



## From Environment to Enamel: A Narrative Review of Social Determinants, Oral-Systemic Health Disparities, and the Interprofessional Clinical Pathway

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### Abstract

**Background:** Oral health disparities are not merely dental problems but manifestations of deeply entrenched social, economic, and environmental inequities. The social determinants of health (SDOH)—particularly poverty, food insecurity, and low health literacy—create a syndemic that fuels both poor oral health and adverse systemic outcomes, perpetuating cycles of disadvantage. **Aim:** This narrative review aims to synthesize evidence on the pathway through which SDOH generate oral-systemic health disparities and to examine the roles of an interprofessional team in screening for, diagnosing, and intervening upon these social and biological sequelae within clinical settings. **Methods:** A comprehensive literature search was conducted in PubMed, CINAHL, PsycINFO, SocINDEX, and Scopus (2010-2024). **Results:** The review delineates a causal pathway from structural inequities to biological risk (e.g., diet-driven malnutrition and inflammation) to clinical disease (caries, periodontitis, diabetes, CVD). It identifies critical gaps in clinical practice, including inadequate SDOH screening in dental and medical settings and a lack of integrated care models. The review proposes a framework for embedding systematic SDOH assessment (by nursing/social work), point-of-care nutritional and inflammatory biomarker testing (laboratory), behavioral counseling (psychology), and resource navigation (social work) into primary care and dental workflows. **Conclusion:** Addressing oral-systemic health disparities requires a fundamental reorientation of clinical practice from a biomedical to a biosocial model. Effective intervention necessitates co-located, interprofessional teams equipped to identify social risks and activate medical, dental, and community resources simultaneously, thereby treating the social roots of disease alongside its symptoms.

**Keywords:** Healthcare Disparities; Social Determinants of Health; Health Literacy; Nutritional Status; Poverty

### Introduction

Oral health is a quintessential biomarker of socioeconomic inequality. While dental caries and periodontitis are biologically mediated by bacteria and inflammation, their unequal distribution across populations is overwhelmingly determined by social, economic, and political forces. The World Health

Organization defines social determinants of health (SDOH) as the conditions in which people are born, grow, live, work, and age, and these conditions are shaped by the distribution of money, power, and resources (World Health Organization, 2021). In no domain of health are the effects of SDOH more visually apparent and yet clinically marginalized than

in oral health. Dental disparities are not random; they cluster geographically and demographically with poverty, racial and ethnic marginalization, food insecurity, and low health literacy, forming a syndemic with chronic systemic diseases like diabetes, cardiovascular disease, and adverse pregnancy outcomes (Peres et al., 2019).

The pathway from social disadvantage to clinical disease is both direct and indirect. Directly, poverty limits access to fluoridated water, affordable healthy food, and most critically, dental insurance and care. Indirectly, chronic stress from financial and social precariousness induces a pro-inflammatory state and promotes health behaviors (e.g., consumption of cheap, cariogenic diets high in processed carbohydrates; tobacco use) that simultaneously damage the periodontium and the endothelium (Shonkoff et al., 2022). This creates a vicious cycle: periodontal inflammation worsens glycemic control in diabetes, while the financial burden of diabetes management can divert resources from oral care, leading to tooth loss, which further compromises nutritional status (Borgnakke, 2015).

Despite this clear interconnection, healthcare systems remain profoundly siloed. Dentistry often operates in a separate financial and physical universe from primary medical care, and neither system is structurally designed to identify or address the upstream social causes of the pathologies they treat. Social workers, nurses, psychologists, and laboratory professionals possess unique but underutilized skills relevant to this crisis. Social workers are trained in structural assessment and resource navigation; nurses in holistic patient assessment and care coordination; psychologists in behavior change within constrained contexts; and laboratory medicine in identifying the subclinical nutritional and inflammatory signatures of social disadvantage.

This narrative review synthesizes literature from 2010 to 2024 to map the pathway from core social determinants—focusing on socioeconomic status (SES), food insecurity, and health literacy—to oral-systemic disease. It then critically examines the potential for an integrated interprofessional clinical response. We propose a model where the clinical encounter, whether in a family medicine office or a dental clinic, becomes a point of interception. Here, systematic screening for social risks triggers a coordinated team response: medical evaluation of nutritional status (supported by laboratory diagnostics), dental assessment of oral disease burden, psychological support for adaptive behaviors, and social work intervention to connect patients with concrete resources. The ultimate aim is to provide a roadmap for transforming clinical practice from a reactive, disease-focused model to a proactive, equity-focused one that treats the mouth as a window into the patient's social world and a starting point for holistic intervention.

