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Research on health inequalities: A bibliometric analysis (1966–2014)

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ABSTRACT

The objective of this study is to report on research production and publications on health inequalities through a bibliometric analysis covering publications from 1966 to 2014 and a content analysis of the 25 most-cited papers. A database of 49,294 references was compiled from the search engine Web of Science. The first article appears in 1966 and deals with equality and civil rights in the United States and the elimination of racial discrimination in access to medical care. By 2003, the term disparity has gained in prominence relative to the term inequality which was initially elected by the researchers. Marmot's 1991 article is one of the five papers with the largest number of citations and contributes to the central perspective of social determinants of health and the British influence on the international status of research on social inequalities of health.

1. Introduction

Health inequalities have long been recognized as a major public health concern. Questioning the progress towards resolving this issue, the United Kingdom Department of Health and Social Security commissioned the Black Report, (Black, 1980) published in 1980. This landmark report found that despite the introduction of the United Kingdom National Health Service in 1948, health inequalities continued to increase between different strata of the population due largely to the further widening of the unequal distribution of socio-economic advantages. This finding was virtually ignored in the era of the Thatcher Conservative government (1979–1990). But in 1997 the new Labour government convened the Acheson Commission on Inequalities in Health to examine the state of the evidence. The Commission's report concluded that the weight of scientific evidence confirmed a socioeconomic explanation of health inequalities (Acheson, 1998). In the United States, the National Center on Minority Health and Health Disparities (NCMHD) was established in 2000 by a Congressional legislation, and a strategic plan was developed to address the continuing poor health situation of minorities (IOM, 2006). This contributed to the development of the research on racial and ethnic disparities. Interest in the study of social inequalities in health has persisted over the years. Unfavorable socioeconomic conditions, pertaining to income, education, housing, employment, and work situation are now irrefutably considered contributors of ill health, and along with ethnicity and gender, are referred to as social determinants of health (WHO-CSDH, 2008).

In this study, we take a closer look at the scientific productivity of research in health inequalities by conducting a bibliometric analysis. The objective is to understand the main thrust of health inequalities research and its production and evolution over time. Bibliometrics is a straightforward analytical approach to measuring and evaluating a large number of scientific publications and citations (Ismail et al., 2009). Bibliometrics was developed in the 1960s, mainly in the field of science and technology. In 1960 the Institute for Scientific Information (ISI) was created to develop and provide bibliographic database services, with a specialized indexing system and citation-computation features. As of 2014, more than 20,000 journals titles in science, social sciences, humanities and arts have been indexed and made available through ISI's Web of Science (WoS) database service (http://wokinfo.com/citationconnection/). ISI also publishes on an annual basis the *Journal Citation Reports*, which assign an impact factor to each of the journals it monitors (http://wokinfo.com/products_tools/analytical/jcr/). Because bibliometric indicators take into account research impact, they have become an indispensable tool for policy makers (Katz, 1999).

Previous bibliometric analyses on the topic of scientific production on health inequalities have been conducted in the past, but

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were focused on one region (Almeida-Filho et al., 2003) or country (Benach de Rovira, 1995). Other studies relevant to our analysis have a broader scope measuring trends in health research (Clarke et al., 2007; Tarkowski, 2007), and in health systems research (Yao et al., 2014), or assessing the evolution of studies of health reforms regionally (Macías-Chapula, 2002). Another bibliometric study looked at publication patterns on access to health services in developing countries (Ritz et al., 2010).

This paper reports on a bibliometric analysis of health inequalities research published from 1966 to 2014, as well as a content analysis of the 25 most-cited articles. Specific consideration is given to the volume of articles published, the use of terminology over time, citation practices, as well as the most productive authors and journals in the field of health inequalities.

2. Method

2.1. Sources of data and selection criteria

The reference database for this study was compiled from an electronic search in Web of Science and then translated into a BibTeX file. "All Databases" in Web of Science was used due to its multi-disciplinarity, global representativeness of core scientific output, and citation-analysis capabilities. To build the reference database, we identified all the references related to health or health care (e.g. Medicare) and to the three main terms of interest: equality/inequality (ies), disparity (ies) and equity/inequity (ies). The electronic search was limited to original articles, review articles, conference abstracts and research notes that contained at least one of the aforementioned terms in the titles, abstracts or keywords. The search strategy involved the following search query:

$$\begin{aligned} Topic = &((health\ or\ care)\ AND\ (disparit*\ OR\ inequalit*\ OR\ inequit \\ &*\ OR\ equit*\ OR\ equalit*))\ Refined\ by\ document\ type \\ &= (article\ or\ review\ or\ proceedings\ paper\ or\ note) \end{aligned}$$

