

Contextual and individual determinants of tooth loss in the Afro-descendant older adult populations of different countries: a scoping review

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Background: The Black population has poorer oral health than other racial groups; however, little is known about the mechanisms that explain this difference. **Objective:** To study the association between race and tooth loss and map the evidence on factors associated with tooth loss in Black older populations. **Methods:** Scoping review following the PRISMA Extension for Scoping Reviews conducted according to the recommendations of the Joanna Briggs Institute. A three-step search strategy was applied, and data were collected between April and July 2021. Searches were performed in the PubMed, Lilacs, and SciELO databases. The grey literature was searched using Google Scholar (<https://www.scholar.google.com/>). The reference lists of included studies were used as additional sources. Studies published in English and Portuguese of the association between tooth loss and different racial groups and the factors associated with tooth loss and tooth retention in Black older adult populations were included. **Results:** Twenty-one of 913 original articles published between 1995 and 2020 were included. Of these, 75% were research articles, 15% were reports, and 10% dissertations. Eighty per cent reported cross-sectional and 20% longitudinal data. African ancestry was associated with increased odds of tooth loss in older adult populations. Periodontal disease, female sex, and advanced age were the exposures most frequently associated with tooth loss. **Conclusion:** Race, educational level, advanced age, and oral diseases such as periodontitis are associated with increased tooth loss in Afro-descendant older populations.

Keywords: *Tooth loss, Aged, Race factors, Minority Ethnic Group, Afro-Caribbean, Black*

Introduction

Tooth loss is a robust marker of poor oral health (Saekel *et al.*, 2016), with dental caries and periodontitis its main disease-related causes (Kim *et al.*, 2018; Jordan *et al.*, 2021). Tooth loss is also one of the most important indicators of oral health status in older adults since it reflects the cumulative lifetime effects of social determinants of health and oral health on the individual (Tiwari *et al.*, 2016).

It is believed that tooth loss results from the interaction between determinants at different levels. Caries and periodontal disease may act as triggers rather than as the sole causative factors (Jaleel *et al.*, 2014). Previous studies have reported associations between tooth loss in older adults and unfavorable socioeconomic, demographic, living, and nutritional conditions (Wang *et al.*, 2014; Tiwari *et al.*, 2016; Vettore *et al.*, 2020). When evaluated according to racial group, tooth loss disproportionately affects Black older adults (Wu *et al.*, 2011; Naorungroj *et al.*, 2017).

Evidence shows that Afro-descendant populations have poorer oral health than other racial groups. However, little is known about the contextual, individual, and oral health factors implicated in these differences (Nalliah *et al.*, 2019), particularly in older adults. A preliminary

search of the Prospero, PubMed, Cochrane Database of Systematic Reviews, and Joanna Briggs Institute (JBI) Database of Systematic Reviews and Implementation Reports revealed no systematic or scoping reviews on the topic. Scoping reviews are appropriate to assess and understand the extent of knowledge in an emerging field or to identify, map, report, or discuss the characteristics or concepts in this field (Peters *et al.*, 2020).

Considering that tooth loss is likely due to the worsening of some oral conditions that are influenced by socioeconomic, demographic, and behavioral factors (Simoura *et al.*, 2019), the objectives of this scoping review were to study the association between race and tooth loss in Black older adults and to map the evidence on factors associated with tooth loss in this population. This scoping review then recommends public policy planning, research, and strategies aimed at reducing racial disparities in tooth loss and oral health.

Methods

All procedures of this scoping review were conducted according to the JBI guidelines (Peters *et al.*, 2020) and were reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) (Tricco *et al.*, 2018).

The protocol was registered on the Open Science Framework [DOI:10.17605/OSF.IO/2AM3V (osf.io/2am3v)] to ensure the transparency of the process.

Searches were performed between April and July 2021 in three databases: PubMed, SciELO, and Lilacs. Google Scholar (<https://scholar.google.com>) was used to identify grey literature (e.g., unpublished studies, conference abstracts, websites, and blogs). The search terms were selected using the Health Sciences Descriptors and the Medical Subject Headings system. A three-step search strategy was applied: a first search was performed in PubMed and SciELO using “Tooth Loss” and “Black Population” and “Elderly”. We analyzed the titles, abstracts, and keywords and the new terms “Race” and “Edentulism” were then included. A second search was performed in Lilacs using all terms of the PubMed search. In PubMed and Lilacs, the following keywords were combined by the Boolean operator AND: (Tooth loss AND Black population AND Elderly), (Tooth loss AND Race AND Elderly), (Edentulism AND Black population AND Elderly), and (Edentulism AND Race AND Elderly). We then focused on the grey literature using the same search terms as described above. To identify any additional studies, a third search was performed by examining the reference list of the studies selected for full-text reading.

