

Conceptualising the relationships between food sovereignty, food security, and oral health among global Indigenous Communities: A scoping review

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Abstract

Objective: Invasive colonial influences and continuing neoliberal policies have a detrimental impact on Land, health, food, and culture for Indigenous Communities. Food security and sovereignty have significant impacts on Indigenous wellbeing and specifically, oral health. Aspects relating to food security, such as availability of nutritious foods, are a common risk factor of oral diseases. This scoping review aimed to collate existing evidence regarding the relationship between food sovereignty and/or food security and oral health for Indigenous Communities, globally.

Design: Four databases were searched using keywords related to ‘Food security’ or ‘Food sovereignty,’ ‘Indigenous Peoples,’ and ‘Oral health.’ Duplicates were removed and two independent reviewers screened the titles and abstracts to identify articles for full-text review. Extracted data was summarised narratively, presenting a conceptual model which illustrates the findings and relationships between food security and/or food sovereignty and oral health.

Results: The search identified 369 articles, with 41 suitable for full text review and a final nine that met inclusion criteria. The impact of food security and food sovereignty on oral health was discussed across different populations and sample sizes, ranging from 18 Kichwa families in Brazil to 533 First Nations and Metis households in Canada. Pathways of influence between food sovereignty and/or food security is explored clinically, quantitatively, and qualitatively across oral health outcomes, including early childhood caries, dental caries, and oral health related quality of life for Indigenous Communities.

Conclusions: Innovative strategies underpinned by concepts of Indigenous food sovereignty are needed to promote oral health equity for Indigenous Communities. The nexus between oral health and Indigenous food sovereignty remains largely unexplored, but has immense potential for empowering Indigenous rights to self-determination of health that honour Indigenous ways of knowing, being, and doing.

Keywords: Food sovereignty, Food security, Oral Health, Health Equity, Indigenous Peoples, Community Health

“Food sovereignty is an affirmation of who we are as Indigenous Peoples and a way, one of the most surefooted ways, to restore our relationship with the world around us.”

Winona LaDuke

Introduction

For thousands of years, Indigenous Peoples around the world have been guardians of thriving homelands, waters, and natural resources ⁽¹⁾. Highly developed management systems have evolved from the intimate relationship with Land and local ecosystems, sustaining the health and wellbeing of Indigenous societies since time immemorial ⁽²⁾. The ontological basis of *food* in Indigenous cultures is grounded on the sacred value that stems from the ethical relationships among the Community, the environment, animals, plants, traditional knowledges, and the cosmos ⁽³⁾. Indigenous perspectives to food honour the social, cultural, spiritual, economic, environmental, and political significance of Indigenous foodways, with important implications for respecting, protecting, and fulfilling Indigenous rights ⁽⁴⁾. The experience of hunger constitutes an unacceptable violation of basic human rights ⁽⁵⁾. In the case of Indigenous populations, such violation is rooted in historical processes of Land dispossession, environmental degradation, loss of biodiversity, centralisation of power, and structural socioeconomic inequities ^(1, 6). While these phenomena have been in motion since the establishment of settler colonial states on Indigenous Lands, the neoliberal logics of over-exploitation of natural resources ⁽⁷⁾ and, more recently, the COVID-19 pandemic have aggravated both acute and chronic circumstances of food insecurity within Indigenous Communities ⁽⁸⁻¹⁰⁾, which has implications for oral health. Despite these adverse realities, Indigenous Peoples have shown immense endurance and resistance in protecting Land sovereignty and knowledges associated with Indigenous foodways ^(11, 12).

Meanings attributed to notions of food security and food sovereignty are often overlapping (such as the importance of cultural foods) and used interchangeably by activists ⁽¹³⁾. The Food and Agricultural Organization defines food security as a situation when *“all people, at all times, have physical and economic access to sufficient, safe, nutritious food to meet their dietary needs and food preferences...”* ⁽¹⁴⁾. The concept is centred on five pillars encompassing aspects related to food availability, accessibility, adequacy, acceptability, and agency ⁽¹⁵⁾. Critical perspectives to food security provide an opportunity to interrogate the