2.2. Bibliometric analysis

Bibliometric analysis was conducted by using descriptive, relational and qualitative indicators. The descriptive measures give an account of the volume of publications and citations. Relational indicators refer to the extent of collaboration between authors and citation practices. Qualitative indicators are based on the keywords provided for each selected article. To manage and process the articles retrieved from the WoS database, we created the *Bibliothécaire*, a computerized program which integrates existing information-processing methods. These methods include the following: a) estimation of retrieval quality measures of accuracy (bootstrap sampling technique) (Efron, 1979), b) least squares for exponential functions (Chatterjee et al., 2000); and c) various information-gathering techniques related to publication characteristics (e.g. annual volume production, language, indexed keywords, journal citation impact, and author affiliation). We used the 2013 edition of *Journal Citation Reports* to determine the journal citation impact. We accessed information on the authors' disciplinary affiliation base ("Departments", "Units", "Division") in order to identify the disciplines that contributed the most to the scientific corpus on health inequalities.

All retrieved references that were formatted into the BibTex file were imported into the custom-built *Bibliothécaire* in order to assess the validity of the search request. *Bibliothécaire* performed the interactive calculation of the precision of input references P, which is obtained by the equation (P = TP/T), where the variable TP (for True Positive) is the number of references that are relevant to the query variables and T is the total number of references found by the query. The calculation performed by the computer software uses a sampling method that provides an accuracy estimate relative to the number of references reviewed by the researcher. The precision estimate of the query is 0.87, with a standard error of 0.01.

Scientific productivity in the field of health inequalities over time was analyzed using the parametric function $A\exp(B\cdot x)$, where $A = 3.608 \times 10^{-157}$ is the parameter that characterizes the initial value of production, near zero from 1966 to 1980, and $B = 0.17077$ indicates the growth rate, and allows for the prediction of future growth.

2.3. Content analysis

A general content analysis was performed, based on the keyword searches, in order to identify prominent conceptual domains characterizing the corpus of health-inequality publications. Next, the 25 most-cited articles were considered for a more detailed content analysis, given their potential influence on the scientific literature on health inequalities.

3. Results

3.1. The annual volume of productivity

The search retrieved a total of 49,294 scientific papers on the general subject of health inequalities, excluding duplicates. The first article appeared in 1966. Yet it took 25 years before a modest productivity would flourish at an exponential rate; after 1990, the number of articles doubled every 4.06 years (Fig. 1). The model predicted that by 2016 the scientific production in the field of health inequalities would yield approximately 50,000 publications.

To determine which terminology among the terms of (in) equalit(y/ies), disparit(y/ies) and (in)equit(y/ies) was being used and how its use evolved over time, we plotted the number of publications identified by each keyword against the year of publication. Fig. 2 shows that both terms "inequality" and "inequity appear in comparable frequency until the year 2000, after which time the "inequality" term was increasingly used. However, 2002 marked the turning point when the term "disparity" surpassed both equality-related and equity-related terms.

3.2. Authors and their affiliations

The number of authors participating in this scientific productivity is 74,133, representing the contribution of 3.92 authors, on average, per publication (Standard Deviation 2.20). About one third of these authors (30.5%) are first authors. The maximum number of co-authors collaborating on a publication is 169 (Samb & WHO Group, 2009), while single-author papers account for 18.4% (n = 9052) of all publications. Table 1 lists the most productive authors, along with their affiliations, according to the number of publications with which they are associated. The three most prolific authors were J.P. Mackenbach with 219 publications, I. Kawashi with 177 publications and C. Borrell with 161 publications.

Twenty-five academic institutions were responsible for 23% of the total literature produced. From these institutions, 21 were from the United States, two from United Kingdom and two from Canada. The disciplines that were most frequently represented include medicine (21.6%), public health (18.4%), epidemiology (15.1%) and social medicine (10.4%).

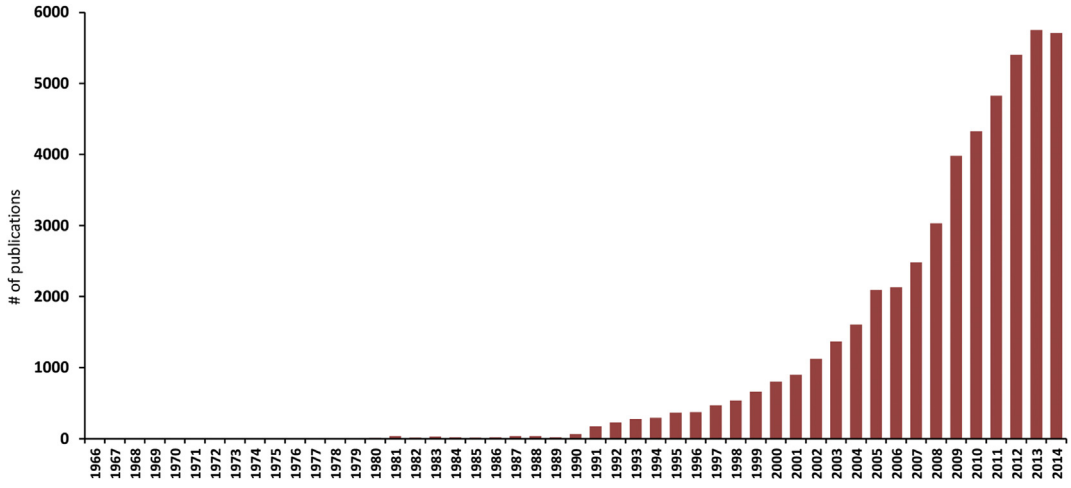

Fig. 1. Number of publications per year in the health inequalities field; 1966–2014.

