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Revisão

Persisting problems related to race and ethnicity in public health and epidemiology research

Problemas persistentes relacionados à raça e etnia na pesquisa em saúde pública e epidemiologia

ABSTRACT

A recent and comprehensive review of the use of race and ethnicity in research that address health disparities in epidemiology and public health is provided. First it is described the theoretical basis upon which race and ethnicity differ drawing from previous work in anthropology, social science and public health. Second, it is presented a review of 280 articles published in high impacts factor journals in regards to public health and epidemiology from 2009-2011. An analytical grid enabled the examination of conceptual, theoretical and methodological questions related to the use of both concepts. The majority of articles reviewed were grounded in a theoretical framework and provided interpretations from various models. However, key problems identified include a) a failure from researchers to differentiate between the concepts of race and ethnicity; b) an inappropriate use of racial categories to ascribe ethnicity; c) a lack of transparency in the methods used to assess both concepts; and d) failure to address limits associated with the construction of racial or ethnic taxonomies and their use. In conclusion, future studies examining health disparities should clearly establish the distinction between race and ethnicity, develop theoretically driven research and address specific questions about the relationships between race, ethnicity and health. One argue that one way to think about ethnicity, race and health is to dichotomize research into two sets of questions about the relationship between human diversity and health.

DESCRIPTORS: Ethnicity and Health. Race or Ethnic Group Distribution. Health Inequalities. Social Inequity. Review.

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RESUMO

Realizou-se revisão recente e abrangente da utilização de raça e etnia em pesquisas dedicadas às disparidades de saúde em epidemiologia e saúde pública. Foi descrita a base teórica sobre qual raça e etnia diferem nos métodos de trabalhos em ciência, antropologia social e de saúde pública. A revisão foi feita com base na seleção de artigos publicados em periódicos de alto fator de impacto no que diz respeito à saúde pública e epidemiologia, no período de 2009-2011. O total de artigos selecionados foi de 280. A revisão foi baseada sobre um conjunto de questões conceituais, teóricas e metodológicas relacionadas ao uso de ambos os conceitos. A maioria dos artigos revisados foi fundamentada em um referencial teórico e desde interpretações de vários modelos. No entanto, os principais problemas identificados incluem: a) falha de pesquisadores para diferenciar conceitos de raça e etnia; b) utilização indevida de categorias raciais para atribuir etnia; c) falta de transparência nos métodos utilizados para avaliar ambos os conceitos; e d) falta de limites de endereços associada à construção de taxonomias raciais ou étnicas e a sua utilização. Concluiu-se que os futuros estudos que objetivem examinar as disparidades de saúde devem estabelecer claramente a distinção entre raça e etnia, desenvolver pesquisas com orientação teórica que trata de questões específicas sobre as relações entre raça, etnia e saúde. Argumenta-se que uma maneira de pensar sobre raça, etnia e saúde é dicotomizar a pesquisa em dois conjuntos de questões sobre a relação entre a diversidade humana e da saúde.

DESCRITORES: Etnia e Saúde. Distribuição por Raça ou Etnia. Desigualdades em Saúde. Iniquidade Social. Revisão.

INTRODUCTION

A universal epidemiological fact is that health and disease are unevenly distributed across groups of populations, regardless of the way these are characterized either on the basis of race, ethnicity, nationality, religious affiliation, socioeconomic level, gender, and so on. Racial and ethnic disparities are reported in the United States for virtually all physical and mental health conditions, health-related risk factors, as well as in the use and quality of health care services.[19] The real public health challenge is to explain how and why these disparities exist in order to properly inform policies and the development of programs aimed at reducing them.[31,50]

The methods of classifying groups of populations have a direct impact on the ways health disparities are examined and interpreted. The theory and methods used to study racial and ethnic disparities have been the subject of important criticisms over the last decades in regards to public health and epidemiology.[5,6,10,13,14,16,22,27,28,30,35,38]

Four comprehensive reviews have examined the use of race and ethnicity concepts in the fields of epidemiology and public health research.[1,12,25,56] These reviews revealed several key problems including: a) a failure from researchers to differentiate between the concepts of race and ethnicity; b) an inconsistency and lack of transparency in the methods used to assess both concepts and c) a dearth in the interpretation of study results based upon race or ethnicity. Reviews conducted in biomedicine[33] and nursing research[15] identified similar key problems which must be addressed. Recent papers addressed methodological issues surrounding the use of statistical analyses and causal inference in the study of racial and ethnic differences[17] as well as problems in the definition and psychometrics of acculturation scales,[8,36,51] and racial discrimination scales.[4]

