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Tracking and predicting growth of health information using scientometrics methods and Google Trends

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Abstract:

The scholarly impact of medical/ health information is measured by scientometric indicators like number of articles, citations and international collaborations. Now, several mobile health applications are available, smart devices to be used by citizens in evaluation of their own health.

The purpose of this paper is to analyse the content of Web of Science (WoS) by searching the interdisciplinary field of Health information, 2010-present with the following WoS categories: Information Science, Library Science, Ethics, Education and Biomedical Engineering. We found 1425 results defined by a set of keywords. Data were retrieved and analysed using a bibliometric tool: VOS Viewer. We found that 34 countries collaborate in 9 clusters in this field, when we created maps over collaboration, co-authoring, and most used descriptors. We aim at drawing conclusions about top universities, authors and sources in the field and impact of health information.

We used Google trend, a Google application in order to find who is interested in the term Health information. We found that in high quality research and users of Google there are similarities regarding interest of searching in finding information.

Originality/value is that the bibliometric model approach is new in light of an overwhelming and exponentially growing amount of literature and comparison with people all over the world interest in searching Health information.

Keywords: Health information, scientometric, Web of Science, Citation analysis, VOS Viewer, Google trends

INTRODUCTION

In the literature review, a range of information sources regarding health information were mentioned, including health professionals (e.g. doctor, physician), non-professionals (e.g. family, friends, co-workers), television, the internet (e.g. search engines, general health websites, association websites, research databases, e-newsletters, online support groups/forums, social networking sites, chat rooms, emails, blogs), and print media (e.g. books, brochures, publications, magazines, newspapers) (Ramesey, 2017)

Whilst the volume of information that is made available through the internet is perhaps one of its biggest strengths, it also brings the challenge of how to identify reliable, accurate and current information (Fiksdal, 2014).

"e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology" (Eysenbach, 2001)

First, if the rapid growth of studies on health information seeking is any indication of the prominence of such behaviours, practitioners would do well to recognize health information seeking as an integral part of the healthcare management experience. Second, public health communicators should pre-emptively educate the general public about how to obtain and evaluate health information. Certainly, credible sources of health information exist and practitioners may wish to direct patients to such information sources/channels. Public health communicators can provide healthcare practitioners, clinics, or college health centres with lists of credible information sources for interested parties. (Anker, 2011).

RESEARCH USING SCIENTOMETRIC TOOLS

A scientometric study was accomplished regarding *Health information.* Scientometric studies are the ideal instrument to search for the research directions of the intended domain, international connections, participant countries involved in research within the domain, how large the scientific productivity is and how disseminated the subject is. We are also able to identify the main authors, journals used for publishing results and citations network.

We employed the Thomson Reuters Web of Science (WoS) database for data collection. This is the only multidisciplinary database in the field of medical science that provides complete bibliographic data in combination with details on citation activity relevant to the topic of interest. We restricted our search to publications containing the search term in the "abstract". The investigation covered the time span from 2010 until 2018 since the WoS.

Then we used VOS viewer, which is a software tool for constructing and visualizing bibliometric networks. These networks may for instance include journals, researchers, or individual publications, and they can be constructed based on co-citation, bibliographic coupling, or co-authorship relations. VOS viewer also offers text mining functionality that can be used to construct and visualize co-occurrence networks of important terms extracted from a body of scientific literature. (VOS viewer, 2018)

3. RESULTS FROM SCIENTOMETRIC RESEARCH

During our research we used Web of Science (WoS) health information in order to search interdisciplinary fields from 2010 to present within the following WoS categories: Information Science, Library Science, Ethics, Education and Biomedical Engineering. We found 1425 results. Data were retrieved and analysed using VOS Viewer.

Top universities publishing about health information are generally American, like Harvard University, Michigan and Columbia (fig.1).