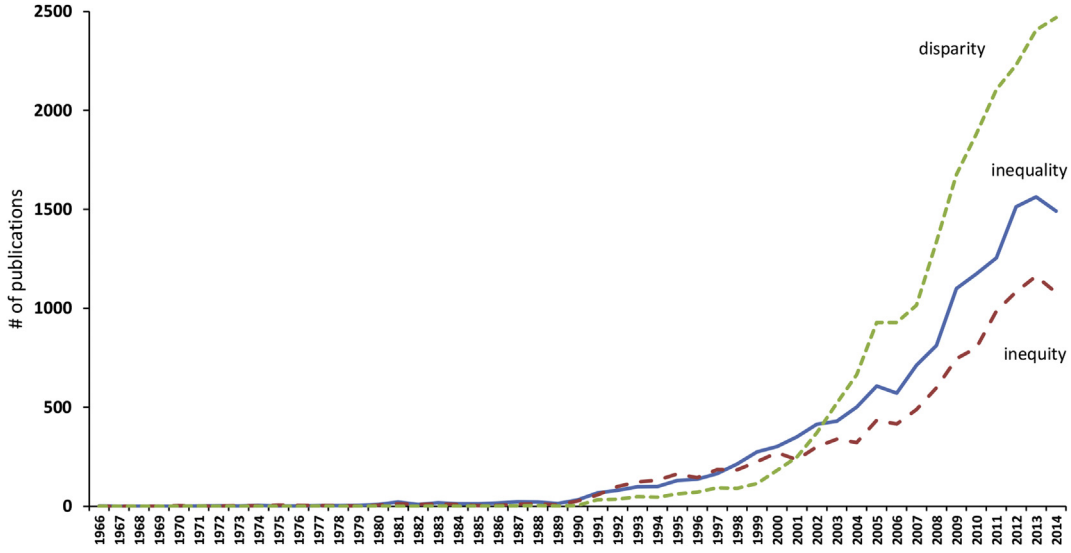

Fig. 2. Frequency of use of terms "disparity" "inequality" "inequity" by year; 1966–2014.

3.3. Impact factor of relevant scientific journals

The 49,294 selected articles were published in 4793 journals; however 12% of these articles were retrieved from eight journals only. *Social Science & Medicine* is the journal which has by far the largest number of publications on health inequalities, followed by the *American Journal of Public Health* (Table 2). According to the impact analysis for 2013, most of the journals scored under 5. The journals publishing the most articles on the topic of health inequalities are not among those with the greatest impact. *Lancet* (39.20) has the highest impact score among the journals (around 300 articles, <1%) and has published four of the most-cited papers in the health-inequality field. Other medically-oriented journals with high impact score, such as the *New England Journal of Medicine* (54.420) and *JAMA* (30.387), have also published highly cited articles in this field.

3.4. The language and geographical distribution of publications

Research from 56 countries contributed to the literature on health inequalities, but ten countries account for 94% of the production, with the United States (52%) and United Kingdom (30%) responsible for a large majority of this work. Over 96% of the articles were published in English, while only one percent were published in Spanish. The remainder consisted of articles written in Portuguese, French, German or Chinese, representing less than 1% each.

3.5. Summary analysis of keywords

Keyword analysis provides an indication of the conceptual structure of a given search theme and the changes that occur over time. This type of analysis is based on the qualifiers chosen by the authors as well as those generated by indexing practices. The total number of keywords found among the identified articles is 46,049; however, no keywords were highlighted for nearly half (47%) of these articles. The most common single terms included were: "health disparities," and "disparities and race," each identified over thousand times. Other frequent terms were race/ethnicity/minority, social class/socioeconomic status/factors, mortality, gender/women, health inequalities, equity, social justice, education, poverty/deprivation, children, African-American,

Table 1
The most productive authors in the health inequalities field; *1966–2014*.