A comprehensive and updated review of the use of race and ethnicity in public health and epidemiology is clearly needed. The most recent review covered manuscripts published over a decade ago.[12] This paper fills this gap and provides an evaluation as to how and if researchers differentiate between race and ethnicity. These questions are essential since we noted that a failure to distinguish both concepts is found in recent papers that discussed theoretical, conceptual and methodological issues regarding the use of race and ethnicity.[37,38,45]

In this paper we first draw from anthropology, social science and public health and describe the basis upon which race and ethnicity differ as concepts related to the categorization of human diversity and as social constructions used to understand the nature of social interaction between human populations. Second, a review of the ways race and ethnicity are used to address

health disparities in public health and epidemiology research is presented. Using a sample of 280 articles published between 2009-2011 in high impacts factor journals, we identified key problems and concluded with recommendations to guide future studies.

Distinguishing Race and Ethnicity

In recent anthropological[14,22] and public health papers,[16] race and ethnicity are clearly differentiated as concepts that address two distinct facets of human diversity.

From a biological perspective, the concept of human races postulates the existence of discrete and non-overlapping biological divisions of the human species which can be identified using physical (e.g., skin color), morphological, geographic (e.g., continental location) or genetic markers. Six racial categories are currently defined by the US Office of Management and Budget in the United States:[41] White or Caucasian, Black or African American, Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, and some other Race. However, on the basis of current knowledge in science and genetics, the Institute of Medicine[24] (2009) recognizes that such racial groups are not mutually exclusive on the basis of biology or genetics.

Gravlee[22] (2009) reviewed the lines of evidence upon which the existence of human races have been rebutted. Recent genetics studies show that while both clines and clusters are part of human genetic variation, clusters explain relatively little of total variation. In fact, the three conventional racial groupings which were originally based on continental origins (Europe, Africa and Asia) differ from one another in about 10 to 15 % of their genes; as such, there is more variation within than between conventional races. Also, most human genetic variation is non-concordant, whereby phenotypes used to distinguish races have no value in predicting other aspects of biology. Moreover, physical variations in skin and hair color amongst the human species occur gradually rather than abruptly over geographic areas.[7] Today, some geneticists now suggest that direct assessment of disease-related genetic variation at the individual level may be more accurate and beneficial in understanding health disparities than the use of racial categories.[26]

While its biological significance has been dismissed, public health scholars have suggested the use of race as a social construct to understand the nature of social interaction and how people perceive and relate to race.[16,30] As Gravlee[22] (2009) explained; the sociocultural reality of race has biological consequences for racially defined groups through two reinforcing mechanisms: social inequalities that may shape the biology of racialized groups and embodied inequalities which perpetuate a racialized view of human biology.

Various models and theoretical considerations have been devoted to explain how psychosocial stress stemming from the experience of discrimination, social exclusion and stereotype may produce health disparities in health care services, access to resources and other health-related factors.[23,27] As pointed by Dressler et al[14] (2005), since discrimination is not only based on racial but also ethnic characteristics, the term 'ethnoracial categories' may be used to refer to the social construction of ethnic and racial differences and the way these shape social interactions.

From a sociocultural perspective, the concept of ethnicity refers to the existence of cultural diversity amongst the human species and therefore can be seen as synonymous to humanity.[27] Ethnic identity refers to the expression of ethnicity that is particular to each human group; it is constructed through a process of communalization born out of social relations and based on the belief in a common origin and history.[55]

Specifically, it is possible to distinguish three main components of ethnic identity: the cultural, ancestral and the referential.[16] The cultural includes shared models of the mundane (language, diet, dress, rituals), and the symbolic (beliefs, world vision etc.); the ancestral refers to a common history, a shared territory and/or kinship, while the referential implies the definition of an established frontier between a group and the rest of the world. Various models have been developed to explain how cultural factors specific to an ethnic group may affect health, including behaviors, norms, attitude, and beliefs.[16]

Anthropologist Fredrik Barth insisted that ethnic studies should focus on the fundamental existence of cultural boundaries that exist between groups of populations[3] (this is similar to the referential dimension described by Dressler et al[14] (2005). In a related approach, Juteau[27] (1999) proposed that the process of ethnic communalization is based on the delineation of an internal frontier, which defines the group based on the belief in a common history and shared culture, and an outer boundary that characterizes the balance of power between ethnic groups. One essential point made by Juteau[27] (1999) is that even if ethnic identity is socially constructed, it remains that ethnicity is a reality inseparable from humanity and necessary to the understanding of social dynamics. Like the effect of race, discrimination based on ethnic identity does shape the health and life of individuals and groups, in processes of migration, cultural contact and acculturation experiences.[13]

There are various ways and debates regarding specific markers that should be used to identify ethnic categories, including; language, religion, nativity, etc.[11] For example Hispanic ethnicity is defined on the basis of spoken language.[41] The Institute of Medicine[24] defines granular ethnicity on the basis of national and sub-national origin (e.g., Korean, Puerto Rican, and German from Russia). Regardless of the markers used to define ethnic group, adopting a cultural perspective

of ethnicity implies two important methodological considerations.