dominance of neoliberal discourses and globalised economic models centred on farming productivity and international trade as the main strategies to address hunger and other forms of malnutrition worldwide ⁽¹⁶⁾. A technocratic understanding of food security focused on adequacy of supplies and nutritional content has been adopted particularly by international entities ⁽¹³⁾. Acknowledging aspects related to the wider food, cultural, social, and political environments is essential to broadening the debate around food security beyond nutritional deficit and access to healthy food. Food sovereignty offers an alternative paradigm that recognises Indigenous Peoples' right to self-determination and supports biodiversity conservation and diversified local food production systems ⁽¹⁷⁾. Indigenous food sovereignty, specifically, is understood as a movement that aims to reconnect Indigenous Peoples with their foodways through four principles: (1) the recognition that food is sacred and the responsibility that Communities have in maintaining relationships with Lands, waters, and beings; (2) daily Community participation in food systems; (3) Indigenous rights to self-determination and therefore, the right to determine healthy and culturally relevant food systems; and (4) the ability of Indigenous Communities to shape food related policies ⁽¹⁸⁾. While there is a growing debate around distinctions between definitions of food security and food sovereignty, we understand these concepts as complementary rather than antagonistic.

Indigenous foodways, culture, sovereignty, and health are intimately connected. For Indigenous Peoples, the health inequities associated with food insecurity (e.g. hunger, malnutrition, obesity, diabetes, and other chronic conditions) is largely driven by processes of environmental dispossession, that is, disrupted access to Land and decline of traditional food systems ⁽¹⁹⁻²¹⁾. However, the dialog between the food sovereignty agenda and health equity research has been limited ⁽²²⁾. Moreover, the dental literature has systematically failed to acknowledge the influence of power (Indigenous sovereignty in the context of Indigenous Peoples) in the determination of oral health inequities ⁽²³⁾. Although oral health (or, the absence of oral disease and pain) shares common risk factors with other chronic diseases related to food insecurity, there is a paucity of literature exploring these relationships in depth. In particular, low availability of nutritious food and high consumption of sugary and cariogenic foods are a common risk factor of several chronic conditions and contributes to the development of dental caries ⁽²⁴⁾. As a manifestation of social inequities, food insecurity has been reported to contribute to periodontal disease through physiological pathways ^(25, 26). An exploration of the relationship between food sovereignty and food security aligns with traditional practices of Indigenous Communities and provides new opportunities for

strengthened oral health and wellbeing. Food sovereignty has been identified in the literature as a mechanism to address food-related issues common in many disadvantaged Communities⁽²⁷⁾. Aspects relating to food security such as availability of nutritious food are a common risk factor of several chronic conditions and oral diseases⁽²⁴⁾. As a manifestation of social inequities, food insecurity has been reported to contribute to periodontal disease through physiological pathways^(25, 26).

Self-determination is a critical aspect of equitable health for Indigenous Peoples⁽²⁸⁾. Exploring opportunities that support self-determination and increase experiences of equitable health, therefore, warrant attention. This scoping review aimed to synthesise existing literature and evidence that contributes to the current understanding of the relationship between food sovereignty and/or food security and oral health for global Indigenous Communities. Specifically, we aimed to answer the following questions: (1) What evidence exists to explain the relationships between food sovereignty and/or food security and oral health for Indigenous Communities, globally?; (2) In what ways has food sovereignty and/or food security impacted oral health for Indigenous Communities, globally?; and (3) What solutions for oral health equity at the nexus of food sovereignty and/or food security have been suggested?

Methods

While systematic reviews are considered the highest level of evidence for a range of purposes across many fields, there are instances where systematic reviews are unable to meet research aims⁽²⁹⁾. Scoping reviews are useful when determining coverage of emerging evidence on a given topic⁽³⁰⁾. This scoping review therefore aimed to explore the evidence base related to the relationship between food security or food sovereignty and oral health. While several systematic reviews on Indigenous oral health exist⁽³¹⁻³³⁾, a search of PubMed, the International prospective register of systematic reviews (PROSPERO), and the Joanna Briggs Systematic Review Register revealed no existing reviews that explicitly explore the relationship between food security and/or sovereignty with oral health outcomes for Indigenous Communities. This scoping review has been registered with the Joanna Briggs Systematic Review Register and in accordance with methodological recommendations for scoping reviews^(34, 35), the protocol⁽³⁶⁾ was published and made publicly available with the Centre for Open Science⁽³⁷⁾. This review was conducted and is reported in alignment with the

Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines extension for scoping reviews (Appendix 1).