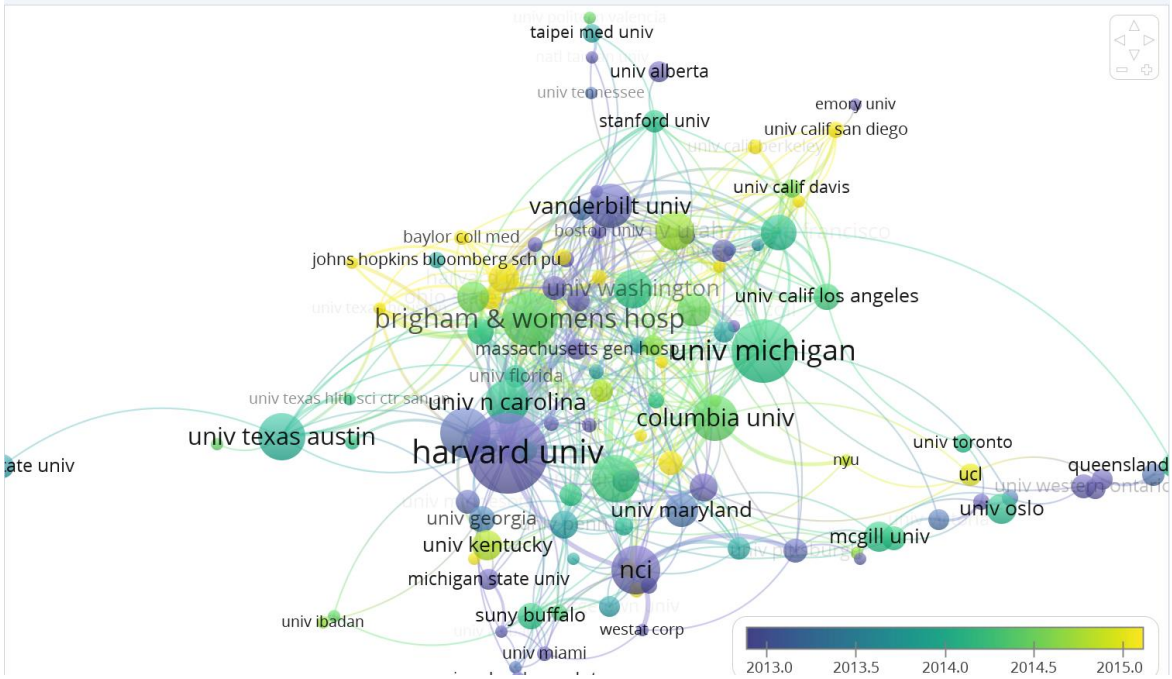

Fig.1: The most productive organizations

The most productive country in the field of health information is USA, followed by England and Canada. There are also some countries with significant contributions but not at the same level as the first three, like Australia, South Korea, Portugal and Spain (fig.2).

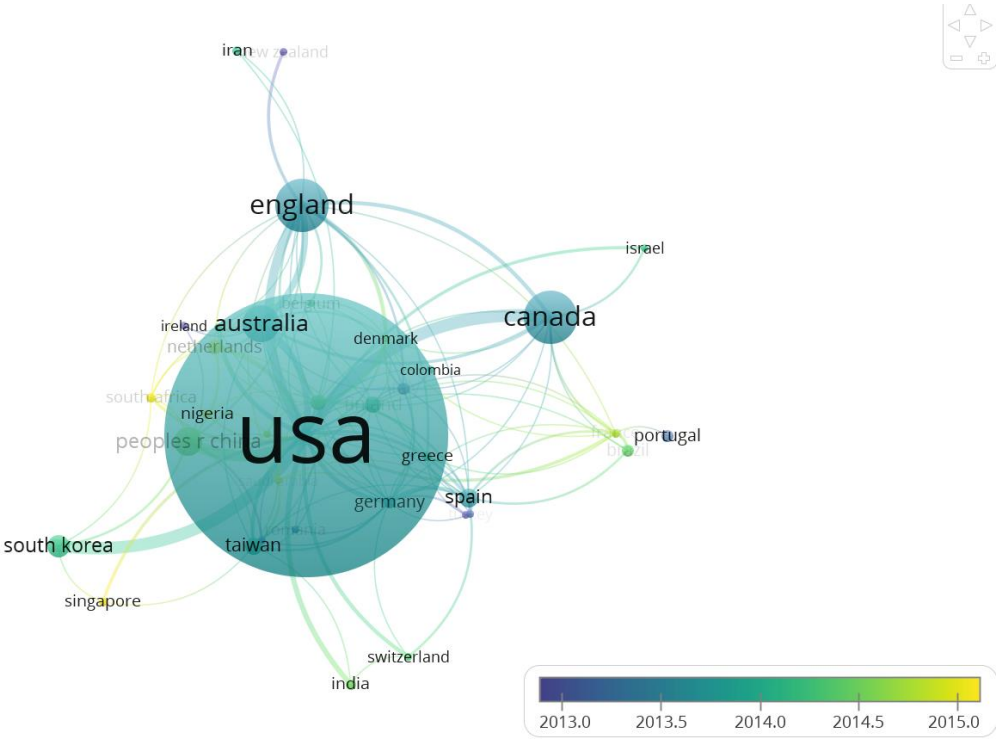

Fig.2 The most productive countries

In fig.3 the most productive authors are grouped in three different clusters according to their collaboration and referencing.

