

Tooth Loss, Social Stigma, and Discriminatory Experiences in Health Services

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Abstract

To investigate factors associated with perceived social discrimination in health care settings related to dental aesthetic conditions. Data were obtained from a Brazilian National Survey. Multivariate Poisson regression models with robust variance were applied to examine associations between reported discrimination in health services—according to different stated motivations—and sociodemographic and dental characteristics. Effect modification by the use of complete dental prostheses was also evaluated. Of the 60,200 individuals surveyed, 11.5% reported experiencing discrimination in health services. Among women, higher prevalence of discrimination was observed in the 30–44-year age group. For both men and women, discrimination was more frequent among individuals identifying as Black or Brown. With respect to dental status, increasing levels of tooth loss were associated with higher prevalence of discrimination, whereas the use of complete prostheses showed a protective effect. Social discrimination was the most frequently reported reason and was particularly prevalent among edentulous individuals who did not use prostheses. Tooth loss is associated with self-reported discrimination in health care settings. The likelihood of experiencing discrimination increases with greater severity of tooth loss, and social discrimination represents the predominant underlying reason.

Keywords: Prejudice, Cross-sectional studies, Health services dental esthetics, Oral health, Dental public health

Introduction

Across the world, individuals are exposed to multiple forms of discrimination and prejudice, and the discriminatory experiences reported by users of public health services have become a growing public health concern [1, 2]. Discrimination in this context can be understood as a social experience in which individuals perceive unfair or unequal treatment, often accompanied by stressful circumstances [1]. Such experiences are frequently rooted in stereotyping processes that promote judgment, labeling, prejudice, and social exclusion [1]. These issues are especially relevant for populations already in vulnerable situations, including dependent

older adults and individuals who rely heavily on health care services [2–4]. Social discrimination may be defined as any explicit or implicit expression of prejudice involving differential judgment or biased attitudes toward an individual [5]. Worldwide, discriminatory practices in health care settings have been documented and may manifest as delayed care, poor communication, denial of treatment, hostile behavior, or even harassment [5]. Racial and ethnic inequalities in health care access and treatment represent well-recognized expressions of discrimination, often reinforced by health systems, professionals, or health insurance structures [6]. In addition, subtle or implicit forms of discrimination may appear through nonverbal behaviors, such as limited eye contact, physical distancing, or dismissive interactions during consultations [4]. Although perceptions of discrimination may vary across cultural and national contexts, there is broad agreement that stereotyping within health services constitutes unacceptable discriminatory conduct in any society [6].

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Multiple individual characteristics have been associated with discriminatory experiences during health care encounters, including socioeconomic disadvantage, obesity, skin color, sex, age, poor dental appearance, and sexual orientation [2, 4, 7, 8]. These factors shape patients' expectations and perceptions of care and may contribute to unequal treatment, with potential long-term consequences for physical and mental health [9, 10]. Examining the relationship between health service use and perceived discrimination is therefore essential to inform policies aimed at reducing inequities in access and quality of care [11].

Dental appearance and aesthetic conditions may also influence discriminatory experiences within health services [12]. Despite its relevance, research addressing self-reported discrimination related to dental aesthetics remains limited [2, 3, 8, 12]. Evidence suggests that poor oral health disproportionately affects socially vulnerable populations, and that poverty, socioeconomic inequality, race, and broader social disparities may increase the likelihood of discrimination linked to dental appearance and access to care [8, 13–15]. Tooth loss, in particular, can function as a social stressor, as individuals with missing teeth—especially older adults with severe tooth loss and impaired functional dentition—may be perceived as more vulnerable [16]. Negative social perceptions of poor dental appearance can contribute to feelings of shame, reduced self-esteem, and psychological distress [8]. From a clinical standpoint, this issue is especially relevant, as individuals with chronic conditions who experience discrimination are more likely to disengage from health services and reduce their use of care [17].

Against this backdrop, the present study addresses the following research question: are dental aesthetic conditions, such as tooth loss and the use of dental prostheses, associated with experiences of social discrimination in health care settings? Additionally, the study explores whether individual characteristics—such as sex, age, and social vulnerability—contribute to discrimination within health services. Accordingly, this study aims to analyze perceived social discrimination among users of Brazilian health services, focusing on motivations related to dental aesthetic conditions.

