# The use of the race/color variable in Public Health: possibilities and limitations

A utilização da variável raça/cor em Saúde Pública: possibilidades e limites

La utilización de la variable raza/color en Salud Pública: posibilidades y límites

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# ABSTRACT

This study aimed to discuss the use of the race/color variable as a determining factor of social difference and social exposure to the risk of illness and death. It is a reflection on the present production of the national and international literature in the Public Health and Epidemiology field on this subject. The study examined 47 original and review papers in the period 1990 to 2005. It was observed that international studies have aimed to debate and ground the use of the race/color variable in the health field. In Brazil, the use of this variable in studies about health inequalities is still incipient, but within the few investigations performed, differentials have been evidenced, which instigates the production of further research in this direction. The study of the role of race/color in the production of health differentials could contribute to make policies focusing on reducing health inequalities.

Key words: Social difference. Health. Race/color. Public Health.

#### **RESUMO**

Propôs-se discutir o uso da variável raça/cor como fator determinante de desigualdades sociais e de exposição social ao risco de adoecimento e morte. Trata-se de uma reflexão sobre a produção atual da literatura nacional e internacional da área de Saúde Pública/Epidemiologia. Foram incluídos no estudo 47 artigos originais e de revisão no período de 1990 a 2005. Observou-se que os estudos internacionais procuram debater e fundamentar o uso da variável raça/cor no campo da saúde. No Brasil, a utilização dessa variável em estudos de desigualdade em saúde é ainda incipiente, mas, entre as poucas investigações realizadas, têm sido evidenciados diferenciais que instigam maior produção de pesquisas nessa direção. Investigações sobre o papel da raça/cor na produção de diferenciais em saúde poderão produzir informações capazes de contribuir para a elaboração de políticas destinadas a reduzir desigualdades em saúde.

Palavras-chave: Desigualdade social. Saúde. Raça/cor. Saúde Coletiva

#### RESUMEN

Se propone discutir el uso de la variable raza/color como factor determinante de desigualdades sociales y de exposición social al riesgo de adolecer y de muerte. Se trata de una reflexión sobre la producción actual de la literatura brasileña e internacional del área de Salud Pública/Epidemiología. Se incluyen en el estudio 47 artículos originales y de revisión en el periodo de 1990 a 2005. Se observa que los estudios internacionales tratan de debater y fundamentar el uso de la variable raza/color en el campo de la salud. En Brasil la utilización de esta variable en estudios de desigualdad en salud es todavía incipiente, pero entre las pocas investigaciones realizadas se han evidenciado diferenciales que instigan mayor producción de investigaciones en esta dirección. Investigaciones sobre el papel de la raza/color en la producción de diferenciales en salud podrán producir informaciones capaces de contribuir a la elaboración de políticas destinadas a reducir desigualdades en salud.

Palabras clave: Inequidad social. Salud. Raza/color. Salud Colectiva

### **INTRODUCTION**

The different treatment given to diverse social segments in Brazil has contributed to the country being classified as highly developed when the social indicators of the white population are considered, and poorly developed when these indicators refer to the black population (Paixão, 2000). It is well-known that, although Brazil has the highest concentration of black population outside Africa (Silva, 2000), this social group is disproportionately represented in power positions and, from the economic and social point of view, it is poorer and less instructed, in educational terms, than the rest of the Brazilian population (FIBGE, 2002).

The black population occupies less qualified and worse paid positions in the job market; lives in areas with absence or low availability of basic infrastructure services; suffers greater restrictions in access to healthcare services, and these, when available, have a worse quality and are less efficient in problem-solving (FIBGE, 2004; IPEA, 2003; Paixão, 2000; DIEESE, 2000). Even so, until recently, there was a strong resistance against the understanding that these disparities could be attributed, at least in part, to the racial prejudice that exists in the Brazilian society. Only from the 1990s onwards has Brazil started to recognize the existence of racial difference as one of the factors of social inequality.

Although the national studies in the area of health that utilize the race/skin color variable are scarce, and despite the fact that some of them signal high occurrence of illness and death in the black population (Araújo, 2007; Batista, Escuder, Pereira, 2004; Barros, Victora, Horta, 2001), the explanation presented to this fact leans on the victims' socioeconomic insertion.