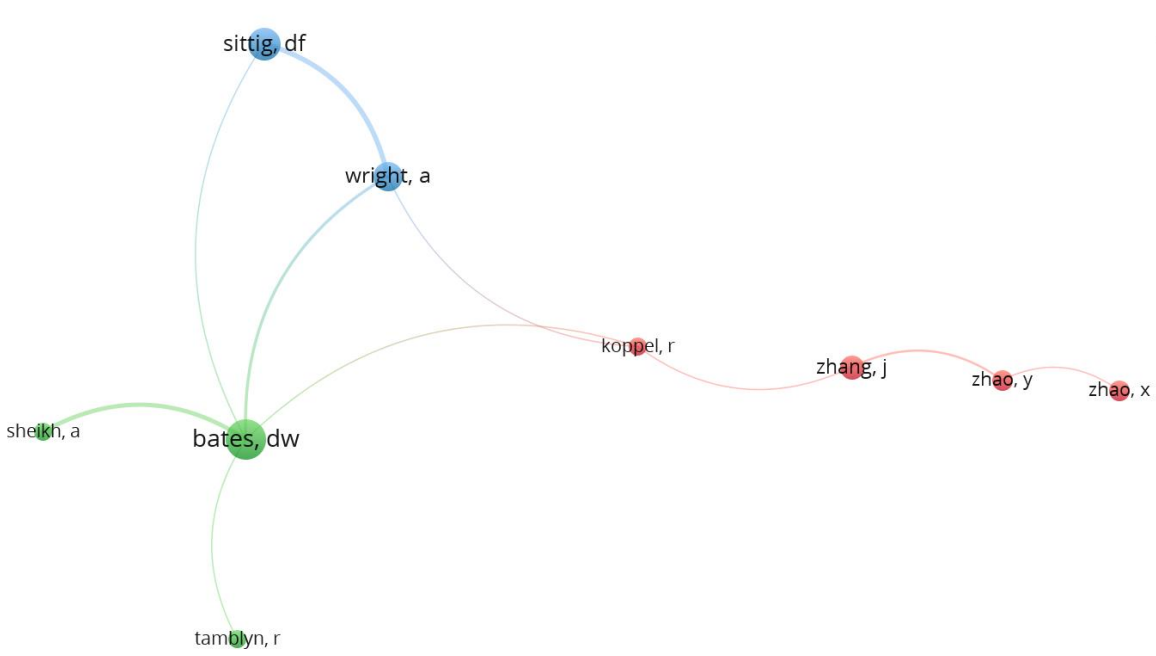

Fig.3 The most productive authors

The most cited authors are Karsh, Koch-Weser and Lau, all of them from 2010.