First, biophysical traits should not be part of the definition of ethnicity since there is no essential correlation between biology and culture.[47] To be clear, categories defined upon skin color such as "Blacks" and "Whites" are not appropriate to represent the cultural and ancestral dimensions of ethnicity.[39] Second, current ethnic categorizations defined on the basis of continental markers or languages are heterogeneous overall in terms of culture. Such groupings may have in certain cases, a useful value in identifying general health disparities,[11] however they do not hold a great potential for understanding the root determinants of disease variation attributed to cultural factors since broad categories such as Asian, Hispanic or Western, lump together various groups that substantially differ both socially and culturally.[5,16,39]

METHODS OF REVIEW

This study aimed to review the ways in which race and ethnicity are used to address health disparities in public health and epidemiology research. We confined our review to articles published in the years 2009, 2010 and 2011 in high impacts factor authoritative peer-reviewed journals in the fields of epidemiology and public health. These journals included the American Journal of Public Health (AJPH), the American Journal of Epidemiology (AJE), Social Science and Medicine (SSM), the American Journal of Preventive Medicine (AJPM), the Journal of Epidemiology and Community Health (JECH), the International Journal of Epidemiology (IJE) and the European Journal of Epidemiology (EJE). This selection offers the most updated and comprehensive reviews since previous ones were limited to one or two peer-reviewed journals.

MEDLINE was searched to identify relevant articles using the following keywords: Rac*, Ethni*, White, Black, European, Caucasian, African, Asian, Latin*, Hispanic, Pacific, and Indian. These words cover the concepts and category terms used in the standard racial and ethnic classification of the Office of Management and Budget (1997) and in most classifications in the United Kingdom, Canada, New Zealand, and Europeans countries.

Out of this search, a total of 508 articles were identified. Abstracts were then systematically reviewed to identify the relevant research articles which focused on health disparities and were available at the university library. Only five out of 508 were not available (less than 1%). Program evaluation research papers were excluded from the main review because they would not allow for the use of the same analytical grid. These papers accounted for less than 3% of all articles (n = 14/508). Commentaries, theoretical and methodological papers, and reviews were scrutinized and their content was included in the theoretical development and discussion of results.

A total of 280 research articles were retained and examined in their full length to answer the following questions:

- What are the study designs used to address racial and ethnic health disparities?
- What are the health outcomes measured and justifications given by authors to examine these outcomes in terms of race and ethnicity?
- What are the concepts used by authors to address group of populations; race, ethnicity, both or neither? Do researchers differentiate between the concepts of race and ethnicity?
- What are the methods used to access race or ethnicity?
- Do researchers discuss and recognize the limits inherent to the methods of racial and ethnic classifications?
- What is the nature of the interpretations given in the studies to explain racial and ethnic health differences?

An analytical grid comprised of 22 variables was developed and used to structure the analysis of each article and to address the aforementioned questions. Data was coded by the author to produce a series of descriptive statistics using SPSS 18.0.

RESULTS

Table 1 presents the distribution of articles reviewed by journals, years of publications and research settings. Notably, research was predominantly conducted in the United States (81.4%), with other research undertaken mostly in western countries. In the following sections, results are reported for all articles considered as a single sample. Important differences between journals and country of setting are also reported when pertinent.

Outcomes and Justifications

Table 2 presents data on the study design, outcomes measured, and types of justifications provided by authors to examine these outcomes in terms of race and ethnicity. Most articles were cross-sectional and used quantitative data (67.9%). A limited number of studies analyzed qualitative data or utilized a mixed methods design. The majority of the examined studies (77.9%) were comparative where health disparities were measured between two or more racial or ethnic

Table 1. Characteristics of articles addressing racial and ethnic health disparities in public health and epidemiology, 2009 to 2011. (n = 280)

Variable	n	%
Year of publication		
2009	113	40.4
2010	96	34.3
2011	71	25.3
Journals		
American Journal of Public Health	96	34.2
Social Science and Medicine	85	30.4
American Journal of Epidemiology	37	13.2
Journal of Epidemiology and Community Health	31	11.1
American Journal of Preventive Medicine	24	8.6
International Journal of Epidemiology	4	1.4
European Journal of Epidemiology	3	1.1
Country of research setting		
United States	228	81.4
United Kingdom	16	5.7
New Zealand	6	2.2
Netherlands	5	1.8
Canada	3	1.1
Others countries	13	4.6
Cross-country comparison	9	3.2

groups, whereas the remaining articles were limited to a single group.