Materials and Methods

Study design and population

This cross-sectional, population-based investigation analyzed perceived discrimination in health care using data from a national household survey conducted in Brazil. The study drew on information from the Brazilian National Health Survey (Pesquisa Nacional de Saúde – PNS), carried out between August 2013 and February 2014 through a collaboration between the Ministry of Health and the Brazilian Institute of Geography and Statistics (IBGE). The survey was developed to provide nationally representative estimates on health conditions, access to services, and health-related behaviors [18]. Because the information was obtained directly from respondents, the survey is consistent with a patient-reported outcomes framework, allowing assessment of subjective experiences related to health care, including perceived quality and treatment experiences [19, 20].

The PNS used a probabilistic multistage sampling strategy. Census tracts were selected as primary sampling units, excluding special sectors such as military installations, prisons, hospitals, convents, indigenous settlements, and similar institutional or collective dwellings. Within each selected tract, households were randomly chosen, and in each household one resident aged 18 years or older who was able to respond was randomly selected to participate. Sample size determination considered the estimation of population proportions with adequate precision at the 95% confidence level, the expected design effect due to clustering, and the distribution of the adult population across households. A total of 79,875 households were initially sampled, accounting for anticipated non-response. Losses were due to vacant dwellings, refusals, or unsuccessful contact after repeated attempts. To ensure representativeness, sampling weights were calculated to reflect unequal selection probabilities and adjusted for non-response and population calibration. Individual weights incorporated both household weights and the number of eligible residents. Additional methodological details regarding the sampling process have been reported elsewhere [21]. For the present analysis, data from 60,200 participants aged 18 to 65 years were included.

Data collection was conducted by trained fieldworkers using handheld electronic devices containing a standardized and previously tested questionnaire. Interviewers followed a detailed operational manual to ensure consistency across data collection sites. Ethical approval was granted by the National Research Ethics Commission (CONEP) under protocol number

10853812.7.0000.0008, approved on June 26, 2013. All respondents provided written informed consent prior to participation.

Variables and measurements

The PNS questionnaire was structured to obtain information at the household and individual levels. The present analysis relied exclusively on self-reported data collected during individual interviews.

The main outcome was perceived discrimination in health care settings. This was assessed through a question asking whether the respondent had ever felt discriminated against or treated worse than others by a physician or another health professional. Responses were dichotomized as yes or no. Participants who answered affirmatively were further asked to identify the perceived reason for such treatment. Reported motivations included social position (such as lack of financial resources, low social class, or occupation), race or skin color, type of illness that was visibly identifiable, sex, age, or other motives, including sexual orientation, religious beliefs, or other unspecified factors.

Sociodemographic variables comprised sex, age, self-identified race or skin color, marital status, and educational attainment. Age was grouped into four categories: 18–29, 30–44, 45–64, and 65 years or older. Race or color was self-classified as white, brown, black, yellow, or Indigenous. Marital status was categorized as married or cohabiting, separated, widowed, or single. Education was classified as illiterate, elementary or secondary schooling, and higher education (university or postgraduate).

Oral health information was obtained through questions addressing tooth loss and the use of dental prostheses. Participants were asked whether they had lost any upper or lower teeth, with response options indicating no tooth loss, partial loss, or complete loss. When partial loss was reported, respondents specified the number of missing teeth, ranging from one to fifteen. Use of dental prostheses was assessed through a question asking whether the individual used any type of artificial tooth, referring to complete dentures for the upper and/or lower arch.

Statistical analysis

Descriptive analyses were first conducted to summarize the distribution of the study variables using absolute and relative frequencies. Associations between perceived discrimination in health services, the reported motivation for discrimination, and sociodemographic and oral health characteristics were examined using chi-square tests. For ordinal variables, tests for linear trend were applied, whereas heterogeneity tests were used for nominal categorical variables.

To estimate the magnitude of associations, Poisson regression models with robust variance were employed to calculate crude and adjusted prevalence ratios (PRs) and their corresponding 95% confidence intervals (95% CI). The multivariable models simultaneously included all sociodemographic and dental variables to control for potential confounding. All statistical procedures were performed using SPSS software, version 21.0 (SPSS Inc., Chicago, IL, USA).

Results and Discussion

The analytical sample comprised 60,200 individuals. The overall non-response rate of the survey was 8.1%. Most participants were women (56.9%), aged between 30 and 44 years (33.6%), self-identified as brown (49.0%), were single (44.9%), and had completed elementary or secondary education (76.0%). Regarding oral health status, the largest proportion reported having no missing teeth in the upper arch (37.2%), while loss of one to four teeth in the lower arch was the most frequent condition (41.5%). The overall prevalence of self-reported discrimination in health services was 11.5%.