Positionality

In accordance with the rejection of emergence and objectivity and embracing of researcher influence and subjectivity on findings commonplace in qualitative methodologies, we would like to acknowledge the positionality and influence of those involved in this research process⁽³⁸⁾. As a mixed Indigenous and non-Indigenous research team from Canada and Australia, we approach this work with vested interest in finding pathways that strengthen Indigenous wellbeing and mirror Community values. Due to our backgrounds in oral health and nutrition, the research team aimed to explore opportunities where increasing food security or food sovereignty has benefits for oral health, in alignment with holistic understandings of Indigenous wellbeing⁽³⁹⁾.

Identifying articles for inclusion

The search strategy was designed in partnership with research librarians and aimed to locate both published and unpublished evidence across four databases: PubMed, Scopus, Web of Science, and ProQuest Central. Databases were searched in May 2022 with no restrictions on publication year, language, or geographic location. Keywords and indexed terms relating to 'Food security' or 'Food sovereignty,' 'Indigenous Peoples,' and 'Oral health' were compiled into a search string, first developed for PubMed and then adapted as per the design of the remaining databases (Appendix 2). Following the removal of duplicate records, two independent reviewers screened titles and abstracts of records identified in the search utilising Covidence (<https://www.covidence.org/>, Veritas Health Innovation Ltd, Melbourne, Australia). Articles considered suitable by either reviewer progressed to full text review, where records were screened critically against the inclusion and exclusion criteria (Table 1). Anthropological articles that utilised human remains to determine changes in dentition were excluded from this review. Studies that only mentioned food security or sovereignty as a risk factor or covariate for oral health but did not explicitly discuss the relationship between these factors were not included, this was determined during full text screening. All disagreements between reviewers were discussed amongst the research team. Critical appraisals were not performed on articles included in this review, in accordance with scoping review methodologies, as the aim did not relate to the production of critically appraised guidelines or recommendations⁽³⁰⁾.

Data extraction and synthesis

Data were extracted into a piloted extraction form by two reviewers. Two articles were completed by both reviewers to reduce selection bias and ensure inter-rater reliability. Extracted data included author name, year, country, study aim, study design, population characteristics, summary of findings, relationship between food and oral health explored, rationale for this exploration, definition of food security or food sovereignty, measurement of food security or food sovereignty, definition of oral health, measurement of oral health, conclusion about the relationship explored, and any recommendations. Data extracted from the included articles were categorically synthesised, tabulated, and narratively described in accordance with the relationship between food security or food sovereignty and oral health explored.

Results

The search identified 369 articles. After the removal of 105 duplicates, 264 unique records remained eligible for inclusion in this scoping review. Following title and abstract screening, 54 records were retrieved in full and assessed against the inclusion criteria during full-text review. Forty-one articles were deemed ineligible for inclusion during this process, primarily due to a failure to consider both an aspect of oral health in combination with either food sovereignty or food security (Figure 1).

Study characteristics

The articles included in this review were published between 2014 and 2022. Four articles were from Canada ⁽⁴¹⁻⁴⁴⁾, two were from Brazil ^(45, 46), and one article was from each of Ecuador ⁽⁴⁷⁾, Australia ⁽⁴⁸⁾, and Mexico ⁽⁴⁹⁾. Papers explored the relationships between food security or food sovereignty and oral health for First Nation ⁽⁴¹⁻⁴⁴⁾, Métis ^(41, 44), Inuit ⁽⁴⁴⁾, Kichwa ⁽⁴⁷⁾, Yalsihón ⁽⁴⁹⁾, Dzilam ⁽⁴⁹⁾, Aboriginal ⁽⁴⁸⁾, Kaingang ^(45, 46), and Guarani ⁽⁴⁶⁾ Communities. Included articles ranged in design; five were qualitative studies ^(41, 42, 46, 48), four were cross-sectional ^(43-45, 49), and three utilised Community based participatory research approaches ^(41, 42, 47) (Table 2).

Synthesis of evidence

The concepts of food security, food sovereignty, and oral health were conceptualised and measured in a variety of ways amongst included articles. Six focused on food security, of which three did not provide a definition^(41, 44, 48), one discussed food insecurity in terms of access⁽⁴²⁾, and two referenced the Food and Agriculture Organization of the United Nations definition of food security^(43, 45). Food security was measured through qualitative experiences^(41, 42, 48), the Brazilian Household Food Insecurity Measurement Scale⁽⁴⁵⁾, and a single questionnaire item regarding difficulty purchasing food for children due to expenses⁽⁴⁴⁾. Four articles considered food sovereignty, all of which conceptualised food sovereignty in terms of loss of traditional foods and transitions away from subsistence practices^(43, 46, 47, 49). Two articles measured food sovereignty through qualitative experiences^(46, 47), and one utilised a non-standardised dietary questionnaire⁽⁴⁹⁾. Oral health was considered in relation to early childhood caries (ECC)^(41, 44, 47), dental caries^(42, 43, 49), oral health related experiences^(41, 42, 48), and oral health related quality of life⁽⁴⁵⁾. These oral health components were measured through clinical dental examinations^(44, 45, 47, 49), qualitative experiences^(41, 42, 46), and the Oral Health Impact Profile-14⁽⁴⁶⁾.