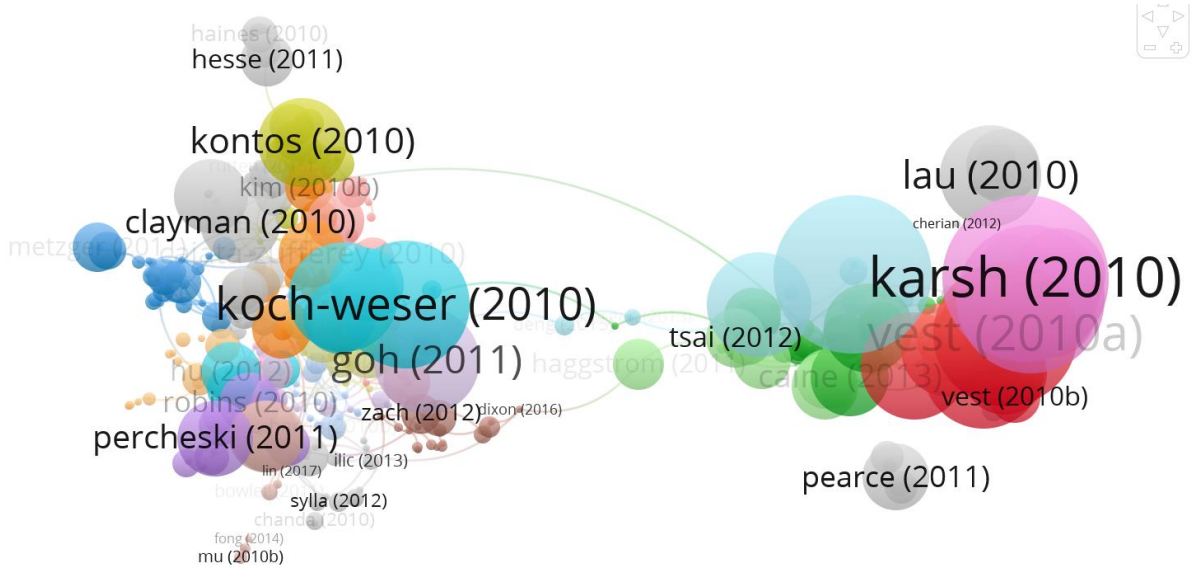

Fig.4 The most cited authors

The most cited journals publishing articles on health information are shown in fig.5: Journal of American Medical association, and Journal of Health Communication.

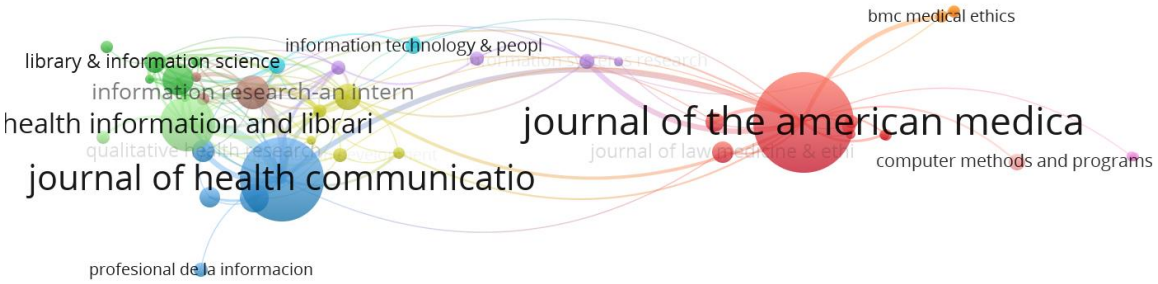

Fig. 5 The most used journals

The most used terms in the articles headings are grouped in four clusters, the first one is based on the analysis of health information, the second on health literacy and electronic health records, the third on case studies and studies about healthcare, and the fourth on health information technology (fig.6). The terms were introduced starting with 2013-2014 as shown in fig.7.