When the sample was stratified according to reported discrimination, higher proportions of discrimination were observed among women (12.3%), individuals aged 30–44 years (12.8%), those identifying as Black (13.8%), separated individuals (14.1%), and participants who were illiterate (12.8%). With respect to dental status, discrimination was more frequently reported among individuals who had lost between 9 and 15 teeth in the upper arch (13.9%) and among those who had lost between 5 and 8 teeth in the lower arch (14.1%). All sociodemographic characteristics and oral health variables showed statistically significant associations with discrimination in health services ($p < 0.001$), as presented in **Table 1**.

Table 1. Proportion of discrimination in health services by sociodemographics and dental characteristics.

Characteristics	Discriminated in health services	Total	Yes %	Yes n	No %	No n	p-value ^a
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Sex							
	Male	25,920	10.5	2,710	89.5	23,210	<0.001
	Female	34,280	12.3	4,228	87.7	30,052	
Age							
	18–29	14,320	10.3	1,473	89.7	12,847	<0.001
	30–44	20,242	12.8	2,591	87.2	17,651	
	45–64	17,926	12.2	2,193	87.8	15,733	
	<65	7,712	8.8	681	91.2	7,031	
Color/Race							
	White	24,105	10.1	2,434	89.9	21,671	<0.001
	Brown	29,511	12.2	3,595	87.8	25,916	
	Black	5,631	13.8	778	86.2	4,853	
	Yellow	533	11.4	61	88.6	472	
	Indigenous	420	16.7	70	83.3	350	
Marital status							
	Married/living together	23,739	11.2	2,650	88.8	21,089	<0.001
	Separate	4,727	14.1	666	85.9	4,061	
	Widowed	4,708	10.1	477	89.9	4,231	
	Single	27,026	11.6	3,145	88.4	23,881	
Education							
	Illiterate	5,867	12.8	753	87.2	5,114	<0.001
	Elementary education or high school	45,737	11.7	5,351	88.3	40,386	
	University or postgraduate	8,596	9.7	834	90.3	7,762	
Upper number of teeth							
	All teeth	22,376	9.6	2,148	90.4	20,228	<0.001
	1–4 lost teeth	20,197	12.8	2,577	87.2	17,620	
	5–8 lost teeth	4,204	13.7	574	86.3	3,630	
	9–15 lost teeth	2,403	13.9	334	86.1	2,069	
	Edentulous without prosthesis	2,012	11.8	237	88.2	1,775	
	Complete prosthesis wearing	9,008	11.9	1,068	88.1	7,940	
Lower number of teeth							
	All teeth	21,115	9.2	1,940	90.8	19,175	<0.001
	1–4 lost teeth	24,962	13.0	3,238	87.0	21,724	
	5–8 lost teeth	4,598	14.1	648	85.9	3,950	
	9–15 lost teeth	2,559	13.6	349	86.4	2,210	
	Edentulous without prosthesis	1,872	10.8	203	89.2	1,669	
	Complete prosthesis wearing	5,094	11.0	560	89.0	4,534	
Total		60,200	11.5	6,938	88.5	53,262	

Table 2 presents the sex-stratified adjusted analysis examining associations between discrimination in health services and social as well as dental characteristics. Among women, a higher prevalence of perceived discrimination was observed in those aged 30–44 years (PR = 1.09; 95% CI 1.01–1.18), those identifying as brown (PR = 1.09; 95% CI 1.02–1.16), black (PR = 1.32; 95% CI 1.20–1.46), or Indigenous (PR = 1.61; 95% CI 1.25–2.09), and among women who were separated (PR = 1.31; 95% CI 1.19–1.44). With respect to oral health, a dose–response pattern was observed in the upper dental arch, whereby increasing tooth loss was associated with

progressively higher prevalence of discrimination. Compared with women without tooth loss, prevalence ratios increased for those missing one to four teeth (PR = 1.43; 95% CI 1.27–1.62), five to eight teeth (PR = 1.75; 95% CI 1.28–2.39), and nine to fifteen teeth (PR = 1.91; 95% CI 1.01–3.14). Women with missing teeth who did not use dental prostheses showed the highest prevalence of discrimination (PR = 2.41; 95% CI 1.18–4.92). A similar pattern was observed in the lower arch, where higher prevalence estimates were found among women with one to four missing teeth (PR = 1.53; 95% CI 1.38–1.70) and five to eight missing teeth (PR = 1.65; 95% CI

1.07–2.79). Conversely, increasing age and higher educational attainment were associated with a lower prevalence of reported discrimination, indicating a protective effect.

