

## INVESTIGATION

### **Common risk and indicators of non-communicable diseases and oral health**

#### **Riesgo común e indicadores de Enfermedades no transmisibles y salud bucal**

#### **Risco e indicadores comuns de doenças não transmissíveis e saúde bucal**

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## **Abstract**

Non-communicable diseases (NCDs) share risk factors for their development with oral pathologies and can be addressed jointly through the common risk approach. The aim of this work was to compare the definitions and indicators of oral health risk factors and NCDs in six selected Uruguayan epidemiological studies.

The risk factors surveyed, the way in which data were collected and the risk definitions for each one were systematized. It was found that the objective of each study was different, with discrepancies in the variables and indicators chosen as well as in their definition, operationalization and way of collecting data.

It would be important to have unified criteria and systematized and integrated information to make health decisions regarding the individual and collective approach to NCDs, as well as to include oral health when addressing NCDs.

**Key words:** Noncommunicable Diseases, Risk Factors, Oral Health

## **Resumen**

Las enfermedades no transmisibles (ENT) comparten factores de riesgo para su desarrollo con las patologías bucales, estas pueden ser abordadas en forma conjunta desde el enfoque de riesgo común. El objetivo de este trabajo fue comparar como se definen los factores de riesgo y qué indicadores se usan para medir la salud bucal y enfermedades no transmisibles en seis trabajos epidemiológicos uruguayos seleccionados.

Se sistematizaron los factores de riesgo relevados, la forma en que se recogieron los datos y las definiciones de riesgo para cada uno. Se constató que el objetivo de cada estudio fue diferente, existiendo discrepancia en las variables y en los indicadores escogidos, así como en su definición, operacionalización y forma de recolectar los datos.

Sería importante contar con criterios unificados e información sistematizada e integrada para tomar decisiones sanitarias con respecto al abordaje individual y colectivo de las ENT, así como también incluir la salud bucal a la hora de abordar las ENT.

**Palabras Clave:** Enfermedades no Transmisibles, Factores de Riesgo, Salud bucal

### **Resumo**

As doenças não transmissíveis (DNTs) compartilham fatores de risco para sua ocorrência com as patologias bucais, que podem ser tratadas em conjunto por meio da abordagem de risco comum. O objetivo desse trabalho foi comparar como os fatores de risco são definidos e quais indicadores são usados para medir a saúde bucal e as doenças não transmissíveis em seis estudos epidemiológicos selecionados no Uruguai.

Os fatores de risco pesquisados, a forma como os dados foram coletados e as definições de risco para cada um deles foram sistematizados. Verificou-se que o objetivo de cada estudo era diferente, com discrepâncias nas variáveis e nos indicadores escolhidos, bem como em sua definição, operacionalização e na forma como os dados foram coletados.

Seria importante ter critérios unificados e informações sistematizadas e integradas para tomar decisões de saúde em relação à abordagem individual e coletiva das DNTs, bem como incluir a saúde bucal na abordagem das DNTs.

**Palavras-chave:** Doenças não transmissíveis, Fatores de risco, Saúde bucal

## **Introduction**

This work is the result of the project "*Oral health as a right and prevention of Non-Communicable Diseases (NCDs) in a context of inequities. A comprehensive approach,*" funded by the interdisciplinary space of the University of the Republic in 2017. The team included members from the Faculty of Medicine, School of Nutrition, Faculty of Sciences, Faculty of Communication Sciences, Faculty of Economics and Administration, and Faculty of Dentistry.

NCDs are closely linked to two interrelated phenomena known as the *demographic transition* and *epidemiological transition*, traditionally referred to as the demo-epidemiological transition (1). In the context of this demo-epidemiological transition, an increase in the number of NCDs has been observed. Cardiovascular diseases (ischemic heart disease, heart failure, stroke), cancer, chronic respiratory diseases (chronic obstructive pulmonary disease, asthma), and diabetes are recognized as the main NCDs (2,3). These diseases account for 41 million deaths each year, which is equivalent to 71% of global mortality. Among those aged 30-69, 15 million people die from NCDs annually. More than 85% of these "premature" deaths occur in low- and middle-income countries, constituting a significant public health problem in the Americas (4,5).