### **Poverty, Food Insecurity, and Health Literacy**

Understanding oral-systemic disparities requires a deep dive into three intertwined, foundational SDOH: socioeconomic status (SES), food insecurity, and health literacy.

#### **Socioeconomic Status (SES) and Structural Access**

SES, encompassing income, education, and occupation, is the most powerful predictor of oral health status. Low income directly constrains access to dental care, which remains one of the least insured and most out-of-pocket expensive healthcare services in many nations (Nasseh & Vujicic, 2017). Even with public insurance, dental benefits are often limited for adults, and provider participation is low. Beyond care access, low SES influences environmental exposures: housing quality, stress levels, and most significantly, dietary patterns (Primm et al., 2009). Educational attainment is closely linked to health literacy and influences occupational opportunities, which in turn determine dental insurance benefits and job flexibility for attending appointments. This constellation of factors creates a "thickening" of disadvantage, where multiple barriers reinforce one another (Thomeer et al., 2023).

#### **Food Insecurity and the Dual Burden of Malnutrition**

Food insecurity—the limited or uncertain availability of nutritionally adequate and safe foods—is a critical mediator between poverty and disease. In high-income countries, food insecurity does not typically present as caloric starvation but as a reliance on low-cost, energy-dense, and nutritionally poor foods. These diets are high in refined sugars and carbohydrates, which are profoundly cariogenic, and low in micronutrients essential for immune function and tissue integrity (e.g., Vitamin C, D, calcium) (Lee & Ahn, 2021). This creates a dual burden: promoting dental caries through frequent sugar exposure while simultaneously undermining the host's ability to mount an effective immune response to periodontal pathogens (Leung et al., 2020). Furthermore, food insecurity is cyclical and stressful, activating the hypothalamic-pituitary-adrenal (HPA) axis, which can further exacerbate inflammatory processes and lead to dysregulated eating behaviors (Laraia et al., 2022).

#### **Health Literacy and Self-Efficacy**

Health literacy is the degree to which individuals can obtain, process, and understand basic health information needed to make appropriate health decisions (Berkman et al., 2011). Low health literacy intersects with low general literacy and educational attainment, creating significant barriers to navigating complex healthcare and insurance systems, understanding preventive messages (e.g., the importance of fluoride), and following treatment plans (e.g., medication regimens for diabetes or antibiotics). In oral health, low health literacy is associated with poorer knowledge of oral disease causes, lower rates of dental attendance, and higher levels of fatalism about tooth loss (Horowitz & Kleinman, 2012). It

impairs the patient-provider dialogue, making effective education and shared decision-making challenging.

### The Biological Pathway from Social Stressors to Oral-Systemic Inflammation

These social determinants converge on common biological pathways, principally chronic inflammation and metabolic dysregulation, which form the mechanistic link between the social environment and clinical disease.

The food-insecure diet provides a perfect substrate for cariogenic bacteria like *Streptococcus mutans*. Frequent consumption of sugary snacks and drinks, often cheaper and with longer shelf lives than fresh produce, leads to prolonged periods of low oral pH, driving demineralization of tooth enamel (Sheiham & James, 2015). Concurrently, deficiencies in vitamins A, C, D, and calcium impair salivary function, enamel remineralization, and gingival health, reducing natural defenses.

Periodontitis is a chronic inflammatory disease triggered by dysbiotic plaque biofilm but fundamentally moderated by the host immune response. Social stressors—financial strain, discrimination, low social support—are potent activators of the HPA axis and sympathetic nervous system, leading to elevated systemic levels of pro-inflammatory cytokines like IL-1 $\beta$ , IL-6, and TNF- $\alpha$  (Boyce et al., 2021). This "primed" inflammatory state lowers the threshold for a destructive periodontal response to bacterial challenge. Furthermore, this systemic inflammation spills over, contributing to insulin resistance and atherosclerotic plaque instability, directly linking the social environment to diabetes and cardiovascular disease progression (Genco & Borgnakke, 2013).