Impact of food security and food sovereignty on oral health

Included studies described the impacts of food security and food sovereignty on oral health for Indigenous Peoples through a range of mechanisms (Figure 2). Cost of living, poverty, and socioeconomic position were related to food insecurity at an individual level but also a Community level^(41, 42, 47, 48). Financial circumstances and food security were also associated with one's ability to attend dental appointments or purchase oral hygiene products^(41, 48). For the Algonquin Community of Rapid Lake within Canada, a lack of basic infrastructure to purchase and store healthy foods challenged the ability to maintain food security, as articulated by one participant: *"There are no stores, grocery stores, in the reserve. And when your baby is hungry and you have no milk, powdered juice is fast. It's not because you don't know [that powdered juice is bad for oral health]"*⁽⁴²⁾. Kichwa families in Ecuador reported ubiquitous challenges in preserving their traditional and healthy foodways, particularly in the face of food insecurity combined with the increased accessibility of processed foods⁽⁴⁷⁾; parents of children with good oral health posited that, *"I make them eat [traditional foods]"*⁽⁴⁷⁾. Food insecurity was understood as a systemic factor that affects oral health for Indigenous Peoples within Canada^(41, 42, 44), Australia⁽⁴⁸⁾, and Brazil⁽⁴⁵⁾. More specifically, early childhood oral health was found to be compromised by lack of quality nutrition^(41, 44).

and higher impact of oral health on quality of life were both associated with food insecurity⁽⁴⁵⁾. Food insecurity also constrained the ability of Community members to make optimal nutritional choices to maintain oral health⁽⁴⁸⁾. In the context of food insecurity, the cumulative burden of dental caries across the lifespan and the lifelong impacts of sugars in dentition was considered as potentially contributing to high prevalence of carious lesions and tooth loss throughout the lifecourse⁽⁴⁵⁾. Critically, the impact of food insecurity was understood as a societal structural risk outside of individual or family control⁽⁴⁴⁾.

A general trend across studies was the impact of colonisation and globalization on a loss of traditional Lands, decreased consumption of traditional foods and increased reliance on store bought and highly processed foods. All factors surmounted in a foundational shift away from subsistence lifestyles and food sovereignty for Indigenous Communities in Ecuador⁽⁴⁷⁾. Exploitation of Indigenous Lands, combined with violence from non-Indigenous agribusinesses, undermined food sovereignty and deprived Kaingang families of their Indigenous foodways in Brazil⁽⁴⁵⁾. Food availability was a concern for Aboriginal Communities in Australia, particularly with increasing impacts of climate change on Indigenous foodways⁽⁴⁸⁾. Rapid expansion of refined carbohydrate consumption was related to the density of refined sugars in a globalized, Western diet^(48, 49). Increased occurrence of dental caries was identified as an external element produced by the Western way of life among Kaingang and Guarani Communities within Brazil; *“White food causes White disease”*⁽⁴⁶⁾. Similarly, one Aboriginal Community member within Australia shared, *“Long time ago, they used to drink tea from their own fields... yeah in the days 60s and 70s, we never worried about things like sweets, we used to hunt for bush food but this time lately everything is sweet now... everything is changing”*⁽⁴⁸⁾. Participation in the global economy and improved socioeconomic position was regarded as having the possibility of leading to a sedentary lifestyle, reliant on foods that are not beneficial for oral health and may have previously been inaccessible⁽⁴⁹⁾. Among Kichwa and Maya families in Ecuador and Mexico, lower socioeconomic position was related to stronger oral health outcomes, due to the ability of families to maintain more traditional food practices despite lower access to resources, including dental services^(47, 49). These findings clearly indicate an interconnected relationship between foodways and oral health and offer hope that optimal oral health does not necessarily require a high income or high education but rather, the ability to retain traditional practices to enforce healthy decisions^(47, 49). Indigenous foodways play an integral role in culture and identity, as such loss of food sovereignty is a form of cultural discontinuity that not only

impacts oral health and overall wellbeing but also the collective cultural wellbeing among Communities^(46, 48). Decreased access of traditional foods erodes strong connections with foodways and moves Indigenous Communities towards a system lacking distinct cultural ties and values⁽⁴⁸⁾. In Brazil, the adoption of Western diets was understood by Indigenous Peoples as a threat to the wellbeing of an individual, with important impacts on oral health status⁽⁴⁶⁾.