Author	Affiliation[a]	Number of publications
1. Mackenbach J.P.	Erasmus University, Rotterdam, Netherlands	219
2. Kawachi I.	Harvard School of Public Health, Boston, US	177
3. Borrell C.	Agency of Public Health, Barcelona, Spain	161
4. Kunst A.E.	University of Amsterdam, Amsterdam, Netherlands	143
5. Marmot M.	University College, London, UK	176
6. Subramanian S.V.	Harvard School of Public Health, Boston, US	115
7. Martikainen P.	University of Helsinki, Helsinki, Finland	110
8. Smith G.D.	University of Bristol, Bristol, UK	106
9. Muntaner C.	University of Toronto, Toronto, Canada	99
10. Lahelma E.	University of Helsinki, Helsinki, Finland	89
11. Krieger N.	Harvard School of Public Health, Boston, US	87
12. Ayanian J.Z.	Harvard School of Public Health, Boston, US	86
13. Williams D. R.	Institute for Social Research, University of Michigan	83
14. Stronks K.	Department of Social Medicine, Academic Medical Center, University of Amsterdam, Netherlands	83
15. Fiscella K.	University of Rochester, Rochester, US	76
16. Galea S.	Department of Epidemiology, Mailman School of Public Health, Columbia University, US	75
17. Benach J.	Universitat Pompeu Fabra, Barcelona, Spain	74
18. Rahkonen O.	University of Helsinki, Helsinki, Finland	72
19. Regidor E.	Universidad Complutense de Madrid, Spain	72
20. Alegria M.	Center for Multicultural Mental Health Research, Cambridge Health Alliance, US	68
21. Cooper L.A.	Department of Medicine/Department of Health Policy and Management, Johns Hopkins University Bloomberg School of Public Health, US	67
22. Whitehead M.	University of Liverpool, UK	65
23. Mckee M.	London School of Hygiene and Tropical Medicine, UK	64
24. Mielck A.	Institute Health Economics & Health Care Management, Neuherberg, Germany	62
25. Blakely T.	Department of Public Health, Wellington School of Medicine, University of Otago, New Zealand	61

[a] Most recent affiliation for the time frame of the study.

Table 2
The 25 most productive journals in the in the health inequalities field (total of journals cited: 4793); *1966–2014*.

Impact factor 2013	Journal	Number of publications (%)
2.558	Social Science & Medicine	1805 (37.7)
4.229	American Journal of Public Health	967 (20.2)
3.294	Journal of Epidemiology and Community Health	756 (15.8)
2.321	BMC Public Health	657 (13.7)
3.534	Plos One	499 (10.4)
0.902	Journal of Health Care for the Poor and Underserved	459 (9.6)
3.423	Journal of General Internal Medicine	457 (9.5)
2.459	European Journal of Public Health	423 (8.8)
2.941	Medical Care	374 (7.8)
4.901	Cancer	371 (7.7)
2.435	Health & Place	371 (7.7)
1.725	Health Policy	365 (7.6)
30.387	Journal of the National Medical Association	364 (7.6)
16.378	British Medical Journal	350 (7.3)
5.297	Pediatrics	319 (6.7)
39.207	Lancet	319 (6.7)
1.589	International Journal for Equity in Health	313 (6.5)
1.659	BMC Health Services Research	310 (6.5)
0.921	Ethnicity & Disease	293 (6.1)
4.975	International Journal of Epidemiology	293 (6.1)
0.988	International Journal of Health Services	282 (5.9)
4.321	Health Affairs	280 (5.8)
4.975	American Journal of Epidemiology	245 (5.1)
2.491	Health Services Research	235 (4.9)
2.137	Health Economics	233 (4.9)

mental health, obesity, health policy; cancer, social capital and primary care.

When examining the patterns of keywords used, the most common combination was health disparities and race/ethnicity (including African Americans), in addition to social factors (e.g. income, education) and access. Such patterns reflect the importance of health inequalities among populations with different ethnic or racial origins, and highlight the need to study social inequalities in health among minority groups.

3.6. The most-cited articles

A more extensive content analysis was conducted on articles that have contributed notably to health-inequality research. The 25 most-cited articles, with a combined total of 27,282 citations, represent the academic achievements of 95 authors (Table 3). The average number of authors per article was 3.92 (Standard Deviation 2.2). Only two articles had sole authors: Krieger, 1992 and Marmot, 2005.

Table 3
The 25 most-cited publications in the health inequalities field; *1966–2014*.