Half of the studies (51.4%) focused on monitoring health disparities in biological outcomes such as; physical morbidities, mortality rates, disabilities, and birth weights. Other important outcomes measured include behaviors (17.1%), health-care use and services (15.0%), and psychosocial related outcomes (10.4%). Interestingly, articles addressing biological outcomes were more predominant in epidemiological journals, including 76.3% of the AJE articles and 100% of the IJE articles.

Authors provided different types of justifications to support their study of racial or ethnic differences in health. First and foremost, almost every author (95.0% of all articles) provided statistics on disease prevalence, service use, or mortality rates and identified at-risk groups which they then examined in their study. Additionally, some authors justified the use of granular ethnicity to examine subpopulations (e.g., Korean Chinese) by explaining the limits of racial or ethnic aggregation into a larger group (e.g., Asian American). However, only 63.6% of authors went beyond the reporting of mere statistics and the identification of at-risk groups to actually provide a theoretical basis for the study of racial and ethnic health disparities. Seven articles presented no justifications at all in relation to why racial or ethnic differences in health were being investigated.

Concepts

We next examined which concepts (race, ethnicity, both or neither) were used by authors to define groups of populations, and whether or not they differentiated race and ethnicity. As shown in Table 3, most authors used both race and ethnicity in their study (170 or 60.7% of articles). Ethnicity was preferred in 61 or 21.8% of articles along with others terms such as ancestry, culture and pan-ethnic. Race was the sole concept used in 28 or 10.0% of manuscripts, sometimes referring to 'people of color'. A remaining 21 or 7.5% of authors avoided referring to either race or ethnicity, and instead opted to refer directly to group labels (e.g., African Americans).

Table 3 also shows the use of fine grain concepts in addition to race and ethnicity noted in 102 or 36.4% of articles. These concepts were used by researchers to

Table 2. Study design, outcomes and justifications provided in the study of racial and ethnic disparities in public health and epidemiology research, 2009 to 2011. (n = 280)

Variable	n	%
Study design		
Cross-sectional	190	67.9
Longitudinal	54	19.3
Qualitative	32	11.4
Mixed-methods	4	1.4
Study nature		
Single group	62	22.1
Comparative	218	77.9
Outcomes[a]		
Biological	144	51.4
Behavioural	48	17.1
Health services	42	15.0
Psychosocial	29	10.4
Socioeconomic	3	1.1
Physical environment	4	1.4
Multiple outcomes	10	3.6
Justifications provided[b]		
Models/hypothesis	178	63.6
Statistics for at-risk groups	88	31.4
None	14	5.0

[a] Outcome types are: biological (e.g., morbidity, mortality), behavioral (e.g., drug use, physical activity), health-services (e.g., health care use), psychosocial (e.g., racism), socioeconomic (e.g., education, income), physical environment (e.g., pollution exposure)
[b] Types of justifications provided by authors to examine health outcomes in terms of race and ethnicity

address the heterogeneity of large groups, or to analyze the ways multiple dimensions of ethnic and racial affiliations interact. Some concepts related to acculturation or immigration measures and included nativity, immigration status, years of residence in the host country, and language spoken or language proficiency. Other concepts such as ethnic density, racial segregation and ethnic enclave were used to define a measure of race or ethnicity at the neighborhood level. Finally, racism or discrimination scales were used in several studies. Interestingly, the use of such fine grain concepts was mainly seen in SSM (58.1% of the journal articles), whereas in other journals the use of such concepts were found in about 25-30% of articles. Two authors developed unique concepts using a relational approach to address social relations in function of race; these are the concept of colourism, expressed racial identity and reflected racial identity[53] and racial centrality.[9]

Overall, 64.3% of authors failed to differentiate race and ethnicity. Such a failure was evidenced by the presence of at least one of the following criteria: a) the systematic use of the expression "race/ethnicity" or "racial/ethnic" when referring to either racial or ethnic differences or both; b) the use of the terms race and ethnicity interchangeably; c) the use of skin color based categories to ascribe ethnicity without justifications (e.g., White and Blacks taken as ethnic groups) or; d) the comparison of ethnic categories with racial ones without justifications (e.g., Mexicans compared to Blacks in a study examining ethnicity). Examples of sentences illustrating the confusion between race and ethnicity include: "The classification of ethnicity was performed by the healthcare professional on the basis of race and country of birth" (p. 697),[43] "Hispanics have become the largest racial/ethnic minority group in the United States" (p. 145),[49] and most evidently "Ethnicity was measured by asking respondents, What race do you consider yourself to be?" (p. 563)[57]