Among men, elevated prevalence of discrimination was also observed for those identifying as brown (PR = 1.18; 95% CI 1.09–1.29) or black (PR = 1.24; 95% CI 1.10–1.41). Dental status showed a strong association with discrimination, particularly for tooth loss in the upper arch. Compared with men without tooth loss, higher

prevalence ratios were found among those missing one to four teeth (PR = 1.36; 95% CI 1.17–1.57), five to eight teeth (PR = 1.40; 95% CI 1.16–1.77), and nine to fifteen teeth (PR = 2.18; 95% CI 1.25–3.82). Men who had lost teeth and did not use dental prostheses exhibited the highest prevalence of discrimination (PR = 3.56; 95% CI 1.48–8.60). In the lower arch, discrimination was more prevalent among men with one to four missing teeth (PR = 1.41; 95% CI 1.24–1.61) and among those with five to eight missing teeth (PR = 1.40; 95% CI 1.16–1.77).

Table 2. Unadjusted and adjusted analysis by Poisson Regression (PR) between discrimination in health services and social and dental characteristics, separated by sex.

Characteristics	Male Adjusted ^a PR		Female Adjusted ^a PR	
	PR	95% CI	PR	95% CI
Age				
18–29	1	—	1	—
30–44	1.07	0.95–1.18	1.09	1.01–1.18
45–64	0.85	0.75–0.96	0.91	0.82–1.01
≥65	0.65	0.54–0.77	0.61	0.53–0.71
Color/race				
White	1	—	1	—
Brown	1.18	1.09–1.29	1.09	1.02–1.16
Black	1.24	1.10–1.41	1.32	1.20–1.46
Yellow	0.82	0.50–1.34	1.24	0.95–1.63
Indigenous	1.23	0.82–1.84	1.61	1.25–2.09
Marital status				
Married/living together	1	—	1	—
Separated	1.11	0.97–1.28	1.31	1.19–1.44
Widowed	1.02	0.83–1.26	0.97	0.87–1.09
Single	0.98	0.91–1.07	1.03	0.96–1.10
Education				
Illiterate	1	—	1	—
Elementary education or high school	0.88	0.78–0.98	0.96	0.86–1.06
University or postgraduate	0.79	0.67–0.92	0.86	0.78–0.99
Currently smoking				
No	1	—	1	—
Yes	1.14	1.04–1.24	1.26	1.16–1.37
Upper number of teeth				
All teeth	1	—	1	—
1–4 lost teeth	1.36	1.17–1.57	1.43	1.27–1.62
5–8 lost teeth	1.40	1.16–1.77	1.75	1.28–2.39
9–15 lost teeth	2.18	1.25–3.82	1.91	1.01–3.14
Edentulous without prosthesis	3.56	1.48–8.60	2.41	1.18–4.92
Complete prosthesis wearing	1.36	0.82–2.25	1.26	0.86–1.89
Lower number of teeth				
All teeth	1	—	1	—
1–4 lost teeth	1.41	1.24–1.61	1.53	1.38–1.70
5–8 lost teeth	2.10	1.19–3.72	1.65	1.07–2.79
9–15 lost teeth	2.20	0.39–12.4	1.48	0.23–9.36
Edentulous without prosthesis	1.68	0.48–6.43	3.99	0.40–8.42

Complete prosthesis wearing	2.97	0.59–14.3	1.80	0.66–4.83
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Brazil, 2019. PR, Prevalence Ratio.

aAll variables in the table included in the adjusted model.

When stratified by the reported motivation for discrimination, the prevalence of discrimination related to dental appearance showed significant associations between the number of teeth in both the upper and lower arches and several perceived reasons for discriminatory

treatment. Significant relationships were observed with social status, type of disease, and age (all $p < 0.001$), as well as with other reported motives, including sexual orientation ($p = 0.005$) and religion ($p < 0.001$), as shown in **Table 3**.

Table 3. Proportion of discrimination in health services by dental appearance, stratified by motivation.