Thus, race/color has been little approached to explain how the prejudiced and discriminatory way in which the society treats its segments leads to economic and social inequalities and structures

disadvantages that determine a lower value position to the discriminated groups. In this direction, race/color should be understood, not from the biological point of view, but as a social variable that brings in it the load of historical and cultural constructions, representing an important determinant of the lack of health equity among racial groups.

In other social contexts, like in the United States, for example, the "race/color" variable has proved to be an important predictor of the health status of concrete populations, when analyzed in medical and public health investigations that aim to quantify differentials in health conditions. Considering that it has already been established that genetic variations between the human races are not capable of explaining health differentials by color groups (Pearce et al., 2004; Cooper, 1984), some researchers have attempted to clarify such differences with the support of Social Determination Theory, according to which the position occupied by individuals and groups in the social space, that is, the ways in which men relate to one another, to nature and in the working process, plays the main role in the determination of illness and its unequal distribution in the population (Sant'anna, 2003; Hasenbalg, 1992).

The present essay, based on the premises of the social determination model, aims to discuss aspects of the use of the race/skin color variable as a determinant of social inequalities and a factor of exposure to the risk of illness and mortality.

#### Methodology

The reflections presented here are based on the analysis of the production of the Brazilian, North American (United States) and English literature in the Public Health/Epidemiology area published in the period from 1990 to 2005. Publications related to the theme of interest were surveyed and analyzed in journals indexed in the databases LILACS (*Literatura Latino Americana e do Caribe em Ciências Sociais* – Latin American and Caribbean Literature in Social Sciences), MEDLINE (international literature database of the medical and biomedical area, produced by the National Library of Medicine, USA) and SCIELO (electronic scientific library). The selected descriptors were: *desigualdade social* (social inequality), *desigualdade em saúde* (health inequality), *raça/cor* (race/color), *raça/etnia* (race/ethnicity); *condições de saúde* (health status); *saúde pública* (public health) (in Portuguese) and *health inequalities, race/color, race/ethnicity, health status* and *public health* (in English).

We found 118 works (complete original papers, review papers, editorials, comments and perspectives) published in Portuguese and English. These were identified by descriptor separately and by using the Boolean combination technique, that is, the database was searched inserting several descriptors at the same time. For this study, 47 original and review papers were selected.

#### Social inequalities and health

To understand the origin of inequalities in health or in any area, it is necessary to look for the structuring principles of inequality in its genesis. Rousseau (1754) conceived in the human species two types of inequality: the natural one, established by nature, and the moral or political one, which depends on a kind of convention established or, at least, authorized by men's consent. The first refers to differences in age, health, body strength and in the qualities of the spirit or the soul. The second consists of the different privileges enjoyed by some to the detriment of others, like being richer, more powerful than others, or even making others obey. To this author, it is not possible to ask what the source of natural inequality is because the answer would be enunciated in the mere definition of the word. It is even less possible to investigate if there would be any essential connection between the two inequalities, because this would mean asking, in other words, if those who command necessarily are worth more than the ones who obey, and if the strength of the body and spirit, wisdom or virtue, are always in the same individuals proportionately to power or wealth.

Enguita (1998) argues that inequality, like popular wisdom highlights, is as old as life but, as a natural phenomenon, it does not cause concern. What is worrisome is the socially produced inequality, because in it, it is implicit that the advantages obtained by some imply disadvantages to others. However, discussing this issue requires the study of life conditions, expression of the

material conditions of human groups of a certain society (Castellanos, 1997), of the social reproduction processes of daily life, incorporating contextual, subjective and qualitative heterogeneities, questioning symbolic systems, analyzing differences in the health situation of ethnic groups, gender, reproduction, familiar social environment and, in parallel, class relations.

In this sense, it is necessary to ask to what extent differences as expressions of diversity, between being white or black, being a boy or a girl, having special needs or not, being rich or poor, being from the north or the south, being an Indian or not, living in an urban or rural area, become reasons for inequalities and injustices (UNICEF, 2000). It is based on this reality that the principle of equity is applied, translated in the recognition that it is necessary to treat in a distinct way those who are not in equality conditions, so that fairer relations can be achieved (Vianna, 2001). Therefore, fighting for equity means paying attention to differences that generate vulnerability situations, promote disadvantages and are become injustices.