Table 3. Concepts used to study racial and ethnic health disparities in public health and epidemiology research, 2009 to 2011. (n = 280)

Variable	n	%
Which concepts are used?		
Race and ethnicity	170	60.7
Ethnicity	61	21.8
Race	28	10.0
None	21	7.5
Race and ethnicity are differentiated?[a]		
Yes	100	35.7
No	180	64.3
Race or ethnicity is defined as a social construct?[b]		
No	262	93,6
Yes	18	6.4
Other variables are used along with race and ethnicity?		
No	178	63.6
Yes, of which:	102	36.4
Country of birth/residence	23	8.2
Ethnic or racial density/segregation	15	5.4
Language	6	2.1
Ethnic or racial discrimination	3	1.1
Immigration status	3	1.1
Others	9	3.2
Many of the above	42	42.2

[a] A failure to differentiate race and ethnicity was evidenced by the presence of at least one of the following criteria: a) the systematic use of the expression race/ethnicity' or 'racial/ethnic' when referring to either racial or ethnic differences, or both b) the use of the terms 'race' and 'ethnicity' interchangeably, c) the use of skin color based categories to ascribe ethnicity without justifications (e.g., Black taken as an ethnic group), or d) the comparison of ethnic categories with racial ones without justifications (ex: Mexicans compared to Blacks in a study examining ethnicity)

[b] The definition of race or ethnicity as a social construct was evidenced by the presence of any comments regarding the social and/or cultural dimension of race or ethnicity in the entire revised paper

Taxonomies

As presented in Table 4, seven different types of taxonomies were found in the reviewed articles to classify group of populations on the basis of race and ethnicity. In the following paragraphs we described how these taxonomies were used by researchers in function of the concepts they chose (race, ethnicity, both or neither).

First, the majority of authors who used both race and ethnicity (n = 119/170) used the Office of Management and Budget (1997) classification system (Taxonomy 1). Categories crossing race and ethnicity were often created by these researchers (e.g., Non-Hispanic Blacks). A second group of authors (n = 13/170) defined racial and ethnic groups on the basis of country of residence or country of birth (Taxonomy 2). A third group of researchers (n = 34/170) created and compared groups by combining the Office of Management and Budget (1997) classification with country or region of birth (Taxonomy 3). For example, authors sub-divided the racial Black group by region of birth place to examine pre-migration exposure to racism and discrimination.[32] A small group of authors (n = 4/170) defined specific ethnic groups on the basis of various cultural markers including language and religion, etc. (Taxonomy 4). Overall, we found that 93.5% (n = 159/170) of all authors that used both race and ethnicity failed to differentiate both terms.

Studies in which ethnicity was solely used (n = 61) were mostly done outside the US where the term "race" is

Table 4. Six taxonomies used in the study of ethnic and racial health disparities in public health and epidemiology, 2009 to 2011.

Taxonomies	Markers	Examples of categories	Use (%) (n = 280)
1. Office of Management and Budget (OMB)	Skin color, continent or region + language	White/Caucasian, Black/African American Asian, American India/Alaska Native Hispanic/Latinos, Non-Hispanic Whites Native Hawaiian/Pacific Islander	60.3
2. Countries	Country of birth and/or nationality	Mexican American, Dutch, Turkish. Chinese, Vietnamese, Filipinos	13.6
3. OMB + Countries	Skin color, continent or region + country of birth Language	White, Non-Hispanic African American, Hispanic Puerto Rican, Hispanic Mexican, White Asian	15.0
4. Cultural specific	Cultural markers (religion, language, history, etc.)	White Mountain Appalachian, Kurds, Arabs Americans, Jews	3.6
5. UK system	Skin color and/or country of birth, region or continent	White British, Black African, Black Caribbean, Bangladeshi, Asians Indians, Chinese, Pakistani, South Asian	5.7
6. Prioritisation system	Exclusion criteria using a referential group (Maori)	Maori, Pacific (non-Maori), Asians (non-Maori and non-Pacific), and Europeans (non-Maori, non-Pacific and non-Asian (nMnPnA)	1.8