Dental Characteristic	Racial		Social Status		Type of Disease		Sex		Age		Others	
	Yes n (%)	p-value ^a	Yes n (%)	p-value ^a	Yes n (%)	p-value ^a	Yes n (%)	p-value ^a	Yes n (%)	p-value ^a	Yes n (%)	p-value ^a
Upper number of teeth												
All teeth	330 (1.5)	<0.001	1,510 (6.7)	<0.001	294 (1.3)	<0.001	101 (0.5)	0.707	193 (0.9)	<0.001	536 (2.4)	0.005
1–4 lost teeth	442 (2.2)		1,968 (9.7)		358 (1.8)		75 (0.4)		274 (1.4)		550 (2.7)	
5–8 lost teeth	111 (2.6)		446 (10.6)		112 (2.7)		18 (0.4)		88 (2.1)		97 (2.3)	
9–15 lost teeth	39 (1.6)		243 (10.1)		67 (2.8)		8 (0.3)		53 (2.2)		67 (2.8)	
Edentulous^b	36 (1.8)		160 (8.0)		59 (2.9)		8 (0.4)		60 (3.0)		44 (2.2)	
Prosthesis^c	103 (1.1)		773 (8.6)		175 (1.9)		31 (0.3)		243 (2.7)		179 (2.0)	
Lower number of teeth												
All teeth	315 (1.5)	<0.001	1,375 (6.5)	<0.001	256 (1.2)	<0.001	84 (0.4)	0.689	195 (0.9)	<0.001	455 (2.2)	<0.001
1–4 lost teeth	528 (2.1)		2,461 (9.9)		475 (1.9)		108 (0.4)		334 (1.3)		713 (2.9)	
5–8 lost teeth	103 (2.2)		488 (10.6)		128 (2.8)		20 (0.4)		107 (2.3)		122 (2.7)	
9–15 lost teeth	34 (1.3)		249 (9.7)		68 (2.7)		7 (0.3)		65 (2.5)		58 (2.3)	
Edentulous^b	30 (1.6)		136 (7.3)		52 (2.8)		6 (0.3)		66 (3.5)		40 (2.1)	
Prosthesis^c	51 (1.0)		391 (7.7)		86 (1.7)		16 (0.3)		144 (2.8)		85 (1.7)	
Total	1,061 (1.8)		5,100 (8.5)		1,065 (1.8)		241 (0.4)		911 (1.5)		1,473 (2.4)	

Brazil, 2019; Others = Sexual preferences and religion.

aChi-square test.

bEdentulous without prosthesis.

cComplete prosthesis wearing.

As presented in **Table 4**, discrimination associated with tooth loss in both the upper and lower arches was more prevalent when the reported motivation was social rather than related to other reasons. Nevertheless, the direction of the associations was consistent across all motivational categories. The highest prevalence of socially motivated

discrimination was observed among edentulous individuals who had lost all upper teeth and did not use dental prostheses (PR = 3.71; 95% CI 2.02–6.79), as well as among those with five to eight missing teeth in the lower arch (PR = 1.93; 95% CI 1.22–3.07).

Table 4. Prevalence ratio (PR) of reporting discrimination in health services by dental appearance, stratified by motivation.

Dental Characteristic	Racial		Social Status		Type of Disease		Sex		Age		Others	
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Upper number of teeth												
All teeth	1	—	1	—	1	—	1	—	1	—	1	—
1–4 lost teeth	1.26	1.07–1.48	1.56	1.39–1.74	1.10	0.92–1.32	0.76	0.53–1.08	1.39	1.23–1.72	1.06	0.92–1.21
5–8 lost teeth	1.46	1.13–1.87	1.65	1.21–2.26	1.45	1.12–1.88	0.90	0.4–1.65	1.63	1.21–2.20	0.95	0.74–1.22
9–15 lost teeth	0.99	0.68–1.46	1.97	1.19–3.26	1.46	1.05–2.02	0.84	0.36–1.96	1.42	0.97–2.08	1.29	0.95–1.75
Edentulous ^a	1.11	0.70–1.75	3.71	2.02–6.79	1.49	1.04–2.13	1.15	0.45–2.96	1.45	0.97–2.16	1.15	0.78–1.67
Prosthesis ^b	0.88	0.63–1.23	1.50	1.05–2.14	1.21	0.90–1.62	0.89	0.45–1.77	1.50	1.08–2.08	1.05	0.80–1.38
Lower number of teeth												
All teeth	1	—	1	—	1	—	1	—	1	—	1	—
1–4 lost teeth	1.15	0.98–1.34	1.59	1.45–1.76	1.39	1.27–1.66	1.17	0.83–1.64	1.17	0.96–1.42	1.38	1.21–1.57
5–8 lost teeth	1.27	0.98–1.65	1.93	1.22–3.07	1.77	1.36–2.30	1.21	0.64–2.30	1.34	1.01–1.81	1.50	1.16–1.92
9–15 lost teeth	0.90	0.60–1.36	2.68	0.76–9.45	1.66	1.18–2.34	0.77	0.30–2.00	1.28	0.89–1.83	1.33	0.95–1.87
Edentulous ^a	1.19	0.73–1.93	1.52	0.24–9.46	1.82	1.24–2.66	0.88	0.32–2.46	1.46	0.99–2.17	1.60	1.07–2.38
Prosthesis ^b	0.92	0.60–1.40	1.48	0.41–5.31	1.27	0.88–1.82	0.89	0.40–1.98	1.19	0.84–1.69	1.16	0.82–1.63

Brazil, 2019.

aEdentulous without prosthesis.

bComplete prosthesis wearing.