The identified titles and abstracts were independently screened by two researchers using the population, concept, and context mnemonic framework (Peters *et al.*, 2020) as follows: (a) Population: older adults of both sexes aged ≥ 60 years of different racial-ethnic groups, given that they included the Black people, from any country. (b) Concept: the predictors of interest that explained the prevalence of tooth loss were defined as tooth loss-associated factors. Tooth loss was analyzed using different methods: oral examination (number of missing natural teeth) or self-reported by the individual. The Black race was divided into Black and/or Brown, Hispanic or non-Hispanic Black, or African-American subgroups (Brazil, 2010; Brazilian Institute of Geography and Statistics, 2012; Perdigon and Opperman, 2019). (c) Context: belonging to the sociodemographic, economic (contextual and individual factors), and oral health context of the population. The Peters *et al.* (2020) framework was used to answer the following questions: What does the literature report regarding the influence of race on tooth loss in Black older adult populations? Which factors are associated with tooth loss in this population?

We included studies published in English or Portuguese that used a quantitative approach (cohort studies, cross-sectional studies, government reports, and dissertations). We also included studies that specifically analyzed the Black population or as part of racial subgroups, given they included the Black and/or Brown, Hispanic or non-Hispanic Black, and African-American subgroups. In addition, we included studies that found an association of oral health status or socioeconomic and demographic conditions with tooth loss (primary outcome), studies that did not have tooth loss as a primary outcome but reported tooth loss data as a secondary outcome in Black older adults and studies that reported associations between tooth loss and different races including Black older adults. Tooth loss was categorized as edentulism (between 1 and

10 natural teeth), partial tooth loss (between 11 and 20 natural teeth), and functional dentition (21 or more teeth) (Hugo *et al.*, 2007).

The following characteristics were extracted from the reports: authors and year of publication, title, journal, type of publication, study type, study design, outcome, exposure, country of origin, study population, sampling, racial/ethnic subgroups, study objective, methodology, tooth loss assessment method, results, and factor associated with tooth loss in Black people.

Results

The database search retrieved 913 articles; of these, 21 met the inclusion criteria and comprised the study sample (Figure 1). The included reports comprised the period from 1995 to 2020. Partial tooth loss or edentulism were the main outcomes in 80% of the studies (partial tooth loss in 30%, edentulism in 30%, and partial tooth loss and edentulism in 20%). Most reports were original articles (75%), followed by survey reports (15%) and dissertations (10%). We identified publications from the United States (75%), Brazil (20%) and Nigeria (5%). Most (85%) of the included studies were quantitative, and 15% used qualitative and quantitative approaches. Eighty per cent were cross-sectional and 20% were longitudinal studies. The samples ranged from 185 to 48,886 older adults. Most participants were community-dwelling (90%), while 10% lived in nursing homes. Only one study did not report the sample size. Among the 21 studies, the samples were stratified by race in 60%, 35% did not report the population size stratified by race, and 5% did not report the sample. The Afro-descendant population corresponded to the main group in only 25% of the studies.

The extracted data and synthesis are available online (<https://sigaa.ufma.br/sigaa/verProducao?idProducao=2307034&key=2b17e1936ce4b2323d787ef88cb4805d>). The number of teeth was the most frequently used measure of tooth loss in 30% of the partial tooth loss studies, in 15% of the edentulism studies, and in 40% of the partial tooth loss and edentulism studies. Among the 21 included studies, 15% included third molars in the scores for present or missing teeth and 30% excluded third molars because of their frequent extraction. The remaining 55% of the reports did not refer to the inclusion or exclusion of third molars. Tooth retention was reported in 15% of the studies using clinical examinations (as the main outcome in two and as exposure in one). One study used counts of absent and present teeth and two others used self-reported data.

Table 1 maps determinants of tooth loss in older blacks and the frequency of factors associated with tooth loss in Black older adults. Social and demographic conditions and oral health conditions were the most associated variables with tooth loss in the studied population.

