and dental student licensing exams, lack of qualified nutrition instructors in dental schools, and lack of reimbursement for nutrition counseling in dental practice. Overcoming these barriers are important for the health of all patients, but especially for those who come from under-resourced communities and face challenges including food insecurity and inadequate access to dental care.

In order to change the oral health landscape, action must be taken both by the field of dentistry as a whole and by individual professionals. We recommend actions including creating clear guidelines for incorporating applied nutrition education into dental school curricula as well as in the accreditation process for dental schools and licensing examinations for dental students, developing continuing education guidelines and resources for dental practitioners, and adequately reimbursing dentists for nutrition counseling services with an increased focus on value-based dental care.

As the novel coronavirus continues to impact us today and reshape our tomorrows, the inequities that face those who are already marginalized will continue to grow. Furthermore, those who were previously secure will face new

uncertainties. The understanding of nutrition and its interplay with oral health will be more important to dentists than ever before as more people face challenges of food insecurity and diminished access to dental care. Dentists now have the opportunity to lead the future of nutrition in oral health. With the appropriate educational foundation and financial incentives, the investment in nutrition counseling made by dentists can improve the oral and physical health of many communities now and for generations to come.

REFERENCES

1. 2000 Surgeon General's Report on Oral Health in America. (n.d.). Retrieved from <https://www.nidcr.nih.gov/research/data-statistics/surgeon-general>
2. About Us. (n.d.). Retrieved from https://www.eatrightpro.org/about-us?_ga=2.112737348.199899529.1591494138-2143705209.1591494138
3. Accreditation Standards For Advanced Dental Education Programs in Advanced Education in General Dentistry (Publication). (2018, August 3). Retrieved from https://www.ada.org/~media/CODA/Files/Advanced_Education_General_Dentistry_Standards.pdf?la=en
4. American Academy of Pediatric Dentistry. (2017). Are Your Kids Covered?: Medicaid Coverage for the Essential Oral Health Benefits. Retrieved from <https://www.aapd.org/assets/1/7/AreYourKidsCoveredfinal.pdf>
5. American Dental Education Association. (2016). Adea Compendium of Curriculum Guidelines for Allied Dental Education Programs May 2015–2016. Retrieved from <https://www.adea.org/cadpd/toolkit/>
6. American Dental Hygienists' Association. (2016). FAQs about Dental Hygiene Education Programs and Accreditation. Retrieved from https://www.adha.org/resources-docs/72617_FAQs_About_Dental_Hygiene_Education_Programs_and_Accreditation.pdf
7. Burt, B. A., Kolker, J. L., Sandretto, A. M., Yuan, Y., Sohn, W., & Ismail, A. I. (2006). Dietary Patterns Related to Caries in a Low-Income Adult Population. *Caries Research*, 40(6), 473–480. doi: 10.1159/000095645
8. Chi, A.C, Neville, B.W., Krayer, J.W., Gonsalves, W.C. (2010). Oral Manifestations of Systemic Disease. *Am Fam Physician*, 82(11): 1381-1388. Retrieved from <https://www.aafp.org/afp/2010/1201/p1381.html>
9. Clinical Dentistry. (n.d.). Retrieved August 29, 2020, from <https://ebusiness.ada.org/Education/coursecategory.aspx?ID=3>
10. Dental Care. (n.d.). Retrieved from <https://www.medicaid.gov/medicaid/benefits/dental-care/index.html>
11. Dhadse, P., Gattani, D., & Mishra, R. (2010). The link between periodontal disease and cardiovascular disease: How far we have come in last two decades? *Journal of Indian Society of Periodontology*, 14(3), 148. doi: 10.4103/0972-124x.75908
12. Diet and Nutrition. (2016). Retrieved from <https://www.ada.org/en/advocacy/current-policies/diet-and-nutrition>
13. DiMaria-Ghalili, A.N., Mirtallo, J.M., Tobin, B.W., Hark, L., Horn, L.V., Palmer, C.A. (2014). Challenges and opportunities for nutrition education and training in the health care professions: intraprofessional and interprofessional call to action. *The American Journal of Clinical Nutrition*, 99(5): 1184S–1193S. doi:10.3945/ajcn.113.073536
14. DiMaria-Ghalili, R.A., Edwards, M., Friedman, G., Jaferi, A., Kohlmeier, M., Kris-Etherton, P., ... Wylie-Rosett, J. (2013). Capacity building in nutrition science: revisiting the curricula for medical professionals. *Annals of the New York Academy of Sciences*, 1306(1), 21–40. doi: 10.1111/nyas.12334
15. Dye, B. A., Li, X., & Thornton-Evans, G. (2012). Nchs Data Brief: Oral Health Disparities as Determined by Selected Healthy People 2020 Oral Health Objectives for the United States, 2009–2010. Center for Disease Control