This nationwide investigation provides evidence that social discrimination related to dental appearance is perceived by users of health services in Brazil. The findings indicate that tooth loss is associated with greater self-reported discrimination, suggesting that oral conditions may influence how individuals perceive their treatment within health care settings. In this context, even partial tooth loss appears sufficient to contribute to experiences of discriminatory treatment. The results further indicate that discrimination is not evenly distributed across the population, disproportionately affecting individuals characterized by social vulnerability, particularly according to race, sex, and educational level. Higher levels of perceived

discrimination were observed among younger women, individuals identifying as Black or Brown, and those with low educational attainment. These findings reinforce the idea that discrimination in health care often reflects broader social hierarchies and structural inequalities.

The present study adds novel evidence by being, to our knowledge, the first nationwide Brazilian investigation to explicitly examine the relationship between tooth loss and perceived discrimination within the public health system. Previous research has documented that multiple social factors contribute to discriminatory experiences in health care contexts. For example, studies among Indigenous populations in Australia have shown that experiences of racism and financial barriers to dental

treatment are associated with oral health problems such as toothache [22]. Other research suggests that providers' clinical decisions may be influenced by patients' skin color, sometimes resulting in less complex or lower-quality treatment options being offered [23]. More broadly, social disadvantage has been shown to generate shared experiences of exclusion and unfair treatment across different institutional settings, including health services [24, 25]. Limited access to care and exclusionary practices further reinforce these inequities [26]. In contrast, some investigations have not identified sex-based differences in discrimination related to dental appearance, such as among smokers, highlighting that these associations may vary across populations and contexts [12].

Tooth loss, edentulism, and unmet needs for dental prostheses remain highly prevalent in several Latin American countries, including Brazil. These conditions are strongly associated with quality of life and with experiences of stigma and discrimination in health care environments [12, 27, 28]. The social consequences of facial and dental appearance have been widely documented, with evidence showing that visible oral conditions can shape social judgments and interpersonal interactions [8, 29, 30]. The present findings reinforce this literature by demonstrating a graded relationship between the extent of tooth loss and the likelihood of reporting discrimination, suggesting a dose–response pattern. In this sense, visible dental deterioration may function as a social marker that triggers negative stereotypes and discriminatory behaviors [31].

Moreover, discrimination within health services represents a relevant public health concern, as individuals who perceive discriminatory treatment are less likely to engage in preventive care and may delay or avoid seeking health services altogether [7, 12, 32]. Our results indicate that tooth loss is associated with a higher prevalence of perceived discrimination, particularly among individuals who are edentulous and do not use dental prostheses. Conversely, the use of prostheses appeared to mitigate this effect, acting as a protective factor. This finding aligns with previous evidence showing that prosthetic rehabilitation can partially restore facial appearance, improve social interactions, and enhance self-esteem [33, 34]. By reducing visible markers of tooth loss, prostheses may lessen the likelihood of stigmatization and unfair treatment in health care encounters.

Taken together, these findings suggest that discriminatory practices in health services may be

influenced by visible physical characteristics, including dental appearance. Addressing such inequities requires not only expanding access to dental care and prosthetic rehabilitation but also promoting professional training and institutional policies aimed at reducing stigma and bias in health care delivery [2].

An important limitation of this study concerns the assessment of discrimination itself. Future research should prioritize the development of more comprehensive conceptual frameworks that allow for the simultaneous evaluation of multiple dimensions and motivations underlying discriminatory experiences. A more integrated measurement approach would enable a deeper understanding of how different forms of discrimination operate and interact, thereby improving our capacity to address their effects on health outcomes and to design effective strategies to reduce their occurrence in society.

Despite this limitation, the study presents several notable strengths. Chief among them is its contribution to the discussion of oral health as a socially relevant issue, highlighting its intersection with discrimination in health care settings. The study is innovative in examining the relationship between tooth loss and perceived prejudice and benefits from the use of a large, nationally representative sample of health service users. Further investigations are warranted to explore in greater detail the mechanisms through which individuals come to perceive discriminatory treatment within health services. Taken together, the findings support the conclusion that discrimination related to dental status and the use of prosthetic rehabilitation is a real and measurable phenomenon in Brazil. These results underscore the need for continued research and policy efforts aimed at reducing inequities and promoting equitable access to oral health care for the population as a whole.