	Articles	Citations	Journal title	Impact factor (2013)
1	Hedley et al., 2004	2500	Journal of the American Medical Association	30.387
2	Martin et al., 2003	2385	New England Journal of Medicine	54.420
3	Fehr and Schmidt, 1999	1928	Quarterly Journal of Economics	5.966
4	Siegel et al., 2011	1788	CA-Cancer Journal for Clinicians	162.500
5	Marmot et al., 1991	1503	The Lancet	39.207
6	Kamangar et al., 2006	1384	Journal of Clinical Oncology	17.960
7	Israel et al., 1998	1247	Annual Review of Public Health	6.627
8	Kawachi et al., 1997	1102	American Journal of Public Health	4.229
9	Krieger et al., 1997	1009	Annual Review of Public Health	6.627
10	Krieger, 1992	949	American Journal of Public Health	4.229
11	D'Agostino et al., 2001	939	Journal of the American Medical Association	30.387
12	Finer and Henshaw, 2006	866	Perspectives on Sexual and Reproductive Health	2.164
13	Pappas et al., 1993	859	New England Journal of Medicine	54.420
14	Starfield et al., 2005	826	Milbank Quarterly	5.391
15	Pickett and Pearl, 2001	817	Journal of Epidemiology and Community Health	3.294
16	Alesina and Rodrik, 1994	758	Quarterly Journal of Economics	5.966
17	Drewnowski and Specter, 2004	746	American Journal of Clinical Nutrition	6.918
18	Williams and Collins 1995	741	Annual Review of Sociology	3.630
19	Lantz et al., 1998	697	Journal of the American Medical Association	30.387
20	Winkleby et al., 1992	694	American Journal of Public Health	4.229
21	Mackenbach et al., 2008	672	New England Journal of Medicine	54.420
22	Prince et al., 2007	672	The Lancet	39.207
23	Macintyre et al., 2002	663	Social Science & Medicine	2.558
24	Marmot 2005	636	The Lancet	39.207
25	Marmot et al., 1997	627	The Lancet	39.207

The top five articles were published in prestigious journals in medicine and public health, most of them with an impact factor over 25: *Cancer Journal for Clinicians* (162.50), *New England Journal of Medicine* (54.42), *Lancet* (39.20), *Journal of the American Medical Association* (30.38), and *Quarterly Journal of Economics* (*5.96*).

The 25 most-cited articles that dealt with topics related to health inequalities fall under one of the following types of study.

1. Epidemiological studies: studies that identify factors associated with health outcomes or access to health services
2. Incidence/prevalence studies: studies that focus on statistics regarding mortality, morbidity, and/or morbidity-related conditions, and may include sub-group analyses based on socio-economic status, ethnicity/race, and/or gender (i.e. the social determinants of health)
3. Ecological studies: studies that analyze the relationship between income distribution, or other social indicators, and health outcomes within and between countries
4. Methodological research: studies that seek to validate, or justify the need to use, certain upstream measures to investigate health inequalities, or that provide guidance for engaging the community in research aiming to address such health inequalities
5. Policy research: studies that explore current understanding of health inequalities and discuss promising or needed approaches to reduce them
6. Economics studies: research that examines inequality from an economic perspective, with implications for a healthier society

The relative distribution of these study types, according to the key terms of interest, is presented in Table 4. Nearly one third of the most cited articles (8 out of 25) fall under the category of epidemiological studies. The remainder consists of five methodological research papers, four incidence/prevalence studies, three ecological studies, three policy research papers, and two economics studies.

The terminology in the health-inequality field has not been used consistently over time. In fact, some authors did not use any specific terms, and simply discussed health in the context of socioeconomic conditions or social factors. Other authors used a variety of terms that also included social gradients (social variations) in health, socioeconomic differences in disease incidence, and social distribution of disease. Yet overall, a large majority of authors (23 out of 25 articles) used at least one of the terms of interest—inequality, inequity, disparity. By contrast, only nine of the 25 most-cited articles were indexed following this terminology. Other terms used by indexers include black-white differences, racial differences, ethnic differences, and class mortality differentials.

4. Discussion

Usage of the prevailing terminology in health-inequalities research began in the mid-1960s. It continued at a steady but slow pace until the 1990s, when it began to grow exponentially, with the number of publications doubling about every four years. The first article in our reference database (Meltsner, 1966), which dates back to 1966, dealt with equality and civil rights in the United States. In this article, Meltsner examined the archives of the Department of Health and the role of the education, welfare and justice systems in initiatives to eliminate racial discrimination in accessing medical care.

The second article in the reference database, which also dealt with unequal access to health services, came from a 1971 study by Bosanquet (1971) whose work, to a great extent, has shed light on the social inequalities in health care. The following year, Fein (1972) examined the implications of establishing a universal system of financing and service delivery that remunerated physicians based on a salary or capitation plan, and concluded that this approach was the only way to distribute resources and provide health services in an equitable manner. Considering the state of affairs at that time with the same critical view, Townsend questioned whether the establishment of the United Kingdom's national health care system in 1948 was really the glorious accomplishment it was meant to be. Although the right to have access to health care, regardless of class or income, was a firmly established principle, health services for some population groups remained grossly inadequate (Townsend, 1974). Improving social inequalities would first require that health and health needs be redefined, professional and

Table 4
Relationship between types of most-cited studies and terms of interest used by authors in the titles, abstracts, keywords, and/or full text; *1966–2014*.