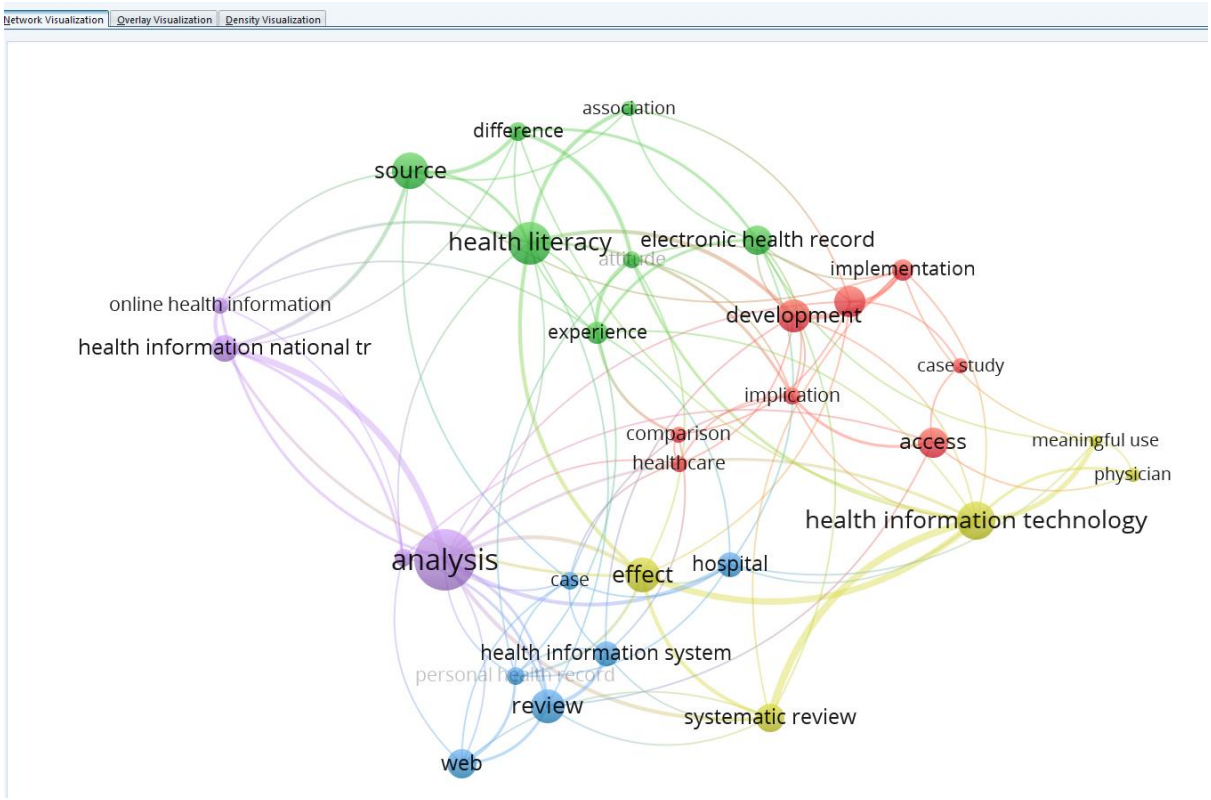

Fig. 6 Network visualization of title descriptors in VOS viewer

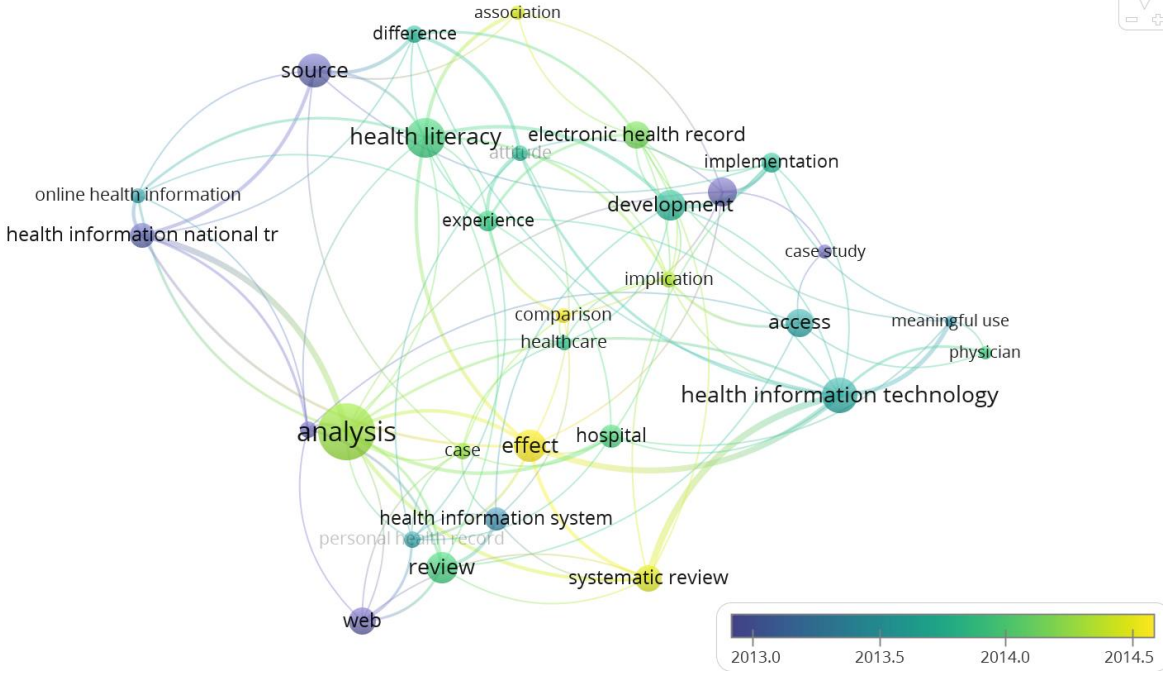

Fig.7 Overlay visualization of title descriptors by year issue

The most used descriptors in documents titles are shown in fig.8.