avoided. However, a great variety of taxonomic systems is found. The first group of authors (n = 9/61) used the Office of Management and Budget (1997) classification system to define ethnic groups (Taxonomy 1). Most researchers however (n = 18/61) defined ethnic groups on the basis of countries or regions of provenance (Taxonomy 2). This is exemplified by Netherland studies where ethnicity is based on country of birth of the father and mother. A third group of authors (n = 7/61) combined the Office of Management and Budget system with countries (Taxonomy 3) while a fourth group (n = 6/61) defined ethnic groups on the basis of specific cultural markers (Taxonomy 4). The fifth group of authors include all studies conducted in the UK (n = 16/61), where British scholars avoid the use of "race" and preferred ethnicity but nonetheless used a system that combined skin color with geographical/country location (Taxonomy 5). Lastly, in studies conducted in New Zealand (n = 5/61), ethnic classification was based on a prioritization system based on the Maori people (see Taxonomy 6). Overall, amongst all authors who used only ethnicity, a third (34.4% or n = 21/61) failed to distinguish it with race. For example, these authors used categories such as White, White British and Blacks as ethnic groups.

Authors using only the concept of race in their studies all used the Office of Management and Budget (1997) classification system (Taxonomy 1) (n = 27/28), except one who used Taxonomy 3. None of the authors who used solely race were found to have mixed race and ethnicity; however, only 1 out of 28 authors acknowledge the use of race as a social construct.

Finally, studies who used neither race nor ethnicity used the Office of Management and Budget system (Taxonomy 1) (n = 12/21) or combined it with countries (Taxonomy 3) (n = 1/21). Other authors (n = 8/21) relied on countries or regions of provenance (Taxonomy 2). No clear evidence was found that authors who avoided the use of race and ethnicity failed to differentiate both concepts.

Transparency in methods and limits of classification

Overall, only 57.9% of studies provided details regarding the manner in which study subjects were assigned to the taxonomy categories. Such methods when given included self-reporting race or ethnicity, parent reported race or ethnicity, mother's race and origin listed on the infant's birth certificate, and identification in medical records. Outstanding positive cases

were found. For example; one study contained an entire paragraph devoted to the description and methods of ethnicity assignment.[18] At the other end, one study provided no details on the definition or methods used to identify a specific and rarely studied ethnic group; the Roma people of Europe.[54]

We found that only 19.6% of authors provided any discussion regarding the limits of using an ethnic or racial categorization. Of those mentioned, these limits were related to issues of group aggregation (e.g., Asian), generalization outside a given territory or state, generalization related to generational status, racial or ethnic misclassification by individuals or health-care providers, arbitrary measures of novel concepts (e.g.: ethnic enclave), and missing data on race or ethnicity. The homogeneity of racial or ethnic groups was simply assumed in 86.9% of articles reviewed.

Finally, very few researchers (6.4%) addressed the issues surrounding the biological significance of race or the social construction of the concept of race and ethnicity. More importantly, we found that only 10.3% of researchers who specifically aimed to describe and analyze psychosocial health related outcomes related to race or ethnicity addressed the issues surrounding the social meaning of these concepts.

Interpretation of ethnic or racial disparities

Lastly, we examined the nature of the interpretations given by authors to explain health disparities according to race or ethnicity (Table 5). First, we found that 69.3% of authors provided interpretations which were based on the actual analyzed data. Amongst these (n = 194), a variety of interpretations were used with the most popular being variations of socioeconomic (16.5%) and psychosocial (16.5%) models, followed by acculturation or immigration models (10.8%). Other models are shown in Table 5. It is noteworthy to mention that 26.8% of authors provided more than one interpretation model based on several factors and covariates being measured in their study.

We found however that 40 or 14.3% of studies provided interpretations that were not based on actual analyzed data either because the interpretations provided belonged to a domain (e.g., socioeconomic) which was not included in the study design or because interpretation model (e.g, racism) was addressed by a proxy (e.g., race) and not by a more specific measure (e.g., perceived racism). Lastly, in 46 or 16.4% of all studies, authors provided no interpretations at all of ethnic or racial health disparities observed because the study was merely descriptive.