Discussion

This scoping review explored the associations between Black ethnicity and tooth loss and is the first study to map the evidence on contextual, individual, and oral health factors associated with tooth loss in this population. There were evident disparities in tooth loss, mediated by

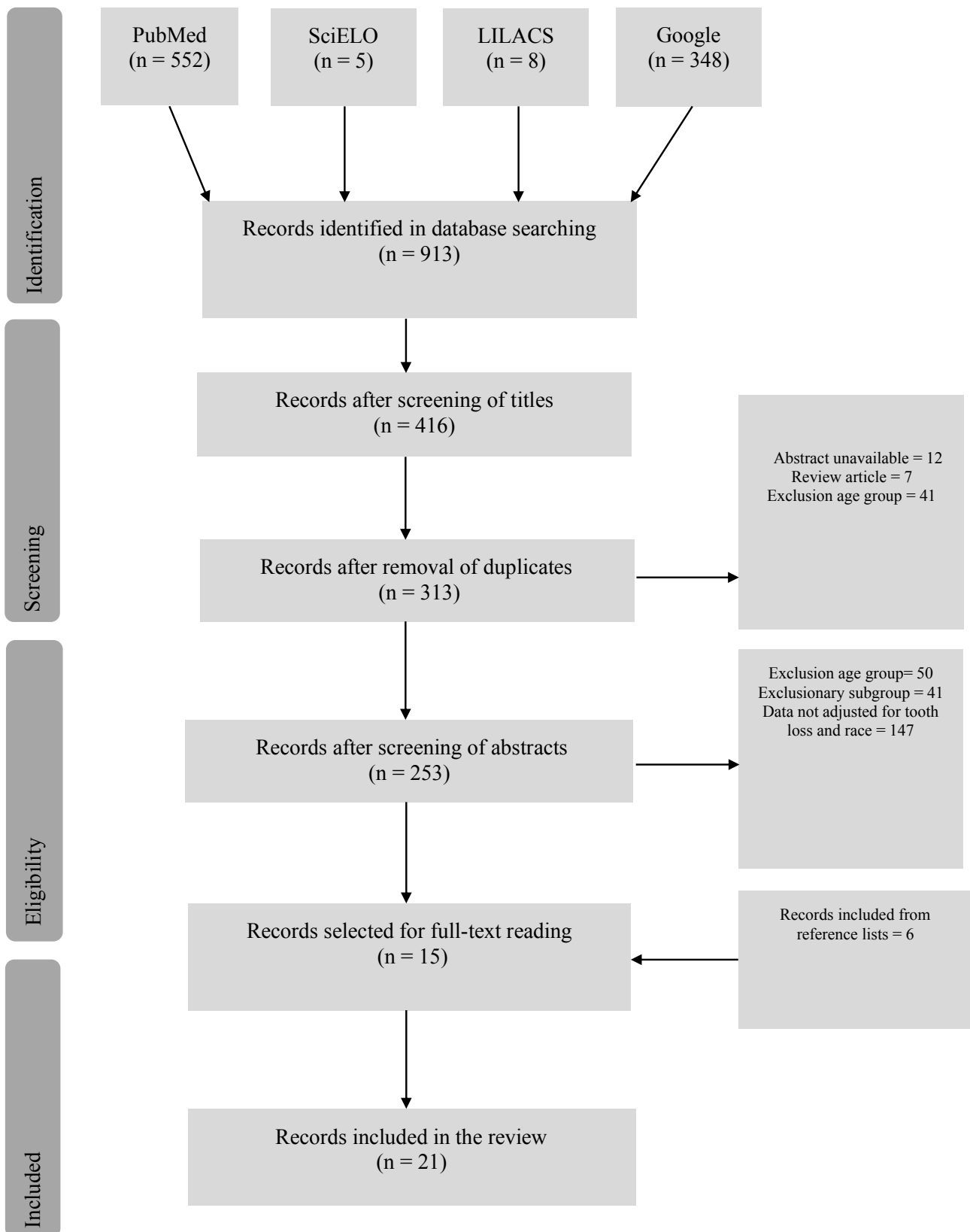


Figure 1. PRISMA flowchart for scoping reviews (PRISMA-ScR).

race (Drake *et al.*, 1995; Hunt *et al.*, 1995; Quandt *et al.*, 2009; Wu *et al.*, 2011a; Wu *et al.*, 2011; Northridge *et al.*, 2012; Liang *et al.*, 2013; Huang and Mijung, 2015; Prado *et al.*, 2018; Griffin *et al.*, 2019; Fleming *et al.*, 2020). Black older adults had the highest rates of tooth loss compared not only to White older adults but also to groups considered to be ethnic minorities such as Asian descent, Indigenous, Hispanic (Mexican American), and

other non-Hispanic groups (Gooch *et al.*, 2003; Wu *et al.*, 2011; Wu *et al.*, 2011a; Gomes *et al.*, 2014).

