

UNSOLICITED SYSTEMATIC REVIEW

Systematic review of Latin American national oral health surveys in adults

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Abstract

Background: Oral diseases represent a main public health problem worldwide. There is scarce information about oral health indicators in adults in middle-income countries in Latin America and Africa.

Objectives: To identify and describe national health surveys with national representative samples that included oral health assessment for adults in Latin America.

Methods: A systematic review was conducted in scientific and regional bibliographic databases (PubMed, SciELO, Wos and Embase); this was complemented with searchings in grey literature (Google Scholar, Open Grey and government health organization websites), from August 2016 to May 2017 (from 2000 to date). Studies conducted, supervised or funded by Ministries of Health or National Health Institutes were included. Data extracted included country, year, methods, interview and dental examination. Two researchers independently performed search and data extraction. Results were discussed as a group.

Results: Only 5 countries in Latin America have developed national health surveys evaluating the dental status in adults, with overall national representative samples during 2000-2015: Brazil, Colombia, Panama, Chile and Uruguay. Main differences were observed in the type of dental indicators selected, measure of dental services access and the professional who performed the dental examination. While some dental surveys were specifically designed as oral health surveys (Brazil, Colombia, Panama and Uruguay) and the examination was performed by dentists, other surveys represent a module within a general health survey (Chile) and the examination was performed by nurses.

Conclusions: There are a small number of Latin American countries that report research about dental status with national representation samples. Most of these studies have been conducted as national oral health surveys, and fieldwork was carried out by dentists. The development of oral health research in this part of the world should be promoted as these surveys provide relevant information to monitor oral health and evaluate the effectiveness of health programmes.

KEYWORDS

health surveys, oral health, public health, public health policy, surveillance

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1 | INTRODUCTION

The World Health Organization (WHO) defines essential public health functions as the set of actions to achieve the objective of public health, which is improving the health of populations. The objectives include monitoring and surveillance, as well as research and evaluation of health status to control risks and threats to public health.¹ A well-managed healthcare information system is essential to implement these goals. Significant efforts are required to meet such goals,² which in some middle- and low-income countries may interfere with adequate surveillance programmes and result in scarce or limited access to information. Nevertheless, collecting data through national health surveys is a useful tool and is predominantly used to obtain information at a country level.¹⁻⁴ Thus, population-based surveys are an essential source of health-related information.⁴

Oral diseases have been identified as one of the most relevant public health problem worldwide, with caries and periodontal disease being the most prevalent.⁵⁻⁷ In 2005, Petersen et al⁷ described a relatively lower distribution and severity of caries among 35- to 44-year-old adults from Asian and African countries, than the observed prevalence for Americans or Europeans and limited information about oral health for some middle- and low-income countries. A worldwide decrease in the prevalence of severe tooth loss, lower overall in Asia and Latin America, was reported by Kassebaum et al,⁸ which could be also a result of diverse dietary or hygiene habits.⁹

World Health Organization has recommended monitoring oral health status every 5 years.¹⁰ In 2005, the Pan American Health Organization (PAHO) suggested to extend interventions that have been proven, such as prevention programs, ongoing surveillance and more accessible information as goals for the 10-year regional oral health plan.¹¹ Since PAHO recommendations, several countries have implemented additional processes to collect national oral health data.

The purpose of this study was to identify and describe national health surveys, with national representative samples that include oral health assessments for adults in Latin America.

2 | METHODS

2.1 | Search strategy

A systematic review of the literature was conducted in scientific and regional bibliographic databases. The search was later complemented through governmental health organization websites in all Latin American countries. Latin American countries were considered according to the classification of the Statistics Division, United Nations Organization,¹² with the exception of French or English territories, and those whose official language does not have a Latin origin.

The study was divided into 2 stages: (1) review of scientific articles and (2) review of public documents. This was a 2-step search carried out from August 2016 to May 2017. The first step used MeSh terms "Dental Health Surveys," "National Health Survey," and "Latin America" in PubMed and Web of Science, and Emtree terms in EMBASE; "Dental Health Surveys," "National Health Survey," and

"Latin America" in SciELO in English, Portuguese and Spanish. Free text of each country name was also used. Second step involved the review of oral health surveillance data and national health surveys in OpenGrey, Google Scholar and the official websites of Health Ministries and National Statistics Institutes (Figure 1).

2.2 | Study selection

National surveys that incorporated dental examinations with an accessible technical report from the government agency were included. The review also included articles from countries with information available in scientific journal publications. Articles based on secondary analyses only, or those not requested by public agencies, were excluded.