Harmful alcohol consumption, tobacco use, physical inactivity, and inadequate diet are common risk factors for all NCDs. These behavioral factors can directly or indirectly influence the development of metabolic risk factors such as obesity, arterial hypertension, dyslipidemia, and carbohydrate metabolism disorders (prediabetes) (6).

Evidence also indicates that the most frequent oral pathologies (caries and periodontitis) share common predisposing factors with NCDs, including inadequate diet, tobacco and alcohol consumption, lack of hygiene, stress, and a sedentary lifestyle (7). Regarding diet, excessive intake of sugars (both frequency and quantity) is considered a risk factor for dental caries,

diabetes, and obesity. As for smoking, it not only predisposes individuals to respiratory and cardiovascular diseases and cancer but also increases susceptibility to periodontal disease and other oral mucosal lesions. Excessive alcohol consumption predisposes individuals to cardiovascular diseases and cancer, while also increasing the risk of accidents that can result in head injuries, potentially causing dental and mucosal lesions (7).

Jointly addressing the most frequent oral pathologies and other NCDs is aligned with the *common risk approach*. This approach enables the efficient and effective prevention of these highly prevalent pathologies, which are considered public health problems in developing countries, while optimizing resources (8,9).

The World Health Organization (WHO), through its manual "The WHO STEPwise approach to NCD risk factor surveillance" (STEPS), proposes the monitoring of the main risk factors for behavioral NCDs (tobacco use, harmful alcohol consumption, inadequate diet, and physical inactivity) and biological NCDs (overweight and obesity, high blood pressure, high glycemia, and high blood lipids) (10). NCD indicators are presented as a tool to measure the prevalence of these pathologies and their associated factors, and to enable comparisons between countries if the appropriate methodology is used.

This paper aims to systematize, compare, and analyze the way in which some NCD indicators are defined and reported in six selected Uruguayan epidemiological studies.

### **Methodology: Work Strategy**

The selection method for the articles was based on convenience; articles in which a member of the project that led to this publication participated as a researcher were considered. The selected studies shared some common characteristics: the study of risk factors for NCDs and the inclusion of adult populations.

Although the considered articles do not result from a systematic search of national epidemiological production, the two national surveys and the only longitudinal study on NCDs

carried out in Uruguay are included, as well as the first national oral health survey (the only one conducted so far).

The indicators used in each study, the instruments, and the diagnostic criteria were analyzed. Considering the *common risk factor* approach, behavioral risk factors (fruit and vegetable consumption, smoking, alcohol consumption, physical activity) and associated metabolic conditions or risk factors (arterial hypertension, altered glycemia, elevated cholesterol, overweight and obesity, elevated waist circumference) were studied. Oral health conditions (caries, periodontal disease, and tooth loss) were also studied.

## **Results**

### *Presentation of the studies*

The following studies were included after applying the selection criteria: Center of Excellence in Cardiovascular Health for South America (CESCAS I), 1st and 2nd national survey for risk factors of non-communicable diseases (ENFRENT), National Survey on Oral Health of Uruguayan Youth and Adults 2011 (ReINacSB), Health and Disease in Deprivation of Freedom (SEPL), Oral health and non-communicable diseases in patients of a university teaching center, Montevideo-Uruguay. Udelar parts 1 and 2 (SBYENT).

The 1st ENFRENT and 2nd ENFRENT are descriptive studies conducted by the Ministry of Public Health, utilizing the STEP methodology proposed by the WHO, and are part of a health surveillance strategy for the years 2006 and 2013. Each survey was carried out by a team hired for this purpose, which included medical, nutrition, and nursing professionals. They were trained for questionnaire administration and calibrated for anthropometric, clinical, and laboratory measurements (11,12).

In the 1st ENFRENT, there were 2008 participants aged 25 to 64 years, with 66% being female. The risk factors explored were alcohol consumption, tobacco use, fruit and vegetable intake, physical activity, overweight/obesity, arterial hypertension, cholesterolemia, and

glycemia. Socioeconomic characteristics were not surveyed. The STEPs methodology was used for the survey, but difficulties were reported in applying steps 2 and 3 (physical measurements and laboratory blood tests, respectively), which were taken into account. In the 2nd ENFRENT, steps 1 (questionnaire on demographic and behavioral data) and 2 were conducted simultaneously, and step 3 was performed via digital puncture instead of venous puncture (11,12).