Table 5. Interpretations models used to explain health disparities in public health and epidemiology research, 2009 to 2011. (n = 280)

Variable	n	%
Data interpretation[a]		
No interpretation provided	46	16.4
Interpretation provided but not based on data analyzed	40	14.3
Interpretations provided and based on analyzed data	194	69.3
Interpretation models (n = 194)[b]		
Socioeconomic	32	16.5
Psychosocial	32	16.5
Acculturation/immigration	21	10.8
Health care services	14	7.2
Norms, attitudes, beliefs	12	6.2
Behavioural	10	5.2
Biological/genetic	7	3.6
Ethnic density	7	3.6
Physical environment	5	2.6
Political/social organization	2	1.0
Multiple (2)	34	17.5
Multiple (3+)	18	9.3

[a] If researchers interpreted health disparities using a specific theoretical model

[b] The interpretation provided belonged to a model (e.g. socioeconomic) which was not included in the study design or the interpretation model (e.g, racism) was addressed by a proxy (e.g., race) and not by a more specific measure (e.g., perceived racism);[3] Interpretation models were classified by types using open and focused coding procedure. These types are: socioeconomic (e.g., based on poverty, education), psychosocial (e.g., based on the effects of racism or discrimination), acculturation/immigration (e.g., health disparities are attributed to changes in the process of migration and/or cultural change), health care services (e.g., disparities are due to language barriers in the use of health care services), norms, attitudes and beliefs (e.g., health disparities are caused by differences in health beliefs, norms or attitudes), behavioral (e.g., based on behavioral differences such as drug or tobacco use) biological/genetic (e.g., health disparities are attributed to different biological or genetic constitution specific to racial or ethnic groups), ethnic density (e.g., neighborhood effects), physical environment (e.g., health differences are attributed to differential exposure of groups to the physical environment), political/social organization (health differences are attributed to different social or political organization particular to ethnic or racial groups)

DISCUSSION

This paper presented the most recent and comprehensive review of the use of race and ethnicity to address health disparities in public health and epidemiology research. The strengths of this review include the cover of multiple high impact factors journals several of which had never been previously reviewed. Our review also included a wide range of questions and topics which had not been addressed in past reviews.

Several findings reported may help orient future research that addresses racial and ethnic health disparities. We identified key problems including: a) a failure from researchers to differentiate between the concepts of race and ethnicity where both concepts are often used interchangeably or merged into a single entity termed "race/ethnicity"; b) an inappropriate use of racial categories to ascribe ethnicity; c) a lack of transparency in the methods used to assess both concepts; d) failure to address limits associated with the classification and use of racial or ethnic taxonomies and; e) failure to recognize the social meaning of race in discrimination and racism studies.

The confusion between race and ethnicity, as well as the inconsistency and lack of transparency in the methods used to assess race or ethnicity, are clearly not a new problem in the field.[12] Plainly, this problem continues to persist even ten years later and must be addressed once and for all. More importantly, this confusion was noted in theoretical and methodological papers. For example; in an interesting discussion of how the theory of Durable Inequality may apply to ethnic health studies, authors avoided the term race and preferred ethnicity, yet they considered Whites and Blacks as ethnic groups.[37] Additionally, in a paper addressing the importance of multilevel modeling, both race and ethnicity were used rather interchangeably and inconsistently.[45]

It is important to acknowledge the positive findings we observed as well. For instance, several authors employed variables in addition to race and ethnicity which are more specific to the research questions and which are clearly related to underlying factors of health disparities. These include acculturation measures, immigration status, as well as concepts grounded in a relational approach such as racial centrality, colourism, and racial expressed identity.

Another positive finding was that the majority of articles reviewed were grounded in a theoretical framework and provided interpretations from various models and were based on analyzed data. This finding is important to consider since problems in the interpretation of results were reported by Comstock et al[12] (2004), where they found that only "30.4 percent of authors discussed their findings in terms or race and ethnicity" (p. 617). Clearly, the situation has improved over the years however the need to address it remains.

Questions About the Relationship Between Human Diversity and Health

To address the key problems noted in this review we must start with the recognition that race and ethnicity are conceptually different. Only then can the proper theory and methods be appropriately chosen to study either, or the interactions of both in the production of health problems. We believe the best ways to think about ethnicity, race and health is to dichotomize research into two sets of questions about the relationship between human diversity and health.[40] However, before describing these sets of questions, we must be clear as to what kind of diversity are we speaking about. Two points need to be addressed.

First, if researchers aim to study health disparities upon the rationale of biological diversity, that is where health differences are attributed to biological or genetic constitutions, they should clearly state it and address the question of biological plausibility. Relevant markers must be used to identify groups of populations that differ on a biological basis, including genetic markers. Today, rather than using phenotype or continental location, human biological variation can be assessed using genetic markers,[44] along with other forms of genealogical and historical knowledge.[46]

Second, social diversity, in terms of education, class, employment and income, is a separate rationale upon which health disparities can be studied. Some scholars recommend that researchers should separate the effects of socioeconomics factors from those of race and ethnicity.[35] This is the case in studies we excluded from this review because they did not address nor frame their research questions in terms of ethnicity, but rather in socio-economic and political terms (e.g., studies comparing different political regimes across countries).[20,34] Indeed cross-country comparisons address social, economic and political disparities, not ethnic disparities.