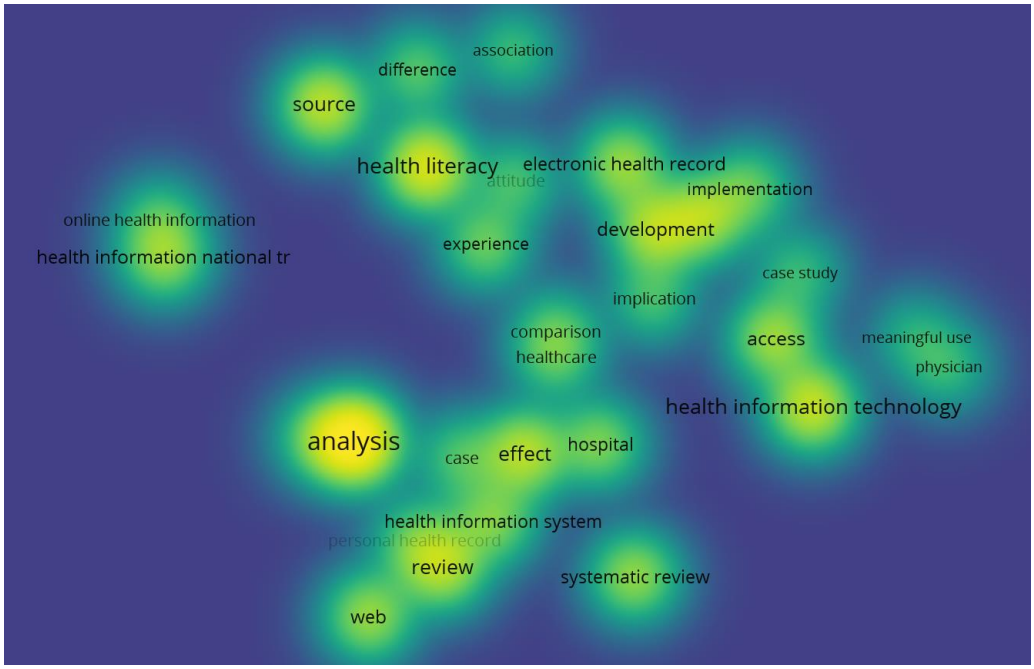

Fig.8 Density visualization of descriptors

RESEARCH ABOUT SEARCHING MEDICAL INFORMATION IN ELECTRONIC ENVIRONMENT (GOOGLE TRENDS)

Google Trends (Fig. 9) represents a facility created by Google Inc, based on Google Search, which "analyses a certain percent of Google searches on web in order to establish how many searches were performed for the selected keywords in comparison to the total number of searches on Google during the respective time"[1]. The horizontal axis of the diagram shows the time (starting with 2010 until the present), while the vertical one shows how often happens the term is used in a query, compared to the total searches at global level[2].

[1]Google Inc, Google Trends, https://support.google.com/trends/answer/4355213?hl=ro&ref_topic=4365599

[2]Idem, http://www.google.com/trends/explore#1, accessed on 10.05.2018.

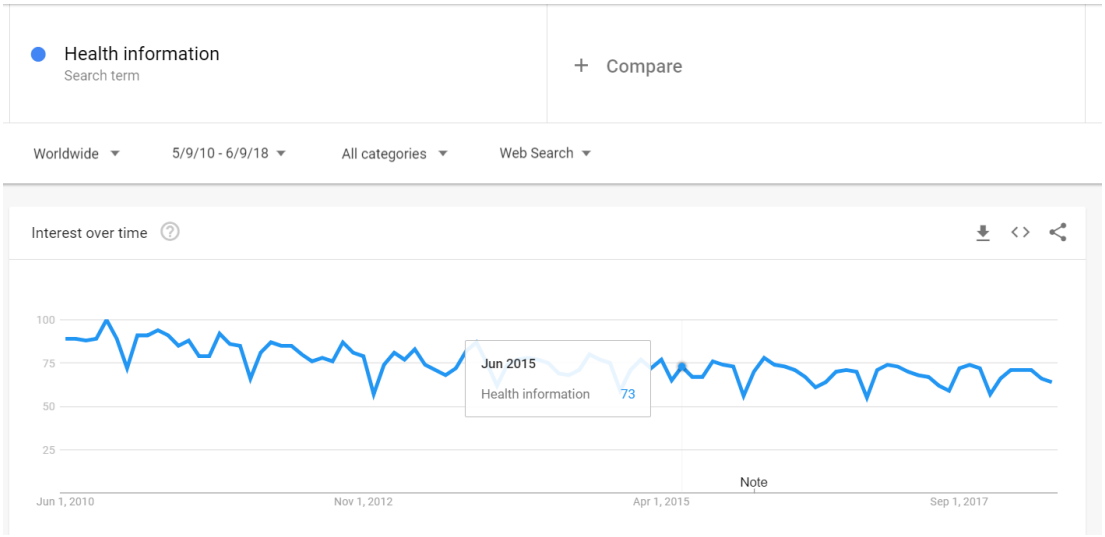

Fig 9 Interest level of query by term *Health information* during 2010-present. Source: http://www.google.com/trends/, 2018.