The 2nd ENFRENT included 2462 participants aged 15 to 64 years (63% female). The study examined risk factors such as alcohol consumption, tobacco use, fruit and vegetable intake, physical activity, overweight/obesity, arterial hypertension, cholesterolemia, and glycemia. Although in this study the socioeconomic conditions of the participants were surveyed through income, such data was not analyzed.

The study conducted by the Center of Excellence in Cardiovascular Health for South America (CESCAS) is a multicenter study of the Southern Cone of America (Argentina, Chile, and Uruguay). In Uruguay, the sample consisted of 1580 participants aged 35 to 74 years, 58% female, residing in Pando, Barros Blancos, and Nicolich. During 2010-2012, the first stage of recruitment and description of the cohort was carried out to determine the prevalence and distribution of cardiovascular risk factors and chronic obstructive pulmonary disease (COPD). The following risk factors were included: fruit and vegetable consumption, tobacco use, alcohol consumption, physical activity, body mass index, abdominal perimeter, arterial hypertension, dyslipidemia, and glycemia. The socioeconomic level of the individuals was assessed using the adapted HCHS/SOL (The Hispanic Community Health Study/Study of Latinos Sociocultural Ancillary Study) instrument, along with their educational level. This study was conducted by the Faculty of Medicine, Udelar (Uruguay Team of the South American Center of Excellence for Cardiovascular Health) through a research team that included teachers, professionals, and medical and nutrition students (13).

In turn, the "First National Survey on Oral Health of Uruguayan Youth and Adults" (ReINacSB), conducted in 2011, had a national scope and included a sample of 1,485 people (53% female). The fieldwork was carried out by a specially trained team that included teachers from the Faculty of Dentistry and advanced students. This research aimed to describe the most prevalent oral pathologies among young people (15-24), adults (35-44 and 65-74) in both the capital city and the interior of the country, and to examine how these oral pathologies related to sociocultural characteristics. The methodological foundation was the WHO manual for national oral health surveys (1997). Additionally, a questionnaire was administered in which participants self-reported some health conditions related to NCDs. The oral conditions studied were: caries, periodontal diseases, tooth loss, malocclusions, and mucosal lesions. The general health conditions were: arterial hypertension, glycemia, fruit and vegetable consumption, alcohol consumption, and tobacco use. The socioeconomic level of the individuals was studied based on the reduced socioeconomic level index (INSE), which includes the following variables: neighborhood in Montevideo/department of the rest of the country, number of income earners, number of people in the household, health care of the main income earner, educational level of the main income earner, domestic service, car, color TV, refrigerator with or without a freezer, and the number of bathrooms in the dwelling (14).

This systematization also included research conducted in 2015-2016 at the Faculty of Dentistry through the project "Oral Health and Non-Communicable Diseases: A Clinical-Epidemiological and Interdisciplinary Approach: First Stage." The project was developed by an interprofessional team from UdelaR composed of nursing, nutrition, and dentistry professionals who were trained for the study. The objective was to determine the prevalence of NCDs, their behavioral and metabolic risk factors, and their relationship with oral health in individuals seeking care. This was a descriptive, cross-sectional study with a sample of 602 individuals aged 15-64 years or older, of both sexes (59% female). The STEPS methodology (step 1) was used for NCDs, and for oral health, the WHO Oral Health Surveys: Basic Methods (1997) was applied. The following NCD risk factors were included: arterial hypertension,



glycemia, overweight, obesity, abdominal perimeter, fruit and vegetable consumption, alcohol consumption, tobacco use, and physical activity. Oral health was studied in terms of caries, gum diseases, and tooth loss. The socioeconomic level was assessed through schooling, income, and type of health coverage (15).

Finally, research conducted in Uruguay that studied NCDs and oral health in the population deprived of freedom was included. The publication is titled "Health and Disease in Deprivation of Freedom" (SEPL). The survey was conducted in 2015 by specially trained health care staff of the prison system. It was a descriptive and cross-sectional study with a sample of 832 participants aged 15 to 55 years or older, of both sexes (12% female), from a sample frame of 37 penitentiary centers. The WHO STEPS methodology was used to monitor risk factors for chronic diseases, mental health, oral health, and injuries. The risk factors for NCDs studied included arterial hypertension, glycemia, cholesterolemia, overweight, obesity, fruit and vegetable consumption, alcohol consumption, tobacco use, and physical activity. Regarding oral health, the questionnaire included some of the questions proposed by the STEPS instrument in the oral health module on self-perception, which are linked to quality of life. Additionally, a self-administered, anonymous, and confidential questionnaire was included to inquire about alcohol and other psychoactive substance use, sexual practices, suicide risk, and barriers to accessing emergency care (16).