The reminder of this section focuses on cultural diversity and introduces two sets of questions. The first set of questions is how do cultural factors particular to an ethnic group such as religious beliefs, dietary traditions, behaviors, beliefs and attitudes affect health? These questions correspond to what Juteau[27] (1999) named the inner frontier of ethnic identity, i.e., the characteristics that are share by an ethnic group. It also corresponds to what Ford & Harawa[16] (2010) called "the attributional" dimension of ethnicity. One example of a model embedded in this first set of questions is the health behavior model where health differences are attributed to behavioral factors particular to ethnic groups.[16] An understudied research area that fits into this first set of question are assets-based approaches that identify strengths particular to ethnic groups and that confer them specific health advantages.[16]

The second set of questions is concerned with the ways human groups interact together in the social arena, on the basis of both race and ethnicity. These questions are grounded in a relational approach, and correspond to the outer frontiers of ethnic groups, or as Ford & Harawa[16] (2010) explain; the relational dimension of ethnicity. One model embedded such a relational approach is the cultural adaptation model, in which health disparities are the product of changes and challenges experienced

through acculturation and migration processes.[23] Another model is the psychosocial stress model in which health disparities are associated with stress related problems stemming from the experience of discrimination.[14] Neighborhood effects of ethnic segregation, racial and ethnic discrimination, language or beliefs barriers in the use of health services, all fall into this second relational dimension of human diversity.

A number of methodological challenges must be addressed when using these two sets of questions about the relationship between human diversity and health. Ethnicity and race are concepts that are complex, subjective, and vary according to the demographic and migration patterns, and sociopolitical history of each country.[14] Clearly, researchers are faced with the problem of using groups that are not too heterogeneous and sufficiently large in sample size. However, the use of heterogeneous ethnic or racial categories (such as Hispanics or Blacks) will only generate imprecise data. The only universal recommendation would be to choose the methods to identify ethnic or racial groups in direct relation to the research question and setting.

However, several points are clear: a) ethnicity must be defined by cultural markers and not biological ones; b) continental categories such as Africans or Asians are too culturally heterogeneous to be used by themselves; c) countries are socio-political entities and not necessarily culturally ones; d) while language is a cultural marker, categories such as Hispanic are culturally heterogeneous; e) Whites and Blacks are socially constructed racial categories, not ethnic groups, and f) discrimination is established on the basis of both ethnicity and race.

Above all, authors must be transparent in their methods to ascribe race or ethnicity and acknowledge the limits of the classification they choose to use. In cases where large aggregated groups are used, researchers should always justify their aggregation in terms of the research questions and the variables of interest.[48] The extremely low number of researchers that described their methods of group assignment suggests that these authors take race and ethnicity categories for granted and are not aware of or concerned by the limits and issues related to the use of these categories.

There are also promising developments such as the use of novels methods to define race and ethnicity employed by researchers using a constructivist and/or relational approach.[9,16,21,53] Also, instead of addressing ethnic identity directly, some researchers are dissecting its components (e.g., religion, language, norms, beliefs, etc.) and using fine grain methods to analyze their relation to health and disease.

Limits

Our sample included research predominantly done in the United States. Different methods and perspectives to investigate the question of human diversity may apply to research done elsewhere in the world. Our review suggests however that our results are also true for research done in all western countries. Second, the review has been conducted by a single rater. A list of all reviewed articles is provided in a supplemental file and is open to criticisms on aspects the author might have been mistaken on. Finally, this review did not cover journals in specialized fields that are of public health and epidemiological health relevance (e.g., in psychiatry). We are confident however that by choosing high impact journals we are presenting the current trends in the use of race and ethnicity in the most state-of-the art research. Reviews conducted in biomedical research[33] and nursing science[15] suggests that our results reflect the wider phenomenon of health research.

CONCLUSIONS

Ethnicity has overtaken race in medical science over the course of the second half of the 20th century.[2] However this shift is useless unless it is accompanied by a theoretical understanding of what race and ethnicity are as concepts related to human diversity. Similarly, experienced researchers from a Latin/North American workshop have called for more theoretically driven and specific oriented research to address the main priority of eliminating health disparities.[31] To undertake such an important quest, researchers must cease to systematically mix race with ethnicity, and understand the theoretical basis upon which each of the concepts affect the health of individuals and populations. Ultimately, the construction and operationalization of race and ethnicity not only determine the quality of research but also affect the way heath disparities are portrayed by the media, perceived by the public and tackled by politics and prevention practices.[29,42,52]

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