Documents included in this review involved oral health status assessment of adults that were requested, supervised or carried out by government agencies. Technical reports and scientific papers were revised selecting only those published after 2000 and had oral health as the main topic (that is diagnosis, use of services and health perceptions). Documents in Spanish, Portuguese and English were included. Both search and analysis were performed by 2 researchers (JA and DD) independently. In case of discrepancies, supervising researchers (MJM and IE) were consulted and made the final decisions. The research was approved by the Scientific Ethics Committee of the Universidad San Sebastián. PRISMA recommendations were followed.¹³

2.3 | Data extraction

Items were extracted using a checklist created by the authors for aspects of the surveys. For each survey, the checklist included country, fieldwork characteristics, outcomes, diagnostic criteria, examiners and examiners' reliability.

2.4 | Data analysis

A qualitative synthesis of oral health surveys was performed. The study did not aim to estimate health outcomes and no meta-analysis or quantitative summary was carried out.

3 | RESULTS

From a total of twenty countries, only 5 have carried out national health surveys that included measurements related to oral health during the reported period. A total of 9 surveys were conducted, but only 6 of these included oral clinical examinations. Eight documents were extracted from Health Ministries and National Statistics Institutes websites. Two countries had information published in scientific journals (Uruguay and Brazil) (Figure 1).

Only Brazil, Colombia, Panama, Chile and Uruguay reported information that met the criteria for analysis. Differences were observed in the interview process and in the clinical oral