When the issue of racial differences in Brazil is particularized, it is possible to verify that the social indicators, markers of the life condition of social segments, have shown that the black population presents worse level of schooling, health, income and housing, higher incidence of diseases, including mental ones, higher mortality, lives in areas that lack basic infrastructure and has worse access to healthcare services (IPEA, 2002). Black women and men are twice as poor and live 2.6 times more in situation of indigence when compared to white men and women. This has been an increasing trend. Furthermore, the Brazilian blacks present the highest rates of illiteracy, and among the literate population, they are 12% less literate than the white population (Sant'anna, 2003; Hasenbalg, 1992). Even when the blacks are able to study more, their salaries are lower and their chances of social ascension and mobility are also minimal (IPEA, 2002; INSPIR, 1999). The distribution of these Brazilian indicators has played an important role in the refutation of "racial democracy", in view of the deep differences observed in the life conditions of population segments.

On the other hand, mechanisms have been pointed through which social and economic inequalities might affect health. We highlight, among them, differences in access to opportunities in life (Kaplan, 2002), increase in social exclusion, conflicts and damage to social cohesion (Kawachi, 2000), lack of control and loss of respect (Wilkinson, 2003), and different possibilities of control and participation in social life by means of status, hierarchy and power (Marmot, 1999). These findings have stimulated investigations that explore the relation between social environment and health.

Studies carried out in industrialized countries, like the Whitehall Study, have revealed a social gradient in mortality rates, even among people who are not poor. According to these studies, such gradient is influenced by factors such as social position, social participation and control (Marmot, 2003). This author argues that the idea that health and disease are directly related to economic power and poverty, respectively, is wrong, as there are countries that are relatively poor, like India and Costa Rica, where there are low mortality rates.

According to Evans (1994, p.3) "health status is also correlated to social status"<sup>1</sup>. These evidences constitute open spaces to investigate other factors that are also important in the determination of the health-disease process.

## Race/color versus biological factors in research in the health area

A large part of the literature involving the relation between race and health emphasizes the lack of scientific evidence when racial differences observed in diverse diseases are primarily attributed to biological factors. In addition, the need to consider historical and structural factors has been pointed in studies about the theme. Therefore, in medical and epidemiological research, the "race" variable should be used as a social construct, more related to environmental than to genetic factors, in view of the fact that genetic determination explains only a very small part of populations' illness and mortality (Pearce et al., 2004).

<sup>&</sup>lt;sup>1</sup> All quotations have been translated into English for the purposes of this paper.

According to some authors, the term "race" favors conceptual ambiguity (Lopes, 1997; Jones, 1991) as its meaning, even in research studies in the health area, can express a perspective of social construction and also of biological construction. This is caused by the imprecision or polysemy of the concept of race and ethnicity, besides the inexistence of characteristics that allow defining a person's race in an unquestionable way, as political, ethnical and social aspects can play a crucial role in its definition (Chor et al, 2005; Krieger, 2000a; Jones, 1991).

In this sense, Pearce et al. (2004, p. 16) emphasize that the conception that genotype determines phenotype is wrong, because, although genetic factors have influence on health, they are "only a piece of a wider conjuncture". The constant interaction between genes and environment indicates that few diseases are purely hereditary, even if they are genetic. Studies carried out by these researchers in New Zealand have evidenced that purely genetic hereditary diseases are very rare, like, for example, Cystic Fibrosis (1/2,300 births), Duchenne Muscular Dystrophy (1/3,000) and Huntington's Disease (1/10,000), and represent a small proportion of the total disease burden.

Thus, the supposition that diseases are genetic because they occur in people from the same family can, in fact, be reflecting a common environment and lifestyle rather than a genetic influence (Pearce et al., 2004). Studies have shown that genetic factors have less importance in the determination of the population's diseases and mortality than environmental factors. For example, trends observed in mortality rates provide evidences that genetic factors are insufficient to explain racial differences in health, as improved life conditions are related to reduction in many diseases, which strongly suggests that they are not mainly genetic (Pearce et al., 2004).

The use of the race/skin color variable in Public Health as a meaning of identity of people's geographic origin or as a genetic marker has no sense because science has already demonstrated that, from the point of view of the biological sciences, there is greater genetic variation among individuals with similar phenotypical similarities than among those with different phenotypes (SEF, 2001). Therefore, from the genetic point of view: "the only certain thing is that an individual is a human being" (Torres, 2001, p.189). Thus, all human beings belong to the same species, which overrides the idea of geographic races (SEF, 2001). The consensus that exists among authors is that the use of the race/color variable can be useful only as a marker of the risk of social discrimination or exposures.