Laboratory medicine reveals the subclinical impact of SDOH. Micronutrient deficiencies, detectable via serum assays, are common in low-SES populations. Vitamin D deficiency, for instance, is

linked to both increased caries susceptibility and impaired glycemic control (Schwalfenberg, 2011). Iron deficiency anemia, detectable through complete blood count (CBC) and ferritin levels, can manifest with atrophic glossitis and is associated with fatigue, further reducing capacity for self-care. These laboratory findings are not merely diagnostic of malnutrition; they are biomarkers of social inequity (Mukundan, 2018). Figure 1 illustrates how upstream social determinants of health (socioeconomic status, food insecurity, and health literacy) translate into biological mechanisms (dietary exposure, stress-induced inflammation, micronutrient deficiency) and culminate in oral diseases (dental caries, periodontitis) and systemic conditions (diabetes, cardiovascular disease).

### The Clinical Encounter as a Point of Interception

To disrupt this pathway, the clinical encounter must be re-engineered to systematically identify social risks and activate a team-based response. This requires shifting from a siloed, visit-based model to an integrated, patient-centered one.

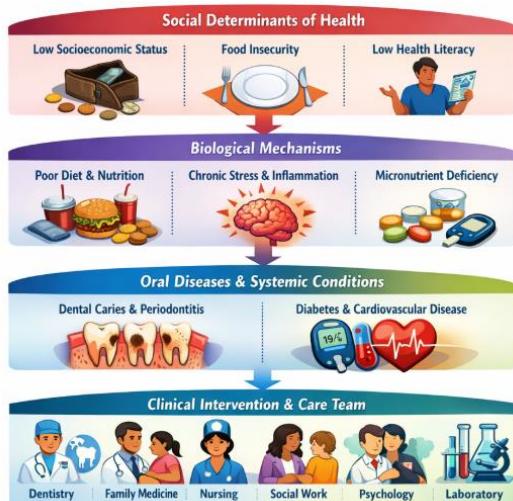
#### Screening and First-Contact Assessment

Universal, stigma-sensitive screening for SDOH should be embedded in both primary care and dental settings. The nurse or medical assistant can administer brief, validated tools such as the PRAPARE (Protocol for Responding to and Assessing Patients' Assets, Risks, and Experiences) tool or the two-item Hunger Vital Sign for food insecurity (Gonzalez et al., 2021). In dentistry, simply asking, "Do you have trouble affording healthy food?" or "Do you ever have to choose between paying for dental care and other necessities?" can open a critical dialogue. The social worker, embedded in or linked to the practice, conducts a more comprehensive psychosocial assessment to understand the full context of need, including housing stability, transportation, and insurance navigation (Gattu et al., 2019).

**Table 1: The Pathway from Social Determinants to Oral-Systemic Disease: Mechanisms and Manifestations**

Social Determinant	Intermediate Mechanism	Oral Manifestation	Health	Systemic Manifestation	Health	Key Biomarkers
Poverty / Low SES	Limited access to care, healthy food, safe housing, and chronic stress.	High untreated caries; severe periodontitis; tooth loss.		Higher prevalence of diabetes, CVD, adverse birth outcomes, and poorly managed chronic conditions.		Elevated HbA1c, LDL-C, and inflammatory markers (hs-CRP).
Food Insecurity	Reliance on a cheap, cariogenic, nutrient-poor diet; cyclical hunger/stress.	Rampant childhood caries; erosive tooth wear; xerostomia.	early	Obesity, metabolic syndrome, micronutrient deficiencies, and iron-deficiency anemia.		Low serum Vitamin D, B12, Ferritin; elevated fasting glucose/triglycerides.
Low Health Literacy	Difficulty navigating systems, understanding instructions, and engaging in self-care.	Poor oral hygiene, late presentation with advanced disease, and poor adherence to treatment.		Medication non-adherence, missed appointments, low participation in screening, and higher hospitalization rates.		Uncontrolled chronic disease markers (e.g., persistently high HbA1c, BP).