Synthesis of recommendations

Recommendations within the included articles existed at family, Community, and organisational levels. At the family level, support for land ownership was suggested as a means of maintaining Indigenous foodways. For non-land owning families, provision of healthy fruits and vegetables at affordable prices in local shops was suggested⁽⁴⁷⁾. Further, parenting programs that promote effective parenting skills, including communication was recommended⁽⁴⁷⁾. At the Community level, initiatives to establish and maintain Community gardens were suggested to help strengthen food security with healthy foods from gardens being distributed to families in Communities⁽⁴²⁾. Findings echoed the importance of promoting consumption of traditional foods directly from the land, rather than reliance on stores, for improved oral health, food security and collective wellbeing^(42, 46). Community and land-based initiatives are an important strategy of resisting colonisation and globalisation of Indigenous foodways and are an important way of maintaining food sovereignty and cultural identity^(43, 46, 48). Community health services could carry large quantities of oral hygiene supplies to combat accessibility issues as well as promote oral health in a culturally secure manner^(42, 47). At an organisational level, policies could be better positioned towards improving access to dental services, oral health information, and transportation services; this could offset the impacts of poverty and food insecurity on receiving dental care⁽⁴¹⁾. Economic incentives could motivate local businesses to advertise and sell more traditional foods⁽⁴⁷⁾. Political actors could increase funding allotment and promotion of family, school, and Community gardens which support Indigenous foodways⁽⁴⁷⁾.

Discussion

Due to the experiences of colonisation⁽⁵⁰⁾, globalisation⁽⁷⁾, environmental dispossession⁽²⁰⁾, and oral health inequities^(31, 32) by Indigenous Peoples around the world, combined with the integral role of food in Indigenous culture and identity^(46, 51), this scoping review aimed to collate evidence related to the relationship between food sovereignty and/or food security and oral health for Indigenous Communities. Subsequently, this review sought to conceptualise the ways in which food sovereignty and food security impact oral health for Indigenous Communities and explore potential recommendations at this nexus. Through the use of scoping review methodologies, evidence from nine articles across five colonised countries and with nine Indigenous Communities were synthesised into seven mechanisms of impact. Food security impacted dental caries, ECC, oral health related quality of life, and oral health related experiences, whereas food sovereignty impacted dental caries and ECC.

Loss of Indigenous foodways, and subsequently Indigenous food sovereignty, is an intentional result of both colonisation and neoliberalism. The centrality of diet in cultural identity, as evidenced within this review, provides further evidence that supports the understanding that living colonial legacies, policies, and institutions deliberately interrupt Indigenous wellbeing. These trends in disruption of Indigenous foodways can be considered as an outcome of social structures, characterised by racism, colonialism, social inequities, and poverty, that are systematically exerted⁽⁵²⁾. Forced reliance on Western foods, loss of food sovereignty, and pervasiveness of food insecurity is therefore, a form of structural violence against Indigenous Peoples⁽⁵²⁻⁵⁴⁾. Considering this in combination with the biomedical and neoliberal context of dentistry, creates a complex feedback loop where the influences between intrinsic, extrinsic, and systemic elements is difficult to map, particularly when Western, colonial ideologies are clothed in normality⁽⁴⁶⁾. It is also critical to consider the future of Indigenous foodways amidst increasing impacts of climate change on traditional Lands, foods, and animals. In many instances, Indigenous Peoples are already suffering from climate change impacts, despite having contributed little to the contemporary climate crisis⁽⁵⁵⁾; but Communities are adapting and resisting, as they have for millennia.