### *Analysis of the studies*

The studies are analyzed in table format. Table 1 presents the studies according to the risk factors studied and the oral health conditions surveyed. Data collection methods are described in two main groups: self-reported (survey) or measured (physical or laboratory); if a condition was not reported, it is stated as unreported.

Table 2 compares the reference values used for the classification of risk or health damage for behavioral risk factors, and Table 3 for metabolic risk factors. Table 4 compares the indicators used to address oral health conditions in each of the studies.

**Table 1** Data collection methods for each risk factor in the selected studies. Uruguay 2006-2016

| <b>Risk factor</b>                     | <b>1st ENFRENT</b>           | <b>2nd ENFRENT</b>           | <b>CESCAS</b>                | <b>SBYENT</b>                | <b>SEPL</b>                  | <b>ReINacSB</b> |
|--|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|-----------------|
| <b>Fruit and vegetable consumption</b> | Self-reported                | Self-reported                | Self-reported                | Self-reported                | Self-reported                | Self-reported   |
| <b>Alcohol consumption</b>             | Self-reported                | Self-reported                | Self-reported                | Self-reported                | Self-reported                | Self-reported   |
| <b>Tobacco use</b>                     | Self-reported                | Self-reported                | Self-reported                | Self-reported                | Self-reported                | Self-reported   |
| <b>Physical activity</b>               | Self-reported                | Self-reported                | Self-reported                | Self-reported                | Self-reported                | Unreported      |
| <b>Blood pressure</b>                  | Self-reported, Physical exam | Self-reported, Physical exam | Self-reported, Physical exam | Self-reported, Physical exam | Self-reported, Physical exam | Self-reported   |
| <b>Glycemia</b>                        | Self-reported, Laboratory    | Self-reported, Laboratory    | Self-reported, Laboratory    | Self-reported, Laboratory    | Self-reported, Laboratory    | Self-reported   |
| <b>Cholesterol</b>                     | Laboratory                   | Laboratory                   | Self-reported, Laboratory    | Unreported                   | Laboratory                   | Unreported      |
| <b>Overweight/Obesity</b>              | Physical exam                | Physical exam                | Physical exam                | Physical exam                | Physical exam                | Unreported      |
| <b>Abdominal obesity</b>               | Unreported                   | Physical exam                | Physical exam                | Physical exam                | Unreported                   | Unreported      |
| <b>Caries</b>                          | Unreported                   | Unreported                   | Unreported                   | Physical exam                | Unreported                   | Physical exam   |
| <b>Periodontal disease</b>             | Unreported                   | Unreported                   | Unreported                   | Physical exam                | Unreported                   | Physical exam   |
| <b>Tooth loss</b>                      | Unreported                   | Unreported                   | Unreported                   | Physical exam                | Self-reported                | Physical exam   |
| <b>Tooth brushing</b>                  | Unreported                   | Unreported                   | Unreported                   | Self-reported                | Self-reported                | Self-reported   |
| <b>Last dentist visit</b>              | Unreported                   | Unreported                   | Unreported                   | Self-reported                | Self-reported                | Self-reported   |
| <b>Oral pain</b>                       | Unreported                   | Unreported                   | Unreported                   | Unreported                   | Self-reported                | Self-reported   |

Observations: CESCAS does not include specific data on oral health issues, but self-reports bleeding gums.

Physical exam: Refers to anthropometric measurements or clinical oral exams

Laboratory: Refers to laboratory tests

Self-reported: Self-reported condition

**Table 2** Reference values used for the classification of risk or health damage for behavioral risk factors addressed in the selected studies. Uruguay 2006-2016