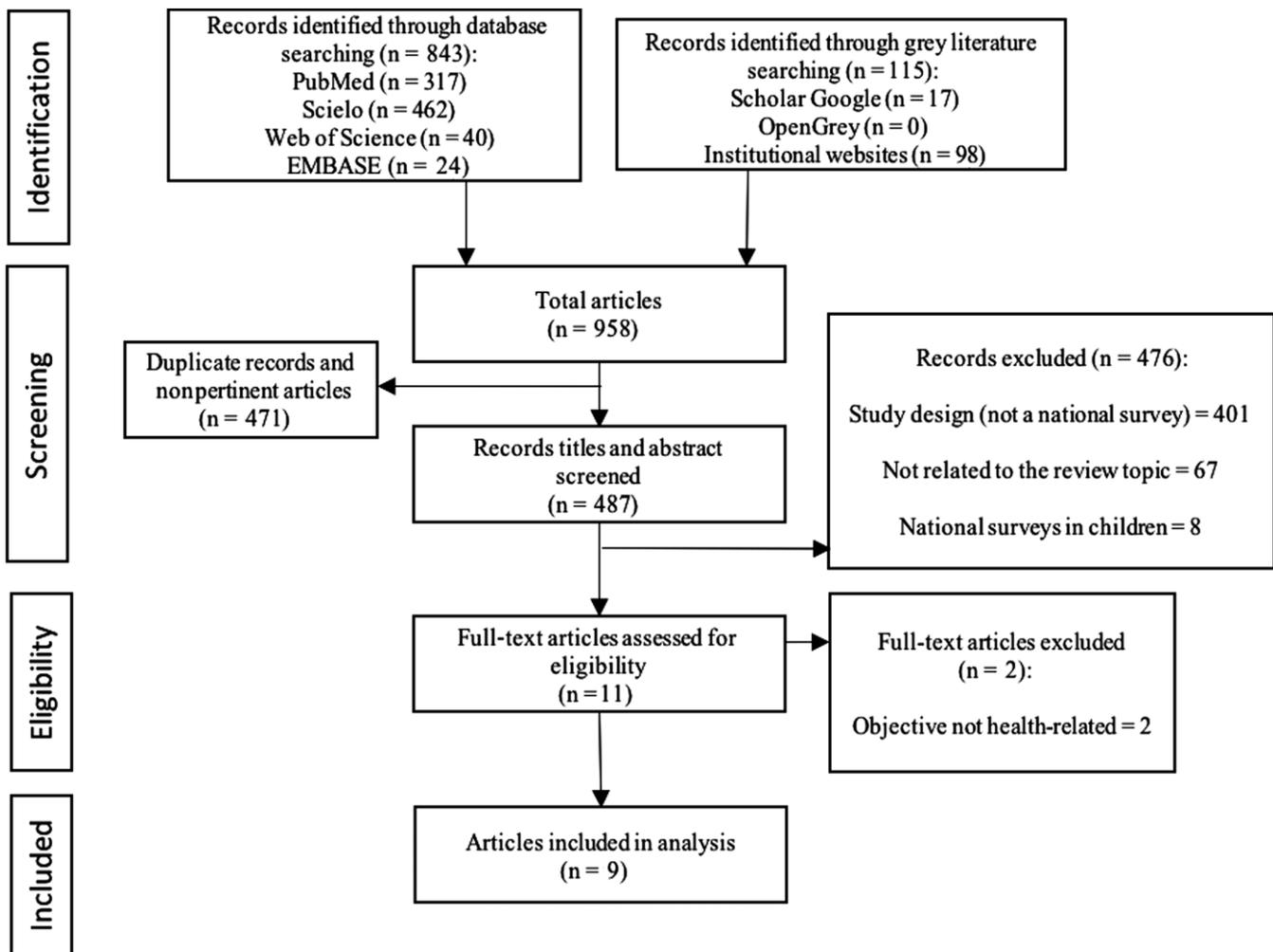


FIGURE 1 Search and selection strategy for the systematic review.

examination. Some studies focused specifically on oral health, while others represented broader general health surveys (Table 1).

Three studies were published in Brazil: (i) Condições de Saúde Bucal da População Brasileira 2002-2003¹⁴; (ii) Pesquisa Nacional de Saúde Bucal 2010¹⁵; and (iii) Pesquisa Nacional de Saúde 2013.¹⁶ The first 2 were developed specifically to measure oral health indicators, while Pesquisa Nacional de Saúde 2013 included an oral health overview within a general health survey.

The objective of the 2002-2003 survey¹⁴ was to collect information on oral health conditions of the Brazilian population and to develop a consolidated electronic database of the main oral health problems in that country. The survey design included a multistage cluster probabilistic sampling representative of Brazil's macroregions, municipalities and age groups recommended by the WHO in 1997.¹⁷ The team who performed the examinations during home visits was trained to reduce variability and included a dentist and dentist assistant. A total of 108 921 individuals were examined. Despite sample design, the majority of specific objectives aimed to describing the sample itself. Population caries prevalence was estimated for the country's macroregions. The report indicates that results only allow inference for 12-year-olds at the level of municipalities. Health

Ministry emphasized that for other age groups, further analyses and considerations were needed.

The 2010 survey¹⁵ was intended as a follow-up of the 2002-2003 objectives but was conducted as a surveillance component of the 2004 National Policy for Oral Health Survey, "Brazil Sorridente." Despite the similar methodological characteristics, the survey was not representative of all municipalities with a total of only 37 519 individuals examined by a dentist and an assistant who had been trained and calibrated. The purpose of the 2010 survey was to gain knowledge of the current oral health situation and provide updated information for planning and prevention at the national and municipal levels. The survey aimed to only represent urban Brazil, unlike the 2002-2003 report, and includes an appendix with extensive detail about sample design and sampling. The appendix indicates an effect of the complex sample design for which corrections were made. However, it does not specify how these corrections were made or the effect this had on the estimates.

In 2013, Brazil's "Pesquisa Nacional de Saúde"¹⁶ addressed general health. The main objective was to assess the performance of the National Health System, evaluate health conditions and monitor

TABLE 1 Characteristics of Latin American Health surveys with oral health inclusion. 2000-2015