The majority of articles included in this review focused on describing experiences of food insecurity or loss of food sovereignty rather than promoting pathways to reclaiming Indigenous foodways. Similar narratives are also typically described in oral health literature, whereby disease occurrence is documented but solutions towards improved oral health is not

explored⁽⁵⁶⁾. A shift towards works that supports improved (oral) health and wellbeing through pathways that support self-determination, such as Indigenous food sovereignty, is necessary⁽⁵⁷⁾. Reclamation of healthy lifestyles and practices is a sustainable way to improve health outcomes for Indigenous Communities, rather than continuing extractive practices of research that fail to build healthier outcomes. There has been success in utilising land-based practices such as food sovereignty, for improving experiences of diabetes, spiritual wellbeing, and cultural connectedness⁽⁵⁸⁻⁶⁰⁾. No articles focused on the opportunity that the nexus between food sovereignty, food security, and oral health provides for a common risk factor approach that would have significant benefits for Indigenous wellbeing and cultural identity^(46, 48). There remains a unique opportunity, through Community driven and controlled initiatives to empower resistance to industrialised foodways, strengthen food security, and improve overall wellbeing, including oral health: *“a refocus on traditional foods in practice and policy could further serve to reinforce the longstanding traditional social and cultural values of food and assist in regaining a sense of life in balance”*⁽⁶¹⁾. Initiatives such as Community gardens, as recommended by articles included in this review^(42, 46), as well as seed libraries, Community kitchens, and increased roles of Land governance are necessary to establish pathways to self-determination of food and wellbeing for Indigenous Communities, as enshrined in the United Nations Declaration on the Rights of Indigenous Peoples⁽²⁸⁾.

Strengths & Limitations

This review considered the impact of food security and food sovereignty in relation to Indigenous oral health, where Indigenous foodways are considered essential to an Indigenous-defined understanding of wellbeing⁽³⁹⁾. This is the first evidence mapping the impact of food security and food sovereignty on Indigenous oral health outcomes, measured through clinical dental examinations, qualitative evidence, and questionnaires. The articles included in this review largely failed to utilise a strengths-based approach to improving food security or food sovereignty. Future work must therefore centre on Indigenous led initiatives and share stories of strength and resilience to inspire grassroots movements in this space. Although the authors made all attempts to limit publication bias by including all locations, languages, and types of articles, limitations remain. Although designed in a broad manner, our search strategy did not include all individual population group names of Indigenous Communities; as such, relying on MeSH headings may not identify all articles eligible for inclusion in this review. Scoping reviews fail to represent knowledges and stories not contained within published literature. As such, critical Community perspectives and

initiatives are likely underrepresented, and the findings presented herein likely only represent a portion of the ways in which Indigenous Communities are strengthening their experiences of oral health through resistance and reclamation of Indigenous foodways.

Conclusion

Initiatives to strengthen food security and food sovereignty for Indigenous Communities provide an opportunity to improve experiences of oral health, collective wellbeing, and cultural identity. This nexus is a largely untapped area which has the potential for meaningful change within Communities as well as translatable outcomes. In accordance with the evidence generated by this review, we propose the following strategies for future directions: (1) integration of Indigenous perspectives on oral health, wherein traditional practices are integrated into oral health promotion and dental interventions, which includes strengthening Indigenous food sovereignty; (2) moving beyond a deficit narrative of food insecurity as well as cultural, social, and ecological losses related to traditional foods to exploring and documenting strengths-based narratives and interventions that have tangible impacts for Communities; and most importantly, (3) designing oral health interventions from a holistic standpoint that amplify Indigenous rights to self-determination and honour Indigenous ways of knowing, being, and doing.

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Table 1. Inclusion and exclusion criteria.