<b>Chronic Stress &amp; Discrimination</b>	Sustained HPA-axis activation; elevated pro-inflammatory cytokines.	Accelerated periodontitis, bruxism, and temporomandibular disorders (TMD).	Hypertension, depression/anxiety, autoimmune flare-ups.	Elevated cortisol; high hs-CRP, IL-6.	salivary
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**Figure 1. Pathway From Social Determinants to Oral-Systemic Health Outcomes**  
**Medical and Dental Examination for Clinical Signs**

The family physician and dentist must be trained to recognize the clinical stigmata of social disadvantage. For the physician, this includes examining the oral cavity for signs of severe caries, gingival inflammation, and mucosal lesions—often overlooked in physical exams. It also involves assessing for signs of malnutrition: glossitis, cheilitis, hair loss, or poor wound healing (Cederholm et al., 2019). The dentist's exam extends beyond the teeth and gums to note signs of erosive tooth wear (linked to diet and GERD, often stress-related), and to consider how oral pain or tooth loss may be affecting nutritional intake (e.g., avoidance of hard, healthy foods like fruits and vegetables) (Muscaritoli et al., 2023).

#### The Role of Laboratory Medicine

The clinical laboratory moves screening from suspicion to objective diagnosis. Point-of-care (POC) or standard lab tests can confirm nutritional deficiencies (e.g., 25-hydroxy Vitamin D, B12, ferritin) and quantify inflammatory burden (e.g., high-sensitivity C-reactive protein - hs-CRP). For patients with periodontitis and a comorbid condition like diabetes, tracking HbA1c and hs-CRP in parallel can powerfully demonstrate to the patient the interconnectedness of their oral and systemic health, motivating engagement in care (Ide et al., 2010). Laboratory data provide an objective basis for nutritional supplementation and monitoring intervention efficacy.

#### Psychological and Behavioral Intervention

The clinical psychologist or behavioral health specialist addresses the cognitive and emotional

dimensions of living with scarcity (Aggarwal et al., 2023). This includes counseling to develop adaptive health behaviors within severe resource constraints (effective oral hygiene with basic tools, selecting the least harmful food options available), managing the stress and depression that accompany poverty and poor health, and employing motivational interviewing to enhance engagement with complex care plans (Fisher et al., 2017). They help patients build self-efficacy, a crucial resource often eroded by systemic inequity.

#### Integrated Care Models and Resource Navigation

Screening and diagnosis are futile without action. The core of the interprofessional response is activating resources (Table 2).

#### Co-Location and Warm Handoffs

The most effective models feature physical co-location of services (e.g., a dental operatory in a community health center, a social worker's office in a dental school clinic) or established, warm-handoff protocols (Hlongwa & Rispel, 2021). A positive screen for food insecurity in the dental chair should trigger an immediate, in-person introduction to the on-site social worker or community health worker, who can enroll the patient in the Supplemental Nutrition Assistance Program (SNAP) or connect them to a local food pantry (Stuart et al., 2017).

#### Social Work as the Linchpin

The social worker is the key agent for systems navigation. Their role encompasses: securing dental and medical insurance (e.g., Medicaid applications), arranging transportation to appointments, applying for utility assistance to free up funds for health, and providing referrals to legal aid for housing issues. They advocate for the patient within complex bureaucracies and provide a consistent, supportive relationship—a form of "social prescribing" that is itself therapeutic (Alderwick et al., 2018).

#### Care Coordination by Nursing

The nurse or nurse care manager ensures follow-through. They reconcile the care plans from the physician, dentist, and psychologist; coordinate medication management; make reminder calls for appointments; and serve as a trusted point of contact for the patient. They translate clinical recommendations into practical, daily steps and monitor for signs of clinical or social deterioration.

#### Challenges, Ethical Imperatives, and Future Directions

Implementing this model faces significant hurdles. Financing: Fee-for-service systems do not pay for SDOH screening, care coordination, or social

work integration. Value-based payment models and Medicaid waivers that allow for "health-related social needs" services are essential precursors (Fichtenberg et al., 2020). Workforce & Training: Most health professionals receive minimal training in SDOH or interprofessional collaboration. Curricular reform and

continuing education are urgent needs. Data & Technology: EHRs are poorly designed to document and share SDOH data across dental and medical platforms, and to trigger automated referrals to community resources (Hausmann et al., 2023).