| Risk factor   | Indicator  | Study considering it   |
|---|--|--|
| Fruit and Vegetable Consumption   | Risk consumption: <5 servings daily  | 1st ENFRENT, 2nd ENFRENT, CESCAS I, ReINacSB, SBYENT               |
|   | Consumption frequency: Never, daily, 2 to 6 days a week, once a week                                   | SEPL   |
| Alcohol consumption   | Prevalence in the last 12 months   | 1st ENFRENT, ReINacSB  |
|   | Prevalence in the last month   | 1st ENFRENT, 2nd ENFRENT, SEPL                                     |
|   | Binge drinking: 5 drinks*(male) or 4 drinks (female) in approximately two hours more than once a month | 1st ENFRENT, 2nd ENFRENT   |
|   | Daily consumption  | CESCAS, ReINacSB, SEPL   |
|   | Consumes alcohol, no other specification   | SEPL   |
|   | Number of days per week consuming alcohol  | ReINacSB   |
|   | Frequency and number of drinks*: does not consume, very low, low, intermediate, high, very high        | SBYENT   |
|   | Moderate consumption: up to 7 drinks** (women) or 14 drinks (men) per week                             | CESCAS I   |
|   | High consumption: 8 or more drinks (women), 15 or more drinks (men) per week                           |  |
|   | Never drinker  | CESCAS I   |
|   | Former drinker (one year or more of abstinence)  | CESCAS I   |
|   | Audit Scale  | 2nd ENFRENT  |
|   | Smoker (no other specification) (YES/NO)   | ReINacSB, SEPL   |
|   | Daily smoker   | 1st ENFRENT, 2nd ENFRENT, CESCAS I, ReINacSB, SEPL                 |
| Weekly smoker   | 1st ENFRENT, CESCAS I  |  |
| Tobacco Use   | Number of daily cigarettes: ≤10 or >10 per day   | ReINacSB   |
|   | Number of daily cigarettes   | CESCAS   |
|   | Has smoked at least 100 cigarettes in their lifetime   | CESCAS   |
|   | Age of initiation  | 1st ENFRENT, CESCAS I  |
|   | Former smoker  | 2nd ENFRENT, CESCAS I  |
|   | Passive smoker: days of exposure at home and work in the last 7 days                                   | CESCAS I   |
|   | Physical Activity  | Low (or insufficient) physical activity: <600 MET-minutes per week |
| Medium (or sufficient) physical activity: ≥600 MET-min/week                           |  | 1st ENFRENT, CESCAS  |
| Physical activity: ≥3000 MET-min/week   |  | 1st ENFRENT  |
| Physical activity: <150 min/week moderate intensity or 75 min/week vigorous intensity |  | 2nd ENFRENT, SBYENT  |
| Average daily hours sitting or lying down   |  | SEPL   |

\*Data provided by the Epidemiology and Statistics Service of the Faculty of Dentistry of the University of the Republic:

Very low: 1 time a month or less, 1 or 2 drinks / Low: 1 time a month or less and 3 or more drinks; 2 to 4 times a month, 1 or 2 drinks / Intermediate: 2 to 4 times a month and 3 or 4 drinks / High: 2 to 4 times a month and 5 or more drinks; 2 or 3 times a week and up to 4 drinks / Very high: 2 or 3 times a week and 5 or more drinks; 4 to 6 times a week; daily.

\*\*Drink: refers to the standard drink unit (SDU) established for measuring alcohol consumption by the National Institute on Alcohol Abuse and Alcoholism, United States (22)

In CESCAS, the operationalized was as follows:

Beer: 1 SDU = large glass (13 cm high containing approximately 340 ml) or can/bottle of 355 ml.

Wine: 1 SDU = small glass (approximately 100 ml) e.g. white, red, or rosé wine

White spirits: 1 SDU = one drink (approximately 45 ml) e.g. whiskey, vodka, tequila, rum, cognac, liqueur, or gin.

**Table 3** Reference values used for the classification of risk or health damage for the metabolic conditions addressed in the selected studies. Uruguay 2006-2016.