Country	Survey	Year	Sample size	Evaluation	Oral examination	Diagnostic Criteria	Examiners and reliability
Colombia	Encuesta Nacional de Salud Pública	2007	20 534	Knowledge: causes of bleeding or gums swelling, use of complementary elements for oral hygiene, moments of tooth brushing in the day, habits for changing toothbrush and use of dental floss. Dental problems, in mouth or gums in the last 30 days and use of dental services if needed. Care for temporary dentition in children under 10 y of age. Fluor applications or use of fluoride mouthwash or sealants	No	-	-
Colombia	Encuesta nacional de salud bucal IV (ENSAB IV)	2013-2014	158 398	3 Modules: Module 1. Home; Module 2. Individuals from 12 to 79 y; 3 sections: (a) way of living and oral health; (b) lifestyle and behaviour; (c) pregnant women; and Module 3. Mother or caregiver of children of 1, 3 and 5 y old	Yes, in children and adults	For dental caries, ICDAS criteria was used. For all other outcomes, the WHO's 4th edition of the Oral Health Surveys-Basic Methods	Teams composed by an interviewer, a dentist and a scorer Reliability was evaluated using Kappa index with 0.7 as a general result and 0.8 intra-examiner
Brazil	III Pesquisa Nacional de Saúde Bucal	2002- 2003	108 921	Use of dental services Self-perceived oral health Caries, need for treatments, periodontal status by sextant, fluorosis, occlusion, use and need of use of dental prostheses, soft tissue changes	Yes, in children and adults	According to the WHO's 4th edition of the Oral Health Surveys-Basic Methods	Teams of one dentist and one assistant Training is declared, but no index for reliability
Brazil	IV Pesquisa Nacional de Saúde Bucal	2010	37 519	Use of dental services Self-perceived oral health Caries, need of treatment, periodontal condition, dental trauma, occlusion, fluorosis use and need of use of dental prostheses	Yes, in children and adults	According to the WHO's 4th edition of the Oral Health Surveys-Basic Methods	Teams of one dentist and one assistant Reliability of examiners was estimated through Kappa index, and a minimum of 0.65 was established as the lowest acceptable
Brazil	Pesquisa Nacional de Saúde	2013	81 767	Toothbrushing habits, use of elements for dental hygiene, difficulties for eating, place for dental care, edentulous self-report, self-perceived oral health	No	-	-
Chile	Primera Encuesta Nacional de Salud	2003	3619	Use of dental prostheses, toothbrushing frequency, last visit to the dentist, reason of the last visit, oral health-related quality of life	Yes, in adults	Count of remaining teeth and caries (at least 1)	Team composed of a nurse and interviewer Reliability between nurses was assessed with Kappa index >0.75. A previous study for 7 nurses showed >70% concordance with dentist diagnostic regarding missing teeth
Chile	Segunda Encuesta Nacional de Salud	2009-2010	5434	Use of dental prostheses, state and satisfaction with it, place where it was obtained. Self-perceived need of prostheses. Last visit to the dentists and reason	No	-	-

(Continues)

TABLE 1 (Continued)

Country	Survey	Year	Sample size	Evaluation	Oral examination	Diagnostic Criteria	Examiners and reliability
Panama	Diagnóstico Nacional de Salud Bucal en Panamá	2008	12 730	Oral examination and sociodemographic survey: educational level, income, age, geographical location and ethnicity.	Yes, in children and adults	According to the WHO's 4th edition of the Oral Health Surveys-Basic Methods	Teams of one dentist (interns) and one scorer. Reliability was evaluated using Kappa index with >0.80 defined as optimal. In cases where this was not achieved, new calibration exercises were conducted
Uruguay	Primer Relevamiento Nacional de Salud Bucal en población joven y adulta uruguaya	2013	922	Oral examination and sociodemographic survey risk factors, use of dental services, self-perceived oral health	Yes, in adults	According to the WHO's 4th edition of the Oral Health Surveys-Basic Methods	10 examiners, calibrated twice. Kappa index was used to assess reliability inter- and intra-examiner

chronic diseases and healthcare equity in the population. This was also a household multistage cluster sampling survey, considering 3 stages: census sectors, residences and people over 18 years of age in the residence. Indigenous populations, residential care homes, orphanages, military bases and the incarcerated population were excluded. Exclusion criteria were not reported on the other analysed Brazilian studies. A description of the 2013 sample design is included in the report, indicating that adjustments were made to counteract the effects of the design's complexity. The objective was to represent the entire population, and thus, production and use of expansion factors for population estimates are reported. A significant difference was noted between prior surveys and the 2013 study. Oral examinations were not included in the 2013 survey with other measures were prioritized. Despite the above, the survey included questions addressing dental health coverage, preventive actions as toothbrushing and use of dental services.

In 2007, Colombia conducted the "Encuesta Nacional de Salud Pública"¹⁸ with questions about the use of dental services. This survey's main objective was to characterize the national, regional, subregional and departmental health situation. Specific information was obtained from households, healthcare institutions and users. Private clinics and cosmetic services, military forces and police were excluded from the sampling process. Methodology consisted of a multistage probabilistic sampling for stratified clusters, and corrective weightings were used to avoid errors when estimating results. The Colombian national survey recorded anthropometric and biomedical measures without performing oral examinations. This household survey considered people from 6 to 69 years of age, mothers provided responses for subjects younger than 18 years and included a total of 158 398 individuals. Self-perceived health, morbidity and disabilities were evaluated; dental problems were recorded in the morbidity section. Topics of oral health in this survey were as follows: knowledge of risk factors for oral diseases, use of dental services and oral health care for children.