There is the possibility of refining the search according to countries and different time spans[3]. As noticed in Fig.10, we followed queries evolution by term *health information*, around the world, starting with 2010 until present. For the search term *health information*, the query indicates that the interest shown for this type of information is constant. Regionally, the search term *health information* shows the following values of the search volume index: 83 (Ethiopia), 63 (Kenya), 56 (Uganda), 55 (Nigeria), 45 (Ghana), 29 (Jamaica), 29 (Tanzania), 29 (USA), 25 (Canada), 5 (Germany) (Fig.10, 11).

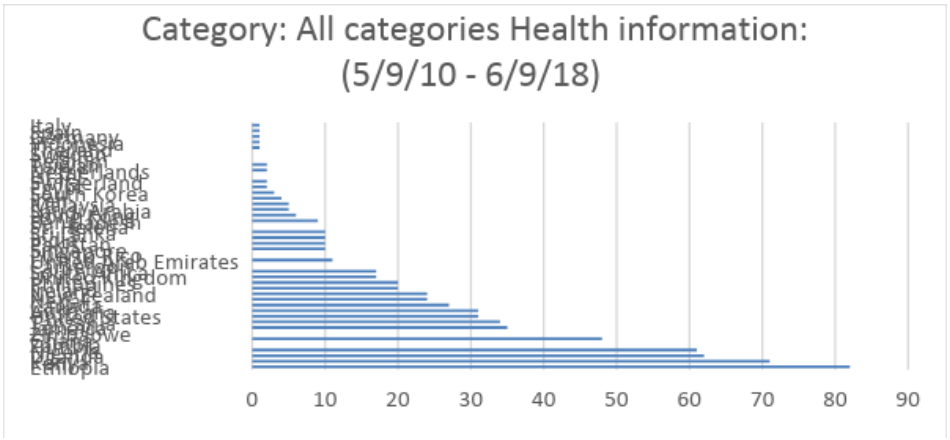

Fig. 10 Countries interest for search term *health information.*
Source: http://www.google.com/trends/, 2018

[3]InsightsSearch, The official Google Search blog, *Insights into what the world is searching for -- the new Google Trends*, http://insidesearch.blogspot.co.il/2012/09/insights-into-what-world-is-searching.html, accessed on 10.05.2018.

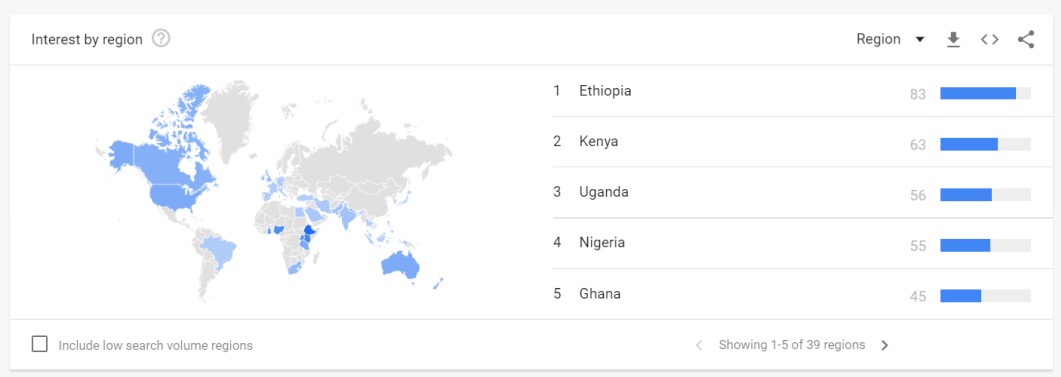

Fig. 11 Regional interest for search term *health information.*
Source: http://www.google.com/trends/, 2018

Google Trends offers the opportunity of an X-ray of the situation regarding similar queries using related terms. Thus, the identified indicators vary as follows (Fig.12