| Risk Factors and Metabolic Conditions | Indicator   | Study considering it                                 |
|---------------------------------------|---|--|
| Arterial Hypertension                 | Clinical Examination: SBP $\geq$ 140 mmHg or DBP $\geq$ 90 mmHg | 1st ENFRENT, 2nd ENFRENT, CESCAS, SBYENT, SEPL       |
| Altered Glycemia                      | Altered fasting glycemia: between 110 and 126 mg/dl             | All except ReINacSB                                  |
|                                       | Diabetes: fasting glycemia $\geq$ 126 mg/dl                     | 2nd ENFRENT, CESCAS, SEPL                            |
|                                       | Diabetes: non-fasting blood glucose $\geq$ 200 mg/dl            | SBYENT, SEPL   |
| Dyslipidemia                          | Total cholesterol elevated $\geq$ 240 mg/dl                     | 2nd ENFRENT, CESCAS, SEPL                            |
|                                       | Total cholesterol $\geq$ 200 mg/dl                              | 1st ENFRENT  |
|                                       | LDL cholesterol greater than 160 mg/dl                          | CESCAS   |
|                                       | HDL cholesterol less than 40 mg/dl                              | CESCAS   |
|                                       | Triglycerides $\geq$ 150 mg/dl                                  | 1st ENFRENT  |
|                                       | Triglycerides $\geq$ 200 mg/dl                                  | CESCAS   |
| Overweight                            | Overweight: BMI $\geq$ 25 kg / m <sup>2</sup>                   | All except ReINacSB (does not report this condition) |
| Obesity                               | Obesity: BMI $>$ 30 kg / m <sup>2</sup>                         | All except ReINacSB (does not report this condition) |
| Abdominal Obesity                     | Altered waist circumference: male 102 cm, female 88 cm          | 2nd ENFRENT, CESCAS, SBYENT                          |

Abbreviations: SBP (Systolic Blood Pressure), DBP (Diastolic Blood Pressure), BMI (Body Mass Index), HDL (High-Density Lipoproteins), LDL (Low-Density Lipoproteins)

**Table 4** Indicators used to address oral health conditions in the selected studies. Uruguay 2006-2016

| Oral Pathology            | Indicator   | Study applying it             |
|---------------------------|---|-------------------------------|
| Caries                    | DMFT*   | RelNacSB<br>SBYENT            |
|                           | DMFT>0  | RelNacSB, SBYENT              |
|                           | SIC**   | RelNacSB                      |
|                           | D Component   | RelNacSB, SBYENT              |
| Periodontitis             | Periodontal disease: pocket > 4 mm and attachment loss > 3 mm | RelNacSB<br>SBYENT            |
|                           | Average of sextants affected by each condition                | RelNacSB                      |
| Tooth Loss                | Functional dentition: > 20 teeth                              | RelNacSB, SBYENT              |
|                           | Severe loss: < 9 teeth present                                | RelNacSB                      |
|                           | Average of teeth present                                      | SBYENT                        |
|                           | No teeth,<br>1 to 9, 10 to 19, 20 or more<br>Doesn't know     | SEPL                          |
|                           | Daily brushing  | SEPL<br>SBYENT*** RelNacSB*** |
| Other Oral Health-Related | Last visit to the dentist                                     | SEPL, SBYENT*** RelNacSB**    |
|                           | Oral pain   | SEPL, RelNacSB***             |

\* DMFT (Decayed, Missing, and Filled Teeth) indicator used to survey dental caries.

\*\* SIC (Significant Caries Index). Indicator used to represent the situation of the worst third in terms of the mean DMFT of the population.

\*\*\* Data provided by the Epidemiology and Statistics Service of the Faculty of Dentistry of the University of the Republic ( yet to be published).

## Discussion

In light of this work's objectives, the studies presented will be discussed in relation to each other and to the literature. Firstly, given that the objective of each selected study is different, so are the variables studied, the indicators chosen, and their definition, operationalization, and data collection. The greatest differences were found with the studies that were aimed exclusively at OH. This was to be expected given that indicators are dynamic instruments and must respond to the specific context in which they are used (17).

As for the methodology used, all the studies comprising this work employed the STEPs methodology proposed by the WHO. This has the advantage of allowing regional and international comparisons and contributing to health surveillance (10). However, from a local perspective, employing internationally standardized criteria could hinder health planning according to the needs of the population involved (18).

Regarding the sociodemographic characteristics of the studies, it was found that all of them involved adult and older adult populations. In addition, in the 2nd ENFRENT, ReINacSB, SBYENT, and SEPL, young people aged 15 years and older were included. The incorporation of the young population in these studies with a preventive approach stands out, given that it is necessary to address NCDs in this population group (19).

Still on the subject of sociodemographic characteristics, the gender dimension of the participants was recorded in all the studies. It was found that, except for the population deprived of liberty, there is a higher proportion of female participants. Although this does not in any way constitute a gender perspective, as gender and sex are not the same thing, the attempt to analyze NCDs with this dimension in mind is appreciated. It is key to incorporate the gender dimension when studying health-disease processes, given that there are matrix inequalities in their production and reproduction (20,21).