On the other hand, Travassos and Williams (2004) draw attention to the limitations of studies that analyze race/color in the Public Health area, and highlight the following problems: non-conceptualization and justification of the utilization of the race/color variable in studies about health inequalities; utilization of this variable without it being accompanied by one or more social stratification variables to avoid error of specification of the risk complex; and simplistic interpretations and conclusions that may lead to spurious emphasis on the explanation of these inequalities. Chor and Lima (2005, p.8) underline the race/color classification methods. The combination of self-classification and classification by third parties, although it is considered the gold standard, should be applied according to the object of study because, as race/ethnicity is understood as a "sociocultural construction, the concept of "gold standard" does not seem to be adequate".

### Health inequalities and race/color in developed countries

The relation between race/color and health has been investigated in developed countries, like the United States and England, shedding light on the importance of reflecting on the problem. Efforts have been made to construct methodological proposals in this perspective (Krieger, 2000a), which have been serving as reference to other nations.

American researchers have observed that chronic diseases that affect blacks and whites attack more sharply individuals of lower socioeconomic level. This finding has led North American epidemiologists who study health inequality determined by race and gender to treat socioeconomic level as a possible confounding variable in the association between race and illness (Williams, 1996; Osborne, 1992). However, there are controversies regarding the residual differences that have

been found in the comparison of health results between blacks and whites. These can be attributed to genetic or to socioenvironmental factors (Pearce et al., 2004; Osborne, 1992), depending on the ideology of the person who observes them (Krieger, 2000a). Nevertheless, to Cooper (1984), treating socioeconomic level as a confounding variable in the association between race and illness makes no sense, as race is one of the factors that determine socioeconomic status.

In the United States, from the 1990s onwards, the study of aspects of social inequalities that, besides the socioeconomic condition, highlighted the role of race/color and gender in the production of negative results in health has been stimulated (Krieger, 2000b; Williams, 1996; Krieger, 1994; Williams, 1994). In that country, race and gender are extensively used in the medical and Public Health literature to quantify racial differences in treatment and health results, and the employment of this approach has increased recently. Studies that relate race to social disparities in health results show that this variable is an important predictor of health status, as the blacks are in disadvantage when compared to whites in the majority of the economic and health status indicators.

The literature extensively documents that poverty is associated with high risk of low birth weight among African and white Americans. In the literature review conducted by Dressler et al. (2005), it was observed that research into low birth weight and arterial pressure also evidenced worse results to the black population. However, although adjustment by poverty substantially reduces the excess of risk in the African American population, it does not eliminate it (Krieger, 2000b; Rowley, 1993). In 1996, a publication of the North American Medicine Institute also showed that there are great racial differences in the quality and intensity of medical treatment, even after adjustment by factors of access, socioeconomic condition and disease severity (Williams, 1996). Therefore, race tends to predict increased health risks independently of the economic condition because, although these two variables are correlated, they are not identical (Lovell, 1998). In this perspective, race/color is a particular dimension of social stratification which defines differences in the access to goods and services that might be attributed to social class. Nevertheless, both concepts carry socially constructed meanings. Race/color is based on individuals' physical characteristics, while social class is a product of social relations.

#### Health inequalities and race/color in Brazil

Although in Brazil social inequalities between blacks and whites are striking, lack of equity determined by race is a little explored theme in the literature in the health area (Chor, Lima, 2005; Travassos, 2004; Cunha, 2001). The academic production on the theme is scarce, and the justifications for this fact are possibly circumscribed to the myth of "racial democracy" that has been cultivated throughout the years. The idea, nationally disseminated by Freyre (2004), gained international notoriety and created the illusion, even among the black population, of equality of treatment among color segments. This may be one of the reasons why race/color is one of the least used variables in studies about health inequalities, despite its great relevance as a marker of discrepancies between groups, in terms of life conditions. This false "democracy" has revealed itself more and more through differences evidenced by the socioeconomic, educational and cultural indicators and also through the results of studies about health inequalities.