Although our method did not evaluate the methodological quality of the included studies, the association in most reports was confirmed by multivariate analysis (Lee *et al.*, 2004; Quandt *et al.*, 2009; Wu *et al.*, 2011a; Wu *et al.*, 2011; Northridge *et al.*, 2012; Liang *et al.*, 2013; Gomes *et al.*, 2014; Huang and Mijung, 2015; Prado *et*

Table 1. Variables associated with tooth loss in Black older adults.

<i>Demographic conditions</i>	<i>Social conditions</i>	<i>Oral health conditions</i>	<i>Personal health habits</i>	<i>Use of dental services</i>
Advanced age (Lee <i>et al.</i> , 2004; Liang <i>et al.</i> , 2013; Taiwo and Omokhodion, 2006; Shariff <i>et al.</i> , 2018; Lin <i>et al.</i> , 2019)	Belonging to Black race/ethnicity (Drake <i>et al.</i> , 1995; Caplan <i>et al.</i> , 1996; Hunt <i>et al.</i> , 1995; Quandt <i>et al.</i> , 2009; Wu <i>et al.</i> , 2011; Wu <i>et al.</i> , 2011a; Northridge <i>et al.</i> , 2012; Liang <i>et al.</i> , 2013; Gomes <i>et al.</i> , 2014; Huang and Mijung, 2015; Prado <i>et al.</i> , 2018 Lin <i>et al.</i> , 2019; Griffin <i>et al.</i> , 2019, Fleming <i>et al.</i> , 2020)	Elevated presence of <i>Streptococcus mutans</i> in saliva (Drake <i>et al.</i> , 1995)	Alcoholism (Lee <i>et al.</i> , 2004)	No visits in the last 12 months (Shariff <i>et al.</i> , 2018)
Sex/gender (Natto <i>et al.</i> , 2014; Shariff <i>et al.</i> , 2018 Fleming <i>et al.</i> , 2020)	Low educational level (Lee <i>et al.</i> , 2004; Liang <i>et al.</i> , 2013; Gomes <i>et al.</i> , 2014; Shariff <i>et al.</i> , 2018; Lin <i>et al.</i> , 2019)	Presence of periodontal pocket (Drake <i>et al.</i> , 1995)	Smoking (Lee <i>et al.</i> , 2004; Shariff <i>et al.</i> , 2018; Lin <i>et al.</i> , 2019)	Oral health perception
Health expenditure	Low social status (Taiwo and Omokhodion, 2006)	Presence of Prevotella intermedia in subgingival plaque (Drake <i>et al.</i> , 1995)	Nutrition	Oral health status self-rated as poor (Lee <i>et al.</i> , 2004; Wu <i>et al.</i> , 2011; Huang and Mijung, 2015)
No dental insurance (Lee <i>et al.</i> , 2004)	Low income (Liang <i>et al.</i> , 2013; Gomes <i>et al.</i> , 2015; Huang and Mijung, 2015) Low HDI cities (Gomes <i>et al.</i> , 2015) Number of household assets (Gomes <i>et al.</i> , 2015) Single marital status (Natto <i>et al.</i> , 2014) Employment difficulty (Huang and Mijung, 2015)	Number of retained roots (Hunt <i>et al.</i> , 1995) Periodontal attachment loss (Hunt <i>et al.</i> , 1995; Shariff <i>et al.</i> , 2018) Toothache (Hunt <i>et al.</i> , 1995) Reduced salivary flow (Caplan and Hunt, 1996) Feeling pain/difficulty chewing (Lee <i>et al.</i> , 2004; Huang and Mijung, 2015) Need for prosthesis (Lee <i>et al.</i> , 2004) Periodontal disease (Taiwo and Omokhodion, 2006) Greater probing depth (Shariff <i>et al.</i> , 2018) Untreated caries (Griffin <i>et al.</i> , 2019)	Poor nutritional status (Lee <i>et al.</i> , 2004) Lack of appetite (Lee <i>et al.</i> , 2004)	Feeling ashamed about teeth (Huang and Mijung, 2015) Systemic health conditions High blood pressure (Drake <i>et al.</i> , 1995) Depression (Drake <i>et al.</i> , 1995) Diabetes (Natto <i>et al.</i> , 2014) Heart diseases (Natto <i>et al.</i> , 2014)