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References

1. Bodenhausen GV, Macrae CN, and Sherman JW. On the dialectics of discrimination: dual processes

- in social stereotyping. *UC Davis* (2016) 1(6): 271–90.
2. Baumgarten A, Peron TB, Bastos JL, Toassi RFC, Hilgert JB, Hugo FN, et al. Experiences of health service-related discrimination: exploratory analysis in two Southern Brazilian State capitals. *Epidemiol Serv Saúde* (2015) 24(3):353–62. doi:10.5123/S1679-49742015000300002
 3. Boccolini CS, Boccolini P de M, Damacena GN, Ferreira AP, and Szwarcwald CL. Factors associated with perceived discrimination in health services of Brazil: Results of the Brazilian National Health Survey, 2013. *Cien Saude Colet* (2016) 21(2):371–8. doi:10.1590/1413-81232015212.19412015
 4. FitzGerald C, and Hurst S. Implicit bias in healthcare professionals: a systematic review. *BMC Med Ethics* (2017) 18(1):19–22. doi:10.1186/s12910-017-0179-8
 5. European Union Agency for Fundamental Rights. Inequalities and multiple discrimination in access to and quality of healthcare. Luxembourg, Europe: European Union Agency for Fundamental Rights (2013) 124.
 6. Nelson A. Unequal treatment: confronting racial and ethnic disparities in health care. *J Natl Med Assoc* (2002) 94(8):666–8. doi:10.5860/choice.40-5843
 7. Rogers SE, Thrasher AD, Miao Y, Boscardin WJ, and Smith AK. Discrimination in healthcare settings is associated with disability in older adults: health and retirement study, 2008-2012. *J Gen Intern Med* (2015) 30:1413–20. doi:10.1007/s11606-015-3233-6
 8. Moeller J, Singhal S, Al-Dajani M, Gomaa N, and Quiñonez C. Assessing the relationship between dental appearance and the potential for discrimination in Ontario, Canada. *SSM Popul Health* (2015) 1:26–31. doi:10.1016/j.ssmph.2015.11.001
 9. Hausmann LR, Hannon MJ, Kresevic DM, Hanusa BH, Kwok CK, and Ibrahim SA. Impact of perceived discrimination in healthcare on patient-provider communication. *Med Care* (2011) 49(7):626–33. doi:10.1097/MLR.0b013e318215d93c
 10. Lewis TT, Cogburn CD, and Williams DR. Self-reported experiences of discrimination and health: scientific advances, ongoing controversies, and emerging issues. *Annu Rev Clin Psychol* (2015) 11:407–40. doi:10.1146/annurev-clinpsy-032814-112728
 11. Skosireva A, O’Campo P, Zerger S, Chambers C, Gapka S, and Stergiopoulos V. Different faces of discrimination: perceived discrimination among homeless adults with mental illness in healthcare settings. *BMC Health Serv Res* (2014) 14:376. doi:10.1186/1472-6963-14-376
 12. Baumgarten A, Bastos JL, Toassi RFC, Hilgert JB, Hugo FN, and Celeste RK. Discrimination, gender and self-reported aesthetic problems among Brazilian Adults. *Community Dent Oral Epidemiol* (2018) 46(1):24–9. doi:10.1111/cdoe.12324
 13. Cabral ED, Caldas Ade F, Jr., and Cabral HA. Influence of the patient’s race on the dentist’s decision to extract or retain a decayed tooth. *Community Dent Oral Epidemiol* (2005) 33(6):461–6. doi:10.1111/j.1600-0528.2005.00255.x
 14. Wamala S, Merlo J, and Boström G. Inequity in access to dental care services explains current socioeconomic disparities in oral health: the Swedish National Surveys of Public Health 2004-2005. *J Epidemiol Community Health* (2006) 60: 1027–33. doi:10.1136/jech.2006.046896
 15. Petersen PE, and Kwan S. Equity, social determinants and public health programmes—the case of oral health. *Community Dent Oral Epidemiol* (2011) 39(6):481–7. doi:10.1111/j.1600-0528.2011.00623.x
 16. Ribeiro CG, Cascaes AM, Silva AE, Seerig LM, Nascimento GG, and Demarco FF. Edentulism, severe tooth loss and lack of functional dentition in elders: a study in Southern Brazil. *Braz Dent J* (2016) 27(3):345–52. doi:10.1590/0103-6440201600670
 17. Nguyen TT, Vable AM, Glymour MM, and Nuru-Jeter A. Trends for reported discrimination in health care in a national sample of older adults with chronic conditions. *J Gen Intern Med* (2018) 33(3):291–97. doi:10.1007/s11606-017-4209-5
 18. Damacena GN, Szwarcwald CL, Malta DC, Borges de Souza PR, Jr., Maria Vieira LFP, Pereira CA, et al. The development of the National Health Survey in Brazil, 2013. *Epidemiol Serv Saúde* (2015) 24:197–206. doi:10.5123/S1679-49742015000200002
 19. Weldring T, and Smith SM. Patient-reported