In 2013-2014, Colombia conducted the "Cuarto Estudio Nacional de Salud Bucal (ENSAB IV)",¹⁹ assessing oral health conditions and determinant social factors. The survey was designed as a quantitative study with an embedded qualitative study to explore social determinants of oral health. The sample was representative of the Colombian population, it included specific age groups for children and adults, with a total of 20 534 interviews and dental examinations. This was a stratified, multistage sample. Expansion factors were used for population estimates. The oral examination was conducted by trained and calibrated dentists. Home conditions, habits and lifestyles of individuals aged 12-79 years were also evaluated. The previous survey was carried out 16 years earlier. An official periodicity has not been established for these national evaluations.

In Panama, the "Diagnóstico Nacional de Salud Bucal (DIS-ABU)"²⁰ was carried out in 2008 to evaluate population aged 5-75 years and addressed the most prevalent diseases and their determinants. This was the first study with national representation of all ages, sexes and regions. Probabilistic 2-stage stratified sampling for provinces and households was used. The objective was to diagnose the oral health of Panamanians from 5 to 75 years of age;

therefore, expansion factors were generated to correct estimates and obtain inferences at the country level. The report included a total of 12 730 interviews. Individuals who were not permanent residents of the household along with those not able to respond or could not be examined due to health or biosecurity reasons were excluded. A team of previously calibrated dentists and assistants collected and recorded sociodemographic and clinical data, information on oral mucosa status, caries, periodontal status, tooth loss, need for dental prostheses and dentofacial anomalies.

In Chile, a national health survey known as “Encuesta Nacional de Salud (ENS)” has been carried out since 2003. The first 2 versions were carried out with a 7-year interval and the third was conducted in 2017. The initial version²¹ was intended to measure the prevalence of 21 health problems, describe them and create a serum national bank for future research. The sample was derived from of a previous national survey for quality of life. It was representative nationally; regionally, however, it was representative for only one of the 13 regions. Individuals 17 years of age and older from both sexes were included, and 3619 individuals were interviewed. The sample is defined as a double or 2-phase sampling. Original expansion factors were used from the primary survey to obtain population estimates, and subsequently adjusted with new factors, considering the country's population at the time of the survey. Pregnant women and patients with mental health problems and a potential risk for the interviewers were excluded. In contrast to surveys from Brazil and Colombia, oral examination performed in this survey reported only number of remaining teeth and untreated caries. Examination was performed by trained nurses.

The second national survey in Chile (2009-2010)²² used the same model for health problems studied in the previous version, however, included additional healthcare issues, risk factors and self-perceived health indicators.²² The sample was stratified in multiple stages and by clusters. It was representative nationally, regionally and by urban/rural areas, for individuals older than 15 years, with a total of 5434 interviews. Same exclusion criteria as 2003 survey were used. Sample expansion was carried out to obtain bias-free national estimates and adapted to the projected population of 2010. This version did not include oral examination and prioritized only 13 of the 21 original health problems. It did include additional health-related problems and interview questions targeting oral health such as use of dental prostheses, dentist visits and reasons for those visits.²²

Uruguay and Brazil were the only countries with national survey results published in a scientific journal. Although sponsored by the local Ministry of Health, the Uruguay survey was not available online at the time of our search. The “Primer Relevamiento Nacional de Salud Bucal en población joven y adulta uruguaya”²³ was carried out in 2010-2011. This study is representative of the urban adult population of all geographical departments of the country. Stratified sampling was carried out in 2 stages; they were obtained as independent samples, according to geographical area. As this was a complex design sample, the Statistics Institute generated expansion factors for population estimates.

When selecting the sample, no exclusion criteria were declared. Substitution methods are detailed in the document. For oral examination, the WHO Manual for Oral Health Surveys with modifications was considered as a reference.¹⁷ The conditions evaluated were oral mucosal lesions, tooth loss, periodontal condition, loss of insertion and need of dental prosthesis. Clinical examination was carried out by dentists of the university responsible for the study, who were calibrated by a collaborator of the Brazilian survey of 2010.