Understanding that the health-disease process of populations responds in a complex way to the productive model and the socioeconomic context of the population, besides gender-related variables, epidemiology should incorporate variables that make it possible to identify the socioeconomic level of the participants (21). In the studies analyzed in this paper, it was found that not all the studies included this dimension, and in those that did, the educational level was used as an approximation to the socioeconomic level, albeit through different indicators.

These elements, both socioeconomic level and gender, should be considered not as isolated factors of influence but as integral parts of the social production and reproduction framework, to achieve a comprehensive understanding (21).

Considering the form of data collection and the composition of the work teams, it was observed that two methods were used to assemble the examining teams: in some cases, the examiners were part of the research team (or worked in that service, as in the case of the SEPL), while in others, specific personnel were hired for this task. There is no data available to evaluate the

effectiveness and efficiency of the way the work teams were formed, but in all cases, the personnel were trained to carry out the activity, which increases data reliability (22).

Table 3 shows that for metabolic risk factors, the variables that presented the most standardized indicators were arterial hypertension and obesity (both abdominal and BMI). This finding makes sense because, as mentioned, the standardization of indicators is useful for public health actions. According to the WHO, hypertension and overweight/obesity are the metabolic risk factors with the greatest impact on deaths due to NCDs (4). However, altered glycemia is also one of the most important risk factors for NCD deaths, and there is greater variability in the way it is reported.

It was found that not all the included studies have information on abdominal obesity, but they do have information on BMI (except for ReINacSB, which does not consider this risk factor). Studies suggest that to establish risk, it is necessary to have both BMI and abdominal obesity information (23).

Table 1 shows that oral health conditions were addressed in three (ReINacSB, SBYENT, and SEPL) out of the six studies, suggesting that oral health is not considered when designing studies on NCDs. There is a shortcoming in the fact that epidemiological studies on NCDs and risk factors do not include oral health, despite having risk factors in common. Additionally, there may be potential common interactions and pathophysiological processes, as well as overlapping behavioral factors, whose understanding would benefit from an integrated and interdisciplinary approach between NCDs and OH (7,15,24,25).

Regarding behavioral variables, as seen in Table 2, alcohol consumption and tobacco use are reported with the greatest variability, with eight and six different ways of measuring and reporting, respectively. Several indicators were also found for physical activity, and in some cases, it is assessed together with sedentary lifestyle. The literature on studies about risk factors for NCDs in the region reveals various ways of measuring these habit-related conditions (26,27).

From a conceptual standpoint, it is erroneous to consider behavioral variables solely as aspects linked to individuals' willpower. These result from a set of dialectical processes, both protective and destructive, taking place across various dimensions. Thus, using a risk-based approach and relying independently on standardized variables and indicators, as per the STEPS methodology, hinders a holistic understanding and approach to health issues, including NCDs (7,8,21).

The primary limitation of this study is the restricted number of NCD studies included, which stemmed from the inclusion criteria set by the interdisciplinary group originating this article. A more comprehensive literature review with less restrictive inclusion criteria would be beneficial.

## **Conclusions**

The variability in the definition and use of indicators expresses the challenge of agreeing on criteria for working with NCDs at the national level. It would be important to not only have unified criteria for data collection, but also systematized and integrated information. This would enable to develop -both from survey data (which should be systematic) and from specific research- the epidemiological surveillance of these pathologies, which includes their prevention and treatment. In this way, there would be better inputs to make health decisions regarding the individual and collective approach to NCDs.

Given that several oral pathologies are classified as NCDs and due to the public health significance of these conditions, it is advisable to include them in the design of epidemiological studies that address NCDs.

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|----------------------|------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|
|                      | 1                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Ramón Álvarez-Vaz    |                        |   | x |   | x | x |   |   | x |    | x  | x  | x  | x  |
| Fiorela Apelo Lozano |                        |   |   | x |   | x |   |   | x | x  |    |    | x  | x  |
| Susana Lorenzo-Erro  | x                      | x |   | x |   | x | x | x | x |    | x  | x  |    |    |
| Paula Moliterno      |                        |   |   | x |   | x |   |   |   |    |    |    | x  |    |
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