**Table 2: Interprofessional Roles in Addressing Oral-Systemic Health Disparities in Clinical Practice**

Profession	Core Screening & Key Intervention Actions	Collaborative Functions	
Assessment Role			
<b>Social Work</b>	Comprehensive psychosocial assessment (PRAPARE); screens for concrete needs (food, housing, insurance).	Resource navigation & enrollment (SNAP, Medicaid, housing); advocacy; crisis intervention; psychosocial support.	Receives warm handoffs from all team members; provides context to inform medical/dental treatment planning.
<b>Nursing</b>	Administers initial SDOH screen (Hunger Vital Sign); conducts holistic nursing assessment.	Care coordination & management; patient education; wound care; medication adherence support; telehealth monitoring.	Triages needs to social work/psychology; communicates patient barriers to physicians/dentists; implements team care plan.
<b>Family Medicine</b>	Physical exam for signs of malnutrition/oral disease; reviews SDOH data; medical history.	Diagnoses/treats systemic conditions (diabetes, CVD); prescribes nutritional supplements; manages medications.	Initiates lab testing for deficiencies; refers to dentistry; co-manages chronic disease with dentist based on oral status.
<b>Dentistry</b>	Oral exam for disease burden & oral signs of systemic/nutritional issues; screens for oral health-related quality of life.	Provides urgent/restorative dental care; applies preventive strategies (fluoride varnish, SDF); provides dietary counseling.	Alerts physician to suspicious oral lesions/uncontrolled oral infection; shares exam findings to inform medical workup.
<b>Clinical Psychology</b>	Assesses for depression, anxiety, stress, health literacy, self-efficacy, and health behaviors.	Provides CBT, motivational interviewing, stress management, and counseling for behavior change within constraints.	Helps patient engage with complex care plans; addresses psychological barriers to dental/medical treatment.
<b>Medical Laboratory</b>	Provides objective data on nutritional status (Vit D, B12, Ferritin) and inflammation (hs-CRP).	Runs POC or standard assays; tracks biomarker trends over time to measure response to social/clinical interventions.	Informs physician/dentist of subclinical deficiencies; provides data to motivate patient and guide supplementation.

Beyond logistics, there is an ethical imperative. A healthcare system that treats the diabetic foot ulcer while ignoring the food insecurity that precipitated the poor glycemic control is practicing incomplete, and arguably unjust, medicine (Sukhera et al., 2022). Similarly, extracting teeth ravaged by caries without addressing the underlying economic deprivation that made prevention impossible is a failure of the healthcare mission (Metzl & Hansen, 2014).

Future directions must focus on policy advocacy for integrated dental-medical insurance, research on the cost-effectiveness of interprofessional models that address SDOH, and community-engaged partnerships that move care beyond clinic walls. Technology, including digital navigation platforms that connect clinics to

community resource databases, and tele-dentistry integrated with primary care telehealth, can expand reach (Estai et al., 2018). Ultimately, the goal is to move from a healthcare system that asks, "What's the matter with you?" to one that asks, "What matters to you?" and is structurally equipped to respond (Talla et al., 2023).

### Conclusion

Oral-systemic health disparities are not a natural occurrence but the predictable result of inequitable social and economic structures. The mouth serves as both a casualty of these inequities and a powerful diagnostic site for their detection. To merely treat dental caries or periodontitis in isolation is to address the downstream symptom while ignoring the upstream cause. This review argues that combating these disparities requires a fundamental integration of

social care into clinical practice. By deploying an interprofessional team—where social workers and nurses screen for need, physicians and dentists diagnose the biological sequelae, laboratories provide objective biomarkers, and psychologists support behavioral adaptation—the clinic can become a hub for resilience-building and resource activation. This model demands systemic change in education, financing, and technology. However, the alternative—perpetuating a system that is blind to the social etiology of disease—is both clinically ineffective and morally indefensible. The path to health equity runs directly through the dental operatory and the primary care exam room, but only if these spaces are reconfigured to see, and to act upon, the full social world of the patient.