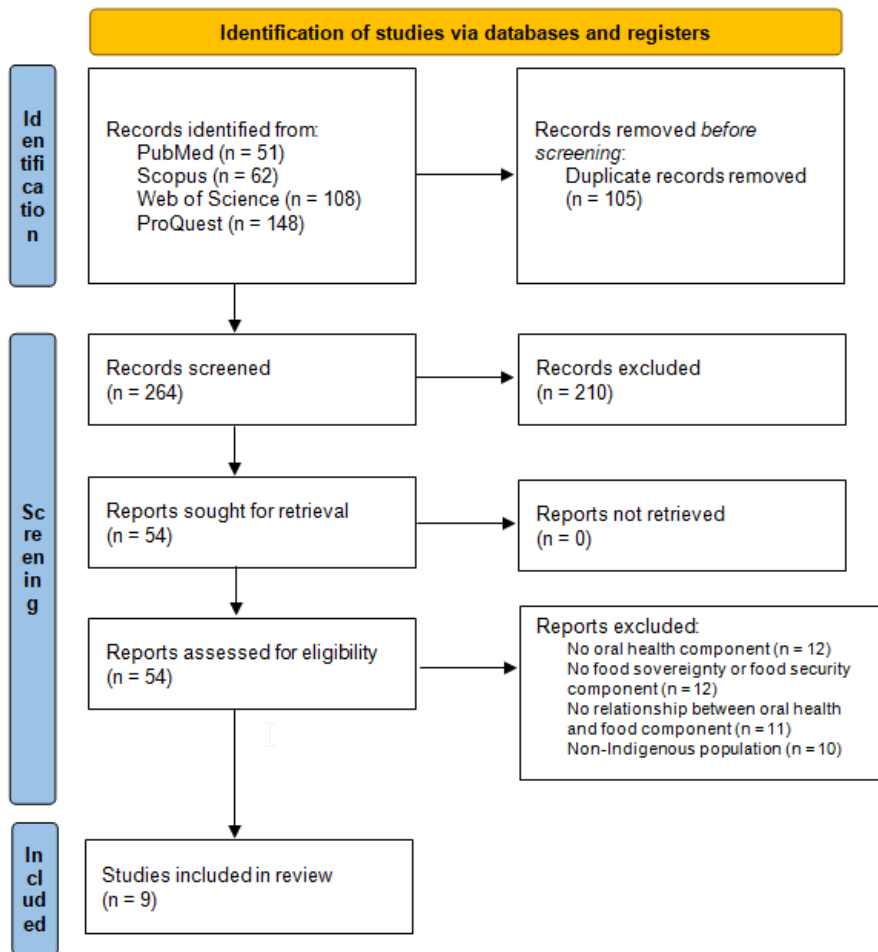
Inclusion	Exclusion
<ul style="list-style-type: none"> • Indigenous population, as based on the United Nations definition ⁽²⁸⁾ • The impact of food sovereignty, Indigenous food sovereignty ^(18, 62), or food security ⁽⁶³⁾ is discussed in relation to oral health • Participants of any age and gender • Any study design • Any language • Any locations 	<ul style="list-style-type: none"> • Non-Indigenous population • Does not explicitly discuss food sovereignty, Indigenous food sovereignty ^(18, 62), or food security ⁽⁶³⁾ in relation to oral health (i.e. only used as covariate or risk factor in analysis without justification or discussion) • Anthropological articles using fossils to determine changes in dentition

Table 2. Characteristics of included studies.

Author	Country	Aim	Design & Methods	Population Characteristics	Findings Summary
Kyoon-Achan et al. ⁽⁴¹⁾	Canada	To report the challenges and problems faced by First Nation and Métis parents in meeting the early childhood oral health needs of their children.	Community Based Participatory Research; Sharing Circles; Grounded theory	59 First Nation & Métis Community members (21-71 years); Females N=48, Males N=11	Thematic findings: difficulties scheduling dental appointments, high cost of dental care, lack of oral health information, lack of available oral hygiene products. Food insecurity and poor nutrition were highlighted.
Levin et al. ⁽⁴⁷⁾	Ecuador	To identify the risk factors and protective factors for nutrition and oral health among Kichwa families.	Community Based Participatory Research; Semi-structured in-depth interviews; Grounded theory	18 Kichwa Families (child mean age=4); 56% male children, 44% female children	The study results suggest that maintaining traditional family farms and authoritative parenting to avoid processed foods/drinks and ensure tooth brushing could improve early childhood nutrition and oral health.
Lizama & Cucina ⁽⁴⁹⁾	Mexico	To test the hypothesis that maize is responsible for high rates of caries.	Cross-sectional; Clinical examinations and diet questionnaires	99 Yalsihón Community members & 107 Dzilam Community members (15-30 years)	Soda and globalized foods were virtually absent at Yalsihon, while at Dzilam they were ingested daily in great quantities. The decline in oral health at Dzilam is inferred to result from consumption of industrially processed foods and drinks, while a traditional diet leads to less caries.
Naidu et al. ⁽⁴²⁾	Canada	To explore oral health and	Community Based	35 First Nation	Thematic findings: a gap exists