Terms used by authors	Type of study						
	Epidemiological Studies	Incidence/Prevalence Studies	Ecological Studies	Methodological Research	Policy Research	Economic Studies	Total
disparit(y/ies)	1[a] 1[b]	4	–	1[a]	–	–	7
(in)equit(y/ies)	–	–	–	–	–	–	0
(in)equalit(y/ies)	2[a]	–	1	1[c] 1[d]	1	–	6
dispart(y/ies) and (in)equalit(y/ies)	2	–	1	–	–	–	3
(in)equit(y/ies) and (in)equalit(y/ies)	–	–	–	1	1	2	4
dispart(y/ies), (in)equit(y/ies) and (in)equalit(y/ies)	2	–	1	1	1	–	5
Total	8	4	3	5	3	2	25

[a] Indexer used “inequalities”.
[b] Indexer, not authors, used “disparities”.
[c] Indexer used “income inequality” only.
[d] This study mentions the “equality” of relative risks, however the topic is directly about inequalities in health outcomes.

organizational values adjusted, and patients engaged.

Despite the critical need to thoroughly investigate the topic of health inequalities, none of the articles produced from 1966 to 1990 are among the most cited. The earliest article on the most-cited list, cited over a thousand times, was published in 1991 by Marmot and colleagues in regards to the Whitehall II Study (M.G. Marmot et al., 1991), a turning point in health inequality research that coincided with the start of an exponential growth in scientific productivity. The Whitehall II Study clearly showed that differences in morbidity between social classes had not declined over the preceding 20 years. The lower the social position, the higher the incidence of most of the diseases studied (e.g. angina, ischemia, bronchitis) and the greater the exposure to risk factors (e.g. smoking, poor diet, lack of exercise, adverse social and economic circumstances). The authors recommended that greater attention be placed on the social environment, work settings and consequences of income inequality. The following section presents further insights gleaned from the 25 most-cited articles, the summaries of which appear in the Appendix.

4.1. Insights from the 25 most-cited articles

The 25 most-cited articles provide a practical glimpse into the ways in which the topics of disparity, equality/inequality and equity/inequity have been brought up within the research community, with a special emphasis on health. These articles are discussed below according to the type of studies to which they belong: epidemiological study, incidence/prevalence study, ecological study, methodological research, policy research, or economics study.

Epidemiological evidence over the years has led to the development of conceptual models to deepen our understanding of population variables associated with health outcomes. Early contributors to this work are the widely-known Whitehall II study on health inequalities among British civil servants, and the subsequent investigations on social variations in the incidence of coronary heart disease (M. Marmot et al., 1997; M. G. Marmot and Smith, 1991). These studies clearly demonstrate that social class (e.g. grade of employment, or job status) is associated with health-risk behaviors, low-quality work, unfavorable social environments, and increased mortality. In addition, low job control explains a considerable portion of the variation in morbidity across socio-economic positions beyond behavioral tendencies. Other highly cited articles have added to this socio-economic patterning of health differences. Taken together, their models of health inequality indicate that social factors (e.g. socio-economic status, gender and ethnicity/race) underlie differences in health outcomes by determining people's food choices, their exposure to other behavioral and biological risks, and their access to health-promoting resources (Drewnowski and Specter, 2004; Pappas et al., 1993; Williams and Collins, 1995; Winkleby et al., 1992). Whereas health differences were expressed either as “inequalities” or “disparities”, the term “inequalities” was used particularly to denote differences in the social determinants of health.

With respect to differential access to health services, the quality of these services must also be taken into account. In their model to explain disparities in the rate of unintended pregnancies, Finer and Henshaw (2006) found that poor, uneducated and non-white women were less likely to have access to effective contraceptives. The need to improve the equal uptake of effective services is as important a consideration as addressing issues of unequal service access.

Incidence and/or prevalence studies generally include subgroup analyses to identify any differential distribution of risk factors. Two such studies covering the incidence of sepsis and the prevalence of obesity and overweight, respectively, reported disparities by sex and racial/ethnic identity in order to identify groups at higher risk (D'Agostino et al., 2001; Hedley et al., 2004; Martin et al., 2003). Kamangar et al.'s study examined cancer disparities according to the geographical area, and found differences in socioeconomic status, as well as in lifestyle behavior and level of exposure to toxic substances and infectious agents (Kamangar et al., 2006). Siegel et al. (2011) calculated the number of deaths due to cancer that could be avoided by eliminating educational and racial disparities. They concluded that low socioeconomic status or poverty among African Americans, had a greater impact on cancer disparities than did the racial group to which they belonged.