## References

1. Aggarwal, A., Tam, C. C., Wu, D., Li, X., & Qiao, S. (2023). Artificial intelligence-based chatbots for promoting health behavioral changes: systematic review. *Journal of medical Internet research*, 25, e40789. <https://doi.org/10.2196/40789>
2. Alderwick, H. A., Gottlieb, L. M., Fichtenberg, C. M., & Adler, N. E. (2018). Social prescribing in the US and England: emerging interventions to address patients' social needs. *American Journal of Preventive Medicine*, 54(5), 715-718. <https://doi.org/10.1016/j.amepre.2018.01.039>
3. Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., & Crotty, K. (2011). Low health literacy and health outcomes: an updated systematic review. *Annals of internal medicine*, 155(2), 97-107. <https://doi.org/10.7326/0003-4819-155-2-201107190-00005>
4. Borgnakke, W. S. (2015). Does treatment of periodontal disease influence systemic disease?. *Dental Clinics*, 59(4), 885-917. <https://doi.org/10.1016/j.cden.2015.06.007>
5. Boyce, W. T., Levitt, P., Martinez, F. D., McEwen, B. S., & Shonkoff, J. P. (2021). Genes, environments, and time: the biology of adversity and resilience. *Pediatrics*, 147(2), e20201651. <https://doi.org/10.1542/peds.2020-1651>
6. Cederholm, T., Jensen, G. L., Correia, M. I. T. D., Gonzalez, M. C., Fukushima, R., Higashiguchi, T., ... & GLIM Core Leadership Committee, GLIM Working Group. (2019). GLIM criteria for the diagnosis of malnutrition—a consensus report from the global clinical nutrition community. *Journal of cachexia, sarcopenia and muscle*, 10(1), 207-217. <https://doi.org/10.1002/jcsm.12383>
7. Estai, M., Kanagasingam, Y., Tennant, M., & Bunt, S. (2018). A systematic review of the research evidence for the benefits of teledentistry. *Journal of telemedicine and telecare*, 24(3), 147-156. <https://doi.org/10.1177/1357633X16689433>
8. Fichtenberg, C., Delva, J., Minyard, K., & Gottlieb, L. M. (2020). Health And Human Services Integration: Generating Sustained Health And Equity Improvements: An overview of collaborations, partnerships, and other integration efforts between health care and social services organizations. *Health Affairs*, 39(4), 567-573. <https://doi.org/10.1377/hlthaff.2019.01594>
9. Fisher, E. B., Boothroyd, R. I., Elstad, E. A., Hays, L., Henes, A., Maslow, G. R., & Velicer, C. (2017). Peer support of complex health behaviors in prevention and disease management with special reference to diabetes: systematic reviews. *Clinical diabetes and endocrinology*, 3(1), 4. <https://doi.org/10.1186/s40842-017-0042-3>
10. Gattu, R. K., Paik, G., Wang, Y., Ray, P., Lichenstein, R., & Black, M. M. (2019). The hunger vital sign identifies household food insecurity among children in emergency departments and primary care. *Children*, 6(10), 107. <https://doi.org/10.3390/children6100107>
11. Gonzalez, J. V., Hartford, E. A., Moore, J., & Brown, J. C. (2021). Food insecurity in a pediatric emergency department and the feasibility of universal screening. *Western Journal of Emergency Medicine*, 22(6), 1295. <https://doi.org/10.5811/westjem.2021.7.52519>
12. Genco, R. J., & Borgnakke, W. S. (2013). Risk factors for periodontal disease. *Periodontology 2000*, 62(1), 59-94. <https://doi.org/10.1111/j.1600-0757.2012.00457.x>
13. Hausmann, L. R., Lamorte, C., Estock, J. L., & EQuAI Collaborative. (2023). Understanding the context for incorporating equity into quality improvement throughout a National Health Care System. *Health Equity*, 7(1), 312-320. <https://doi.org/10.1089/heq.2023.0009>
14. Hlongwa, P., & Rispel, L. C. (2021). Interprofessional collaboration among health professionals in cleft lip and palate treatment and care in the public health sector of South Africa. *Human resources for health*, 19(1), 25. <https://doi.org/10.1186/s12960-021-00566-3>
15. Horowitz, A. M., & Kleinman, D. V. (2012). Oral health literacy: a pathway to reducing oral health disparities in Maryland. *Journal of public health dentistry*, 72, S26-S30. <https://doi.org/10.1111/j.1752-7325.2012.00316.x>
16. Ide, R., Hoshuyama, T., Wilson, D., Takahashi, K., & Higashi, T. (2011). Periodontal disease and incident diabetes: a seven-year study. *Journal of dental research*, 90(1), 41-46. <https://doi.org/10.1177/0022034510381902>
17. Laraia, B. A., Gamba, R., Saraiva, C., Dove, M. S., Marchi, K., & Braveman, P. (2022). Severe maternal hardships are associated with food

insecurity among low-income/lower-income women during pregnancy: results from the 2012–2014 California maternal infant health assessment. *BMC pregnancy and childbirth*, 22(1), 138. <https://doi.org/10.1186/s12884-022-04464-x>

18. Lee, J. Y., & Ahn, S. (2021). The association between food insecurity and dental caries in adults: A systematic review and meta-analysis. *Community Dentistry and Oral Epidemiology*, 49(4), 287-298.