		hygiene practices in the Algonquin Community of Rapid Lake, Québec.	Participatory Research; Semi-structured interviews and focus groups; Thematic analysis	Community members (9-58 years)	between oral health knowledge and oral health behaviours; challenges for oral health promotion included attitudes and beliefs, access, and priorities; and parents needed to be further integrated into health promotion strategies.
Patel et al. ⁽⁴⁸⁾	Australia	To explore the perceptions and attitudes of Aboriginal Australians living in remote Kimberley Communities towards oral health education and disease prevention.	Semi-structured interviews and yarning circles; grounded theory	80 Community members from Kimberly region; Females N=53, Males N=27	Lifestyle changes brought about by modernity, internet availability and fixed Community stores were perceived to create new challenges and shift the priorities for those living in remote Communities.
Soares et al. ⁽⁴⁶⁾	Brazil	To analyse the social representations of the Guarani and Kaingang Indigenous Peoples from the Southern region of Brazil regarding the transformations in their traditional food systems and possible effects on their oral health.	Focus groups; grounded theory	16 Kaingang and Guarani Community members (18-64 years)	Thematic findings: contemporary Indigenous identities, perceptions of food systems, shared knowledge in the orientation of differentiated assistance in oral health; ethnic cultural capital in conflict. The food transition is represented as a form of cultural discontinuity, whereas the ability to redefine identity boundaries contributes to promote food security and oral

					health.
Soares et al. ⁽⁴⁵⁾	Brazil	To investigate the relationship between household food insecurity, dental caries, oral health-related quality of life, and social determinants of health among Indigenous adults.	Cross-sectional; Questionnaires and clinical examinations	107 Kaingang Community members (35-44 years)	Approximately 95% lived in food insecure families. Severe food insecurity was present in 58% of the households. Food insecurity among the Kaingang Peoples is associated to oral health perception and social determinants of health.
Thompson et al. ⁽⁴³⁾	Canada	To explore food-related activities and their impacts on sustainable livelihood assets, food sovereignty, and food security.	Cross-sectional; Questionnaires and participatory videos	533 households in 14 First Nation & Métis Communities	The lack of Community control undermines both food sovereignty and sustainable livelihoods, while creating high levels of food insecurity.
Tsai & Lawrence ⁽⁴⁴⁾	Canada	To determine whether psychosocial determinants of adverse childhood experiences are associated with severe early childhood caries in Indigenous children.	Cross-sectional; Questionnaires and clinical examinations	344 First Nation and Métis mother-child dyads (maternal age= 14-48 years)	Household overcrowding and food insecurity had the largest association with severe early childhood caries for children living both on- reserve and off-reserve



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For more information, visit: <http://www.prisma-statement.org/>

Figure 1. PRISMA 2020 Flow Diagram⁽⁴⁰⁾

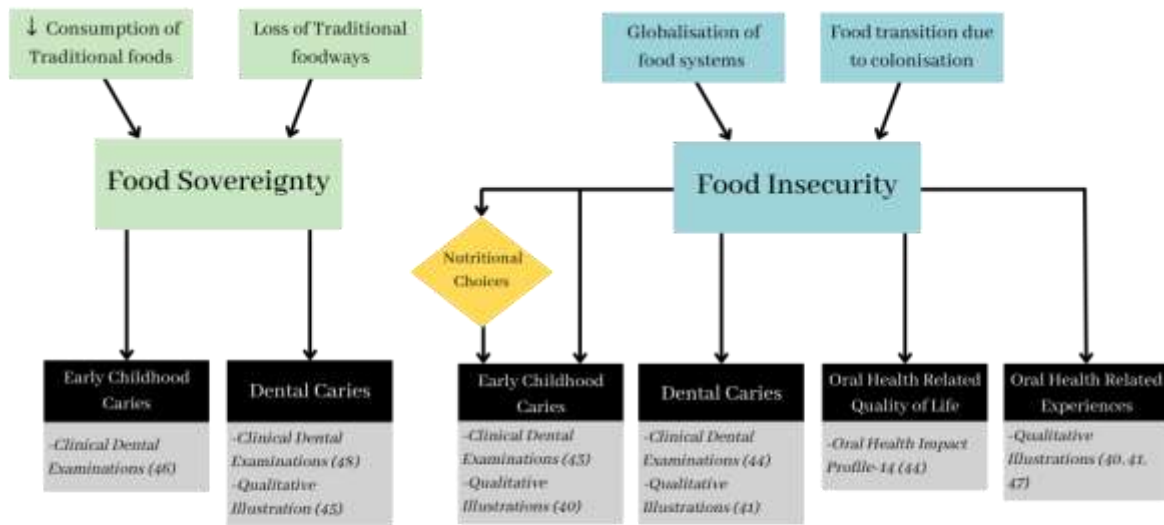


Figure 2. Conceptual model of the impact of food security and food sovereignty on oral health for global Indigenous Communities.