Ecological studies, such as macro-economic analyses and neighborhood studies, also contribute to model development by examining the relationship between measures of health determinants (including income inequalities) and health outcomes within and between countries. Some highly cited studies went beyond individual-level conditions of risk, and identified the area in which people live as having an influence on health. One area-related determinant of health is the social capital that shapes the quality of the living space. Decreased social capital, measured in terms of civic engagement (group membership) and a lower level of mutual trust among community members (social trust), appear to mediate the relationship between income inequality and mortality (Kawachi et al., 1997). Taking this analytical approach one step further, Mackenbach et al. (2008) found variations in the *magnitude* of inequalities in mortality among European countries, and

detected influences on health above and beyond that of income inequalities. For example, the Mediterranean culture (e.g. social norms supporting healthy eating and discouraging smoking) seems to counter, in part, the adverse health effects of income inequalities, while welfare policies to compensate for unequal income distribution, although necessary, may not be sufficient to reduce lifestyle-related risk factors. These findings support the earlier observation of modest neighborhood effects on health, which suggests a health risk associated with the social structure and ecology of neighbourhoods. Among the key characteristics of neighbourhoods with poorer health status are infrastructure deprivation (e.g. lack of parks and stores selling healthy, affordable foods), stress, lack of social support, prevailing social norms that are not conducive to healthy living, and low availability/accessibility of health services (Pickett and Pearl, 2001). All of these studies addressed the influences of the structural determinants of health that extend beyond the health effects of income inequalities.

A few of the most-cited articles covered methodological topics. One study describes the many facets of community-based research that aims to understand and address social, structural, and physical inequities related to health (Israel et al., 1998). The authors' mention of the term *inequities*, in this particular instance, seems to reflect the purpose of the research activities to empower community members in taking action on matters appearing unjust. Social inequalities in health, or social gradients in health, are the subject of two other methodological studies. These studies have made major inroads in conceptualizing and validating individual-level and census-derived measures of socio-economic position, including income, poverty, social class, deprivation, wealth, and education (N. Krieger, 1992; N. Krieger et al., 1997). However, not all relevant measures pertaining to differences in health outcomes have undergone the same level of advancement. Macintyre et al. (2002) argue that insufficient attention is being given to the upstream determinant of health known as place of residence. These authors understand place of residence to be characterized by contextual, material and institutional resources and opportunity structures as well as “collective social functioning and practices”. They contend that the field of health inequality research needs to put more effort into ensuring that the effects of place on health are adequately conceptualized, operationalized and measured. This approach would complement other validation studies. For instance, the validation of the prediction scores regarding coronary heart disease, derived from the prominent Framingham cohort, examines individual characteristics only (D'Agostino et al., 2001). This cohort has greatly contributed to the scholarly understanding of health-inequality factors, but this contribution has been limited in its scope.

Among the various policy research papers on health inequalities, three stand out above the rest. In their review of primary care, Starfield et al. (2005) discuss the strong influence that primary care and income inequality have on health outcomes. They used the terms “inequalities” and “disparities” interchangeably in regards to health differences in the population, but seemed to prefer the term “disparities” when referring to racial and socioeconomic groups. The evidence indicates that equitable access to primary care services remains a policy challenge despite findings of major contributions to the reduction of inequities in the population's health (Starfield et al., 2005). In addition, mental health issues are not being adequately addressed within the healthcare system. Within the healthcare sector throughout the world, people with mental disorders may be accessing primary care services of poorer quality and to a lesser extent than those without a mental illness. Prince et al. (2007) viewed this “inequity” as an obstacle to reaching a number of Millennium Development Goals, such as improvement of maternal health and promotion of gender equality and empowerment of women. They advocated for “holistic models of care, which integrate psychosocial assessments and interventions seamlessly and routinely into the management protocols for major communicable and non-communicable diseases and reproductive and childhood disorders” (p. 871). On the other hand, Marmot (2005) promoted action on the social determinants of health as the preferred approach to reducing health inequalities. Supported by an extensive body of evidence in this area, he echoed the global health community's assertion that health issues need to be addressed by all policy makers, particularly those outside the health sector for improved social arrangements underlying the health of whole populations. Reducing social inequalities in health or inequities in the distribution of resources is a matter of policy, and therefore within the purview of policy makers.

An interesting perspective on equity has come from the field of economics. Alesina and Rodrik (1994) presented their empirical finding of an inverse relationship between a country's income inequality and subsequent economic growth, and referred to this observation as a distributional issue. They reasoned that a more “equitable” distribution of income and wealth, through such mechanisms as taxation policies, would more likely generate greater economic growth. It is worthwhile to note that economic redistribution may be as much a contributing factor to economic growth as it is to population health. Viewed from another angle, the article by the economists Fehr and Schmidt (1999) introduce a theory in which a few people advocating strongly for equity can engender greater cooperation and fairness in order to create a more caring society, even within an environment dominated by self-interests. Within this broader understanding, a glimmer of hope emerges for dedicated individuals who are acting outside of the health sector to promote a more equitable distribution of power and resources across the societal hierarchy. Whether consciously intended or not, these efforts also carry within them potential health benefits for disadvantaged populations.

Following a close examination of the 25 most-cited articles, terminology preferences appear to be discipline specific. Public health researchers, social epidemiologists and sociologists tend to favor the term “inequalities” when referring to health-status differences. The term “disparities” has more often been used among researchers in the fields of medicine, clinical epidemiology, and health administration to denote differences in health outcomes, patient characteristics, or differential access to health services. Perhaps the increased use of the term “disparities” in health over the years is a reflection of the growing interest, within clinical settings, in the health effects of social factors. However, such interest may reside more in broadening the concept of risk within the context of patient care, than in pointing out a social dilemma to be addressed.