19. Leung, C. W., Kullgren, J. T., Malani, P. N., Singer, D. C., Kirch, M., Solway, E., & Wolfson, J. A. (2020). Food insecurity is associated with multiple chronic conditions and physical health status among older US adults. *Preventive medicine reports*, 20, 101211. <https://doi.org/10.1016/j.pmedr.2020.101211>

20. Metzl, J. M., & Hansen, H. (2014). Structural competency: theorizing a new medical engagement with stigma and inequality. *Social science & medicine*, 103, 126-133. <https://doi.org/10.1016/j.socscimed.2013.06.032>

21. Mukundan, M. K. (2018). *Improvement Pattern in Iron Deficiency Anemia in Response to Treatment* (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India)).

22. Muscaritoli, M., Imbimbo, G., Jager-Wittenaar, H., Cederholm, T., Rothenberg, E., di Girolamo, F. G., ... & Molfino, A. (2023). Disease-related malnutrition with inflammation and cachexia. *Clinical nutrition*, 42(8), 1475-1479. <https://doi.org/10.1016/j.clnu.2023.05.013>

23. Nasseh, K., & Vujicic, M. (2017). The impact of the affordable care act's Medicaid expansion on dental care use through 2016. *Journal of public health dentistry*, 77(4), 290-294. <https://doi.org/10.1111/jphd.12257>

24. Peres, M. A., Macpherson, L. M., Weyant, R. J., Daly, B., Venturelli, R., Mathur, M. R., ... & Watt, R. G. (2019). Oral diseases: a global public health challenge. *The Lancet*, 394(10194), 249-260. [https://doi.org/10.1016/S0140-6736\(19\)31146-8](https://doi.org/10.1016/S0140-6736(19)31146-8)

25. Primm, A. B., Vasquez, M. J., Mays, R. A., Sammons-Posey, D., McKnight-Eily, L. R., Presley-Cantrell, L. R., ... & Perry, G. S. (2009). The role of public health in addressing racial and ethnic disparities in mental health and mental illness. *Preventing chronic disease*, 7(1), A20.

26. Schwalfenberg, G. K. (2011). A review of the critical role of vitamin D in the functioning of the immune system and the clinical implications of vitamin D deficiency. *Molecular nutrition & food research*, 55(1), 96-108. <https://doi.org/10.1002/mnfr.201000174>

27. Sheiham, A., & James, W. P. T. (2015). Diet and dental caries: the pivotal role of free sugars reemphasized. *Journal of dental research*, 94(10), 1341-1347. <https://doi.org/10.1177/0022034515590377>

28. Shonkoff, J. P., Boyce, W. T., Bush, N. R., Gunnar, M. R., Hensch, T. K., Levitt, P., ... & Silveira, P. P. (2022). Translating the biology of adversity and resilience into new measures for pediatric practice. *Pediatrics*, 149(6), e2021054493. <https://doi.org/10.1542/peds.2021-054493>

29. Stuart, J., Hoang, H., Crocombe, L., & Barnett, T. (2017). Relationships between dental personnel and non-dental primary health care providers in rural and remote Queensland, Australia: dental perspectives. *BMC Oral Health*, 17(1), 99. <https://doi.org/10.1186/s12903-017-0389-y>

30. Sukhera, J., Knaak, S., Ungar, T., & Rehman, M. (2022). Dismantling structural stigma related to mental health and substance use: an educational framework. *Academic Medicine*, 97(2), 175-181. DOI: 10.1097/ACM.0000000000004451

31. Talla, P. K., Inquimbert, C., Dawson, A., Zidarov, D., Bergeron, F., & Chandad, F. (2023). Barriers and enablers to implementing teledentistry from the perspective of dental health care professionals: protocol for a systematic quantitative, qualitative, and mixed studies review. *JMIR Research Protocols*, 12(1), e44218. <https://doi.org/10.2196/44218>

32. Thomeer, M. B., Moody, M. D., & Yahirun, J. (2023). Racial and ethnic disparities in mental health and mental health care during the COVID-19 pandemic. *Journal of racial and ethnic health disparities*, 10(2), 961-976. <https://doi.org/10.1007/s40615-022-01284-9>

33. World Health Organization. (2021). World health statistics 2021: monitoring health for the SDGs, sustainable development goals.