- outcomes (PROs) and patient-reported outcome measures (PROMs). *Health Serv Insights* (2013) 6(8):61–8. doi:10.4137/HSI.S11093
20. Jokstad A. Patient-reported outcomes (PROs) versus patient-reported outcome measures (PROMs)-Is there a difference? *Clin Exp Dent Res* (2018) 4(3):61–2. doi:10.1002/cre2.112
 21. Souza-Júnior PRB, Freitas MPS, Antonaci GA, and Szwarcwald CL. Sampling design for the National Health Survey, Brazil 2013. *Epidemiol Serv Saúde* (2015) 24:207–16. doi:10.5123/S1679-49742015000200003
 22. Ben J, Paradies Y, Priest N, Parker EJ, Roberts-Thomson KF, Lawrence HP, et al. Self-reported racism and experience of toothache among pregnant Aboriginal Australians: the role of perceived stress, sense of control, and social support. *J Public Health Dent* (2014) 74:301–9. doi:10.1111/jphd.12059
 23. Chisini LA, Noronha TG, Ramos EC, dos Santos-Junior RB, Sampaio KH, Faria-E-Silva AL, et al. Does the skin color of patients influence the treatment decision-making of dentists? a randomized questionnaire-based study. *Clin Oral Invest* (2019) 23(3):1023–30. doi:10.1007/s00784-018-2526-7
 24. Durey A, McAullay D, Gibson B, and Slack-Smith L. Aboriginal health worker perceptions of oral health: a qualitative study in Perth, Western Australia. *Int J Equity Health* (2016) 15:4. doi:10.1186/s12939-016-0299-7
 25. Durey A, Bessarab D, and Slack-Smith L. The mouth as a site of structural inequalities; the experience of Aboriginal Australians. *Community Dent Health* (2016) 33:161–3. doi:10.1922/CDH_3717Durey03
 26. Fleming PJ, Villa-Torres L, Taboada A, Richards C, and Barrington C. Marginalisation, discrimination and the health of Latino immigrant day labourers in a central North Carolina community. *Health Soc Care Community* (2017) 25(2):527–7. doi:10.1111/hsc.12338
 27. Campos MR, Carvalho PSP, Moura WVB, Moura PMMM, and Vasconcelos MO. Oral health-related quality of life in Brazilian patients wearing three types of lower dentures: psychosocial and clinical aspects. *Res Health Sci* (2017) 2: 279–90. doi:10.22158/rhs.v2n3p279
 28. Azevedo JS, Azevedo MS, Oliveira LJC, Correa MB, and Demarco FF. Needs for dental prostheses and their use in elderly Brazilians according to the National Oral Health Survey (SBBrazil 2010): prevalence rates and associated factors. *Cad Saude Publica* (2017) 33(8):e00054016, 2017 [in Portuguese, with English summary]. doi:10.1590/0102-311X00054016
 29. Mahajan R. The naked truth: appearance discrimination, employment and the law. *Asian Am Law J* (2007) 14:165–203. doi:10.15779/Z385P3K
 30. Gonçalves H, Dumith SC, González DA, Menezes AMB, Araújo CLP, Hallal PC, et al. Self-reported discrimination by adolescents in a Brazilian birth cohort: prevalence and associations. *Rev Panam Salud Publica* (2013) 31: 204–10. [in Portuguese, with English summary].
 31. Duvernay E, Srinivasan M, Legrand LD, Herrmann FR, von Steinbüchel N, and Müller F. Dental appearance and personality trait judgment of elderly persons. *Int J Prosthodont* (2014) 27:348–54. doi:10.11607/ijp.3813
 32. Trivedi AN, and Ayanian JZ. Perceived discrimination and use of preventive health services. *J Gen Intern Med* (2006) 21:553–8. doi:10.1111/j.1525-1497.2006.00413.x
 33. Müller F, Shimazaki Y, Kahabuka F, and Schimmel M. Oral health for an ageing population: the importance of a natural dentition in older adults. *Int Dent J* (2017) 67(Suppl. 2):7–13. doi:10.1111/idj.12329
 34. Sheiham A, Steele JG, Marcenes W, Tsakos G, Finch S, and Walls AW. Prevalence of impacts of dental and oral disorders and their effects on eating among older people; a national survey in Great Britain. *Community Dent Oral Epidemiol* (2001) 29(3):195–203. doi:10.1034/j.1600-0528.2001.290305.x