- and Prevention. Retrieved from <https://permanent.access.gpo.gov/gpo44730/db104.pdf>
16. Establishment of the Commission. (n.d.). Retrieved from <https://www.ada.org/en/coda/accreditation/about-us>
 17. Expectant Mothers' Periodontal Health Vital To Health Of Her Baby. (2013, August 28). Retrieved from https://www.perio.org/consumer/AAP_EFP_Pregnancy
 18. Fávaro-Moreira, N. C., Krausch-Hofmann, S., Matthys, C., Vereecken, C., Vanhauwaert, E., Declercq, A., ... Duyck, J. (2016). Risk Factors for Malnutrition in Older Adults: A Systematic Review of the Literature Based on Longitudinal Data. *Advances in Nutrition*, 7(3), 507–522. doi: 10.3945/an.115.011254
 19. Flemming, E., Afful, J. (2018) Prevalence of Total and Untreated Dental Caries Among Youth: United States, 2015–2016. Center for Disease Control and Prevention. Retrieved from <https://www.cdc.gov/nchs/data/data-briefs/db307.pdf>
 20. Franki, J., Hayes, M.J., Taylor, J.A. (2014). The provision of dietary advice by dental practitioners: a review of the literature. *Community Dental Health*, 31: 9–14. doi:10.1922/CDH_3297Hayes06
 21. Gundersen, C., & Ziliak, J. P. (2015). Food Insecurity And Health Outcomes. *Health Affairs*, 34(11), 1830-1839. doi:10.1377/hlthaff.2015.0645
 22. Institute of Medicine (US) Committee on the Future of Dental Education, & Field, M. J. (Eds.). (1995). *Dental Education at the Crossroads: Challenges and Change*. National Academies Press (US).
 23. Johnson, D.L., Gurenlian, J.R. and Freudenthal, J.J. (2016). A Study of Nutrition in Entry-Level Dental Hygiene Education Programs. *Journal of Dental Education*, 80: 73-82. doi:10.1002/j.0022-0337.2016.80.1.tb06060.x
 24. Kassebaum, D., & Tedesco, L. (2017). The 21st-Century Dental Curriculum: A Framework for Understanding Current Models. *Journal of Dental Education*, 81(8): eS13-eS21. doi:10.21815/jde.017.002
 25. Khan, S.Y, Holt, K., Tinanoff, N. (2017). Nutrition Education for Oral Health Professionals: A Must, Yet Still Neglected. *Journal of Dental Education*, 81(1): 3-4. Retrieved from <http://www.jdentaled.org/content/81/1/3/tab-article-info>
 26. Lankarani, K. B., Sivandzadeh, G. R., & Hassanpour, S. (2013). Oral manifestation in inflammatory bowel disease: a review. *World journal of gastroenterology*, 19(46): 8571–8579. doi: 10.3748/wjg.v19.i46.8571
 27. *Manual of Pediatric Dentistry*. (n.d.). Policy on Early Childhood Caries (ECC): Unique Challenges and Treatment Options (pp. 74-75, Rep.).
 28. Map the Meal Gap (Publication). (2018). Retrieved <https://www.feedingamerica.org/sites/default/files/research/map-the-meal-gap/2016/2016-map-the-meal-gap-health-implications.pdf>
 29. National Board Dental Examinations. (n.d.). Retrieved from <https://www.ada.org/en/jcnde/examinations>
 30. Neumann, L.M. & MacNeil, R.L. (2007). Revisiting the National Board Dental Examination. *Journal of Dental Education*, 71(10): 1281-1292. Retrieved from http://www.jdentaled.org/content/71/10/1281?ijkey=ede-9612745f05205277558af2dc5bd63ac3d16da&keytype=tf_ipsecsha#sec-2

31. Odoms-Young, A., & Bruce, M. A. (2018). Examining the Impact of Structural Racism on Food Insecurity: Implications for Addressing Racial/Ethnic Disparities. *Family & community health, 41* Suppl 2 Suppl, Food Insecurity and Obesity (Suppl 2 FOOD INSECURITY AND OBESITY), S3–S6. doi:10.1097/FCH.0000000000000183
32. Otto, M. (2017, June 13). The healthcare gap: how can a child die of toothache in the US? Retrieved from <https://www.theguardian.com/inequality/2017/jun/13/healthcare-gap-how-can-a-child-die-of-toothache-in-the-us>
33. Rajesh, K.S., Thomas, D., Hegde, S., & Kumar, M. S. (2013). Poor periodontal health: A cancer risk? *Journal of Indian Society of Periodontology, 17*(6), 706. doi: 10.4103/0972-124x.124470
34. Spanemberg, J. C., Cardoso, J. A., Slob, E., & López-López, J. (2019). Quality of life related to oral health and its impact in adults. *Journal of stomatology, oral and maxillofacial surgery, 120*(3), 234–239. doi-org.ucsf.idm.oclc.org/10.1016/j.jormas.2019.02.004
35. Teeuw, W. J., Gerdes, V. E., & Loos, B. G. (2010). Effect of Periodontal Treatment on Glycemic Control of Diabetic Patients: A systematic review and meta-analysis. *Diabetes Care, 33*(2), 421–427. doi:10.2337/dc09-1378
36. Touger-Decker, R. (2004). Nutrition education of medical and dental students: innovation through curriculum integration. *The American Journal of Clinical Nutrition, 79*(2): 198-203. doi:10.1093/ajcn/79.2.198
37. Touger-Decker, R., Mobley, C. C., & American Dietetic Association (2003). Position of the American Dietetic Association: Oral health and nutrition. *Journal of the American Dietetic Association, 103*(5), 615–625. doi: 10.1053/jada.2003.50130
38. Value-based Payment. (n.d.). Retrieved from <https://www.dentaquest.com/oral-health-resources/the-future-of-oral-health/value-based-payment/>
39. Walker, R. E., Keane, C. R., & Burke, J. G. (2010). Disparities and access to healthy food in the United States: A review of food deserts literature. *Health & place, 16*(5), 876–884. doi-org.ucsf.idm.oclc.org/10.1016/j.health-place.2010.04.013
40. Xiao, J., Alkhers, N., Kopycka-Kedzierawski, D. T., Billings, R. J., Wu, T. T., Castillo, D. A., ... Eliav, E. (2019). Prenatal Oral Health Care and Early Childhood Caries Prevention: A Systematic Review and Meta-Analysis. *Caries Research, 53*(4), 411–421. doi: 10.1159/000495187