4.2. Lack of consensus on definitions

It is interesting to note that “inequality” was initially the term of choice by researchers, but by the early 2000's, the term “disparity” began to be used more frequently. The expression inequalities in health made its way onto Great Britain's political scene following the publication of the Black Report in 1980 (Black, 1980). Although it was assumed at the time that British society had become more egalitarian with the introduction of public policies supportive of the welfare state, socioeconomic inequalities persisted and appeared to be increasing.

The Black Report revealed important differences in mortality rates according to occupational class. Over the years, research conducted in Great Britain firmly established that health inequalities stem directly from social inequalities, which in turn are due to hierarchical structures in society and differential access to

resources (Wilkinson, 1986). Social class is a major consideration in the study of health determinants since it is the basis for the observed gradients in health in which health status gradually declines the further one goes down the hierarchical social ladder. The Whitehall studies represent a major milestone in this area of research (M.G. Marmot et al., 1991).

In the United States, it was the use of the term "disparity" that was fostered in 2000 through the establishment of the National Institutes of Health's Center on Minority Health and Health Disparities, along with their strategic plan to address the ongoing issue of poorer health status among minorities. This organization has contributed to the development of an integrated and inclusive field of study on racial and ethnic disparities (IOM, 2006). The greater number of American researchers may also explain the increased usage of the term "disparity."

In addition, research originating from Europe may have progressed along a different path than that followed by American researchers. For instance, unlike the American practice, certain European countries do not include the variables of race or ethnicity in their health information systems.

There is yet to be a consensus on the definition of "health disparities," a term which is intended to be synonymous with "health inequalities." Some scholars contend that health disparities should not simply be defined as differences in health, but should also connote a difference that is deemed inequitable, unjust, or unacceptable for groups that are disadvantaged in regards to opportunities and access to resources (IOM, 2006; Nancy Krieger, 2005; Whitehead, 1992). The underlying question is whether an observed difference in health constitutes a disparity, in the sense that this difference is inequitable or unjust.

The issue at hand is that the term "health disparities" may be used indiscriminately to describe differences in health status without necessarily implying the presence of injustice (Adler, 2006). In today's usage, "disparities" may or may not refer to the undesirable nature of health differences or to the existence (whether explicit or not) of structural hierarchies underlying this variable (Bihr and Pfefferkorn, 2014), as is the case with the term "inequality." Even though these two terms may technically be used interchangeably, the term "disparity" may take on a more neutral character.

4.3. Strengths and limitations

One major limitation of this bibliometric study is the complete reliance on the Web of Science database. This database is restricted to peer-reviewed articles published in academic journals, thus excluding other sources of knowledge such as books and monographs. This drawback has serious implications particularly for the social sciences, where researchers often choose other means of knowledge dissemination (Katz, 1999). The use of the term "disparity" may introduce some selection bias to our analysis, as in many epidemiological and/or clinical studies it may imply mere differences in health outcomes; however we it has been a critical term applied to a great part of the research in health inequalities in the last 20 years. Another important criticism of bibliometric analysis is that the dominance of English-language journals grants *de facto* advantage to journals and researchers of English-speaking countries. Nevertheless, the 2000-top journals indexed by ISI represent about 85% of articles published worldwide, and 95% of citations, lending validity to this bibliometric approach (Gauthier, 1998). Furthermore, ISI's Web of Science not only contains a complete list of cited references, it is also the sole database source of authors' institution addresses, which can be used to analyze affiliations and professional identity. Bibliometric analysis using this source is therefore a useful tool to track trends and the evolution of a given research domain despite acknowledged biases.

5. Conclusions

Health-inequality research began to take hold and flourish as of the early 1990s. During these past four decades the scientific productivity of health-inequality research has increased exponentially and has fully revealed the undeniable reality of social inequalities in health.

The urgent need to galvanize policy action on the social inequalities in health led to the establishment of the World Health Organization's Commission on Social Determinants of Health, whose report was published in 2008 to encourage governments to develop effective strategies for reducing health inequalities. A few years later, the Rio Political Declaration of 2011 confirmed a member state commitment to take action to address the social determinants of health in five key areas: improved governance for health and development; greater participation in policy-making and implementation; increased efforts for the promotion of health and the reduction of health inequities; strengthened global governance and collaboration; and increased focus on progress monitoring and accountability (WHO, 2011). It is expected that following these two initiatives more research will be conducted to support policy decision-making on the social determinants of health, and to evaluate the impact of interventions to reduce health inequalities.

Now is the time for researchers in this field to contribute towards collaborative efforts in identifying and evaluating the best policy approaches for undertaking the arduous task of reducing these inequalities.

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.socscimed.2015.07.022.

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