In the 1990s, some authors, aiming to give visibility to health differentials between subgroups, started to utilize the concept of vulnerability, defined as a "set of individual and collective aspects related to the degree and mode of exposure to a certain situation and, in an inseparable way, to the individual's greater or lesser access to adequate resources to protect himself from the undesirable consequences of that situation" (Lopes, 2003, p.12).

According to this concept, the social exclusion that is destined to blacks configures social vulnerability, and the inadequate assistance to their juridical, health, leisure, work and housing needs, among others, constitutes the programmatic vulnerability that exposes them to the condition of higher risk (Batista, 2003; Mann, 1999). This concept is related to the production of inequalities that reflect on the conditions of social, economic, cultural and environmental insertion of the population which, in turn, determines the lack of equity that makes disadvantaged groups in society

suffer the negative consequences of such insertion. In spite of the scarcity, in Brazil, of more robust studies about the differences that exist between color segments, the social indicators have pointed that the black population has worse life conditions, which contributes to their greater exposure to suffering damages and risks. Concerning this issue, it should be highlighted that the incorporation of this question into the political and social agenda, and even the emergence of research targeted at the analysis of racial inequalities in health, is a result of the pressure exercised by the social movements, both national and international. In this sense, it is also worth highlighting the pressure that has been exercised by the international academic production about this theme since the 1990s.

In the few studies that approach social inequalities in Brazil, differences in classes and regions have been emphasized (Vianna, 2001; Szwarcwald, 1998; Souza, 1995; Minayo, 1993). Only recently have some authors related the blacks' social inclusion with health results, showing differences between groups according to race/color.

Among the Brazilian investigations that approach health differences according to race/color, the following studies, briefly described below, stand out in the literature: Martins and Tanaka (2000), using data from the Maternal Mortality Committee of the State of Paraná, have evidenced great differences in the risk of dving due to maternal causes, which disproportionately affected black and yellow women. However, maternal mortality did not differ between mixed-ethnicity (black and white) and white women. A study about child's and adult women's mortality conducted by Cunha (2001) has shown that the mortality of children younger than one year of black mothers and the mortality of black adult women were higher compared to the whites even when social and economic conditioning factors of mortality were controlled, such as: mother's level of schooling, socio-occupational category and average monthly income of the head of the family. Barros, Victora and Horta (2001), using longitudinal health data, have shown worse health results for black children in the South of Brazil, even after adjustment by socioeconomic condition and other variables (marital status, mother's age, parity, pregnancy planning, social support, smoking, work during pregnancy and prenatal care). The adjustment by these variables reduced the magnitude of the associations according to race, but did not eliminate them. The results also suggested that black mothers received poorer health assistance when compared to white mothers. According to Goodman (2000), in Brazil, racial inequalities are more common in treatment than in access to healthcare services. This statement was corroborated by Chor and Lima (2005) when they showed that, in 2001, the proportion of deaths without medical assistance among the Indians was 9.0%, compared to 6,0% among whites. These authors refer to a longitudinal study carried out in Rio de Janeiro with university employees in which it was found, among other aspects, that discriminatory medical assistance might hinder the diagnosis and control of arterial hypertension. With the contribution of these evidences, the Ministry of Health, in the document "A Saúde da População Negra e o SUS" (The Health of the Black Population and the SUS), has focused on the problem through an equity perspective, considering both the specific health needs of the black population, and the inequalities that affect this segment, in terms of access to services and assistance provided for this population.

On the other hand, no statistically significant differences were found due to race/color in self-reported health status, in an analysis performed by Dachs (2002) after adjusting by educational and income level, having as source the data from *Pesquisa Nacional de Amostragem Domiciliar* (PNAD – National Household Sample Survey) of 1998. In the State of São Paulo, a study carried out by Batista (2003) based on data from death certificates of 1999, with the aim of describing the mortality profile of black men and women living in the State of São Paulo, focusing on gender and race/color inequalities, evidenced the highest crude mortality rates for black men and women. Kilsztajn et al. (2005) also observed higher crude mortality rate by homicide for blacks in the metropolitan region of São Paulo, although race was not significant when adjusted by the variables years of schooling, sex and age. Lopes (2005, p.5), however, considers that studies about health inequalities, disparities or iniquities should overcome the barrier of figures, going beyond the comparison of statistical data, since racism is not always revealed "in an explicit and measurable form in social interactions".