et al., 2018; Lin *et al.*, 2019; Silva *et al.*, 2020; Vettore *et al.*, 2020). Some reports did not present odds or prevalence ratios (Drake *et al.*, 1995; Hunt *et al.*, 1995; Gooch *et al.*, 2003; Taiwo and Omokhodion, 2006; Natto *et al.*, 2014; Griffin *et al.*, 2019; Fleming *et al.*, 2020) but rather based their conclusions on the p-values of the tested associations.

The associations between ethnicity and tooth loss (Drake *et al.*, 1995; Northridge *et al.*, 2012; Lin *et al.*, 2019; Griffin *et al.*, 2019) raise questions about disparities in oral health. For instance, the odds of a Black older adult having access to the healthcare system is lower than that of an older adult belonging to another racial group (Table 2).

Despite the possibility that discriminatory behavior affects access to oral healthcare, the association between racial discrimination and oral health outcomes has not been adequately addressed (Muralikrishnan and Sabbah, 2020; Jamieson, 2021, Bastos *et al.*, 2021; Evans and Smith, 2021 and Hedges *et al.*, 2021). It is known that African ancestry is an unfavorable condition for accessing health care goods and services or dental services (Souza *et al.*, 2012). Institutional racism may manifest in the organizational structures of society and of the healthcare system (Moura, 2021). Almost a quarter (23.3%) of Black and Brown people in Brazil reported being discriminated while seeking health services (Brazilian Institute of Geography

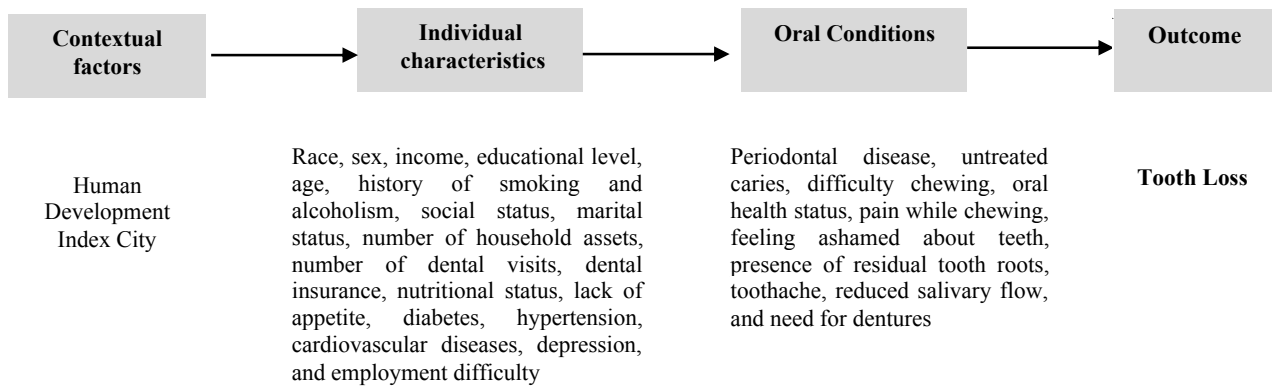


Figure 2. Theoretical model of contextual, individual, and oral health determinants of tooth loss in the Afro-descendant older population.

and Statistics, 2012. In addition to skin color, healthcare institutions may also discriminate based on the individual's socioeconomic class (Santos, 2019).

In the case of Black people, structural and institutional racism likely start in childhood and have a negative impact on development and aging, social class, educational level, working conditions, types of work, income, access to and use of goods and services, and health conditions (Moura, 2021). Thus, discrimination may be indirectly associated with tooth loss, as individuals frequently exposed to stress are less likely to use dental services (Sanders *et al.*, 2007).

Discrimination can cause psychological distress that can lead to the adoption of unhealthy behaviors such as smoking and excessive sugar and alcohol consumption. These behaviors, in turn, can lead to tooth decay and periodontal disease and, eventually, to tooth loss (Paradies *et al.*, 2015). In addition, the stress associated with racism is a risk factor for hypertension (Moura, 2021).