It is worth mentioning that at the time this review was carried out, other Latin American countries had conducted national oral health surveys. However, their sole focus was on children. Another initiative to consider is the Mexican oral health surveillance system, the “Sistema de Vigilancia Epidemiológica de Patologías Bucales (SIVEPAB)” an ongoing source of information for the country, that includes individuals who use dental services.²⁴

4 | DISCUSSION

International literature has reported that information on oral health indicators with national representation is scarce in Latin America,⁴ which is consistent with the results of this review. Only 5 countries thus far have conducted national oral health surveys or have included an oral examination in their national health surveys.²⁻⁸

To our knowledge, this is the first study that describes technical and scientific aspects of oral health surveys in adults in Latin America since 2000, with emphasis on methods design and sampling. Although previous studies have described the oral health scenario of some pathologies in Latin America,^{25,26} these have not addressed the technical or scientific aspects of the primary studies.

Another original characteristic of this study is the inclusion of national surveys as primary studies, to highlight national endeavours in Latin America which rely heavily on government-sponsored initiatives. This aspect is relevant if we consider that it allows a continuity of oral health surveillance in each country.

The scarcity of information may relate to the array within the region in terms of economic and social development of the different countries. The latter is relevant as it may influence the agenda situating oral health surveys in a low priority level. Lack of qualified human resources to design and carry out national surveys is also a consideration.

Initiatives as the Mexican surveillance system²⁴ should be remarked as it collects data from oral health consultations. Despite the fact that in other countries this information is collected, it is not geared towards epidemiological surveillance purposes, as was observed in Mexico.

Another consideration and possible obstacle to further monitoring through national surveys is for national representativeness with samples' complex design. This aspect increases costs of the studies and involves a more difficult execution.

Similarities and differences between the 9 surveys were observed. We noted common aspects among the methods and differences were found among objectives, sample designs and sampling,

age groups examined, oral examinations, measured health outcomes and periodicity.

The differences between the designs of the samples may be due to the geographical and administrative characteristics of the countries (regions, states, municipalities and among others), the number of inhabitants (Brazil has 4 times the population of Colombia and almost 60 times that of Uruguay) and the objectives of each survey. In their study, Caplan et al.²⁷ suggest that the strategy to analyse data should be similar to the strategy of collection. Therefore, when complex designs are used, the analysis should consider the effect of this design. Likewise, these authors recommend that if the intention is to estimate the magnitude of the prevalence or incidence of a disease in a population, estimates should be adjusted based on the proposed design. Caplan et al.²⁷ also note that adjustment by sample design, is recommended but not required, when is an initial study since it corresponds to a first approximation, as was the case of Uruguay in 2013.

Common technical aspects are reported in relation to the calibration of examiners, the use of expansion factors for the population estimates and use of the WHO Oral Health Survey Manual, as reference for the clinical examination. All surveys conducted included the variables of brushing habits, use of dental services, last visit to the dentist and the use of or the need for dental prostheses.

Oral examinations were carried out by dentists in all of the surveys, with exception of the 2003 Chilean health survey,²¹ which was performed by nurses. Positive results in the diagnosis of untreated caries, teeth counting and functional occlusal contacts have been reported, when performed by trained healthcare professionals. One example is the 2005 NHANES survey, which modified its oral examination protocol, originally performed by dentists, to a screening by healthcare technologists, with excellent reliability results.²⁸ Untreated caries was the clinical diagnosis with lower values of concordance, and its qualification was rated as substantial, but not perfect. However, we did not find studies that estimated the sensitivity and specificity of different oral pathologies diagnosis by health professionals other than dentists.

A limitation of this review is that the bibliographic search was carried out electronically. Consequently, government initiatives for oral health that were not accessible online may have been omitted.

In our research, we observed that most of the studies were specific health surveys for oral health. However, during the initial and local surveys, it may be advisable to consider cost, feasibility and benefit, and to collect the information as a module within a general health survey. The clinical examination could be performed by dentists or dental hygienists, trained by dentists. The feasibility of systematic monitoring would certainly be simplified if oral health status were included in national health surveys.

In several Latin American countries, there are oral health surveys that include the results of oral examinations performed by dentists only. Clinical conditions described in the data, that is oral mucosa pathologies, malignant lesions and temporomandibular joint disorders, are an additional advantage in the development of national oral health policies. An illustration of this is the 2002-2003 Brazilian

survey, which was used for the delineation of the current national policy of Brazilian Oral Health.¹⁴⁻¹⁶

This type of studies are relevant and undoubtedly noteworthy for its scientific and academic contribution. An example is the case of the national oral health survey of Brazil in 2010, which developed secondary analyses for an entire special issue of a scientific journal.²⁹ This was also the case of the secondary studies based on the oral health module of the national health survey in Chile in 2003. The advantages regarding the significant contribution of these data for the generation of new knowledge should be emphasized.

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