Cardoso et al. (2005) analyzed the consistency of *Sistemas de Informações sobre Mortalidade* (SIM - Mortality Information Systems) and *Sistemas de Informações sobre Nascidos Vivos* (SINASC – Live Births Information Systems) as sources of data for the assessment of race/color inequalities in health in Brazil in the period 1999-2002 and found a significant reduction in the number of deaths and records of live births with non-informed race/color in this period.

Leal, Gama and Cunha (2005) analyzed social inequalities and inequalities in the access and utilization of health services in relation to skin color in a representative sample of puerperal women who demanded childbirth hospital care in the municipality of Rio de Janeiro from 1999 to 2001 and observed a persistent unfavorable situation of black and mixed skinned (black and white) women compared to the whites. Chor and Lima (2005) highlighted that racial discrimination, projected in the socioeconomic differences that are accumulated during the life of successive generations, are in the origin of a large part of ethnical-racial inequalities in health.

Although the studies mentioned above used distinct methodologies, which hampers the establishment of a more consistent comparison between them, it is possible to observe that the studies on racial inequalities in health produced in Brazil so far have discussed race/color as a social construction, surveyed evidences on the lack of equity in health according to this variable, evaluated the availability and quality of the race/color information in official record systems, drawn the attention to problems and limitations referring to the methods of racial classification and contributed to demystify the idea of "racial democracy" in Brazil.

#### **Final Remarks**

This study highlighted the role of social inequalities in the production of health differentials according to color segments, the emergence of the concept of race as a fertile field to access inequality indicators, and the possibilities and limits of the utilization of the race/color variable in the area of Public Health. The studies have shown that despite the limitations in its use, this variable can capture the health inequalities to which social groups are exposed.

The international papers emphasized the justification of the use of the race/color variable, proposed methodologies and pointed to the need to overcome the limitations highlighted by the literature, giving the impression that the focus on these aspects represents a phase that is subsequent to that of mere denunciations. The Brazilian studies, in turn, underlined health differentials according to race/color, discussing aspects about the use of classificatory methods and evaluating the quality and availability of race/color data, which might represent a more incipient phase in studies about the theme, in relation to the international literature.

However, even though incipient, research production in Brazil, allied with what has been demanded by social movements, has contributed to policymaking with the aim of reducing racial inequalities in health. A proof of this is that, in spite of the fact that Sistema Unico de Saúde (SUS -National Health System), in its planning, considered the Brazilian population "supposedly homogenous, leaving aside the different damages and risks to which the population's subgroups are distinctly subject" (Paim, 2003, p.184), some measures have been taken in order to revise this mistake. Among them, we highlight the document produced by the Ministry of Health entitled "A Saúde da População Negra e o SUS" (The Health of the Black Population and the SUS), where it is established that: ethnical-racial inequalities in health should play a more expressive role in the epidemiological research agenda in the country, so as to fill an important gap in the knowledge about the population's health conditions; the inclusion of the race/color field should be extended to other national databases, besides SIM and SINASC; a pact will be made with CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico - National Council for Scientific and Technological Development) to include race/color as a methodological requisite in the public notices of research financed with Ministry of Health's resources. This equitable action is defined by the commitment of health managers and technicians, and also by the active participation of civil society organizations.

The recent public notices for funding research on social inequalities in health focusing on the health of the black population published by fostering institutions, like CNPq, is an indication that a consensus has started to be built around this question and this possibility is already part of the governmental agenda in the above-mentioned perspective.

Research that takes into account the limitations related to the studies of social inequalities in health according to race/color, so as to overcome them, may represent a great contribution to Public Health and to the deconstruction of health disparities, by fostering the creation of specific policies and interventions. In addition, this investment constitutes an opportunity for the academic production in the field of Public Health to refresh itself when it is demanded by social necessity, stimulating the conduction of other investigations that contribute to give visibility to the real health status of different social groups.

# COLLABORATORS

Costa, M. C. N. collaborated in the writing and revision of the text; Hogan, V. K. collaborated in the writing and revision of the text; Araújo, T. M. participated in the organization and writing of the text; Batista, A. participated in the writing and revision of the text; Oliveira, L. O. participated in the planning and survey of the papers in the databases, revised and contributed to the organization of the bibliographic references.

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