Tooth loss was more common among Black people than other ethnic groups. However, we cannot determine whether discrimination is specifically linked to the ethnic condition. For example, socioeconomic status can be an indirect modifier of the association between tooth loss and discrimination since low socioeconomic status can increase the chances of individuals feeling discriminated, regardless of their skin color.

This scoping review also found gender differences in tooth loss. Black women are more likely to lose teeth than Black men (Natto *et al.*, 2014; Liang *et al.*, 2014; Fleming *et al.*, 2020). Gender may contribute to the onset of tooth decay and periodontal disease, leading to tooth loss. Moreover, lower socioeconomic status is more common among women and is related to lower use of dental care (Russel *et al.*, 2013; Lukacs *et al.*, 2011a; Lukacs *et al.*, 2011). Oral diseases such as untreated caries and periodontitis have also been associated with tooth loss in the Black older adults. However, greater inequalities in periodontal disease experience were found mainly in this population (Drake *et al.*, 1995; Hunt *et al.*, 1995; Taiwo and Omokhodion, 2006; Silva *et al.*, 2020). Periodontitis is the second most common chronic oral disease after dental caries that causes tooth loss (Jordan *et al.*, 2021).

Publications over the years show that Black older adults are more likely to live under precarious housing

conditions and have less access to dental services, resulting in poorer oral health. The burden of oral diseases and tooth loss is greater among people living in poverty (Thomson *et al.*, 2012), which is part the unequal conditions of social inclusion of Black older adults and the disparities in tooth loss.

People living in regions of socioeconomic and demographic equity have better oral health and are less likely to experience tooth loss (Martins *et al.*, 2007; Gabardo *et al.*, 2008). The large socioeconomic inequality experienced by the Black population is also a reason for tooth extraction as the main treatment option (Seering *et al.*, 2015) because of the difficulty in acquiring a dental insurance and in accessing dental services in a timely manner (Gooch *et al.*, 2003; Lee *et al.*, 2004; Lin *et al.*, 2019; Shariff *et al.*, 2018).

This scoping review showed that most research was conducted in the United States. Only four Brazilian studies reported tooth loss in older adults according to race (Prado *et al.*, 2018; Vettore *et al.*, 2020; Gomes *et al.*, 2014; Silva *et al.*, 2020), with higher tooth loss in Black and Brown people compared to White, Indigenous and Asian descents older adults. This points to the presence of historical social inequalities related to the continuing violation of human rights of the Black population (Cruz, 2006).

Regardless of the country of origin, contextual and individual factors may be responsible for these oral health inequalities. Oral diseases of Black older adults are therefore "social diseases" (Guiotoku *et al.*, 2012). Moreover, the knowledge gained from this review shows gaps understanding of the oral health of Black older adults; for example, studies of tooth loss in Black people are rare, especially those involving older people. However, we alert readers to the inclusion of aggregating racial groups for data analysis. Self-declared race may cause classificatory distortions. Further studies evaluating the causes of tooth loss in Black older adults from a contextual perspective are fundamental since not all determinants are individual characteristics.

This scoping review set no publication date restrictions, which allowed us to review comprehensively. Although only four longitudinal studies were included (Drake *et al.*, 1995; Hunt *et al.*, 1995; Lee *et al.*, 2004; Liang *et al.*, 2013), the predominance of relevant and

accessible scientific reports is helpful (Curty and Boccato, 2008). Understanding the factors that cause tooth loss in older adults, particularly in the Black population allows identification of interventions to reduce tooth loss via equitable and comprehensive health promotion for this population group. Further longitudinal studies comparing racial inequalities are needed to elucidate the causes of tooth loss to confirm our findings.

Some limitations of this review must be mentioned. Most of the included studies were cross-sectional, which limits the attribution of causation. However, even if a causal relationship cannot be established, the associations appear to exist and are important. Some variables were not adjusted in some studies, and further associations may exist. The heterogeneity among the reviewed studies could be considered a limitation, although expected since the main objective was to explore the diverse contexts found in the literature.

In conclusion, contextual and individual determinants and poor oral health increase the frequency of tooth loss in Black older adults. African descent, advanced age, a low educational level, and periodontal disease were most frequently associated with tooth loss.

Conflict of interest

The authors declare they have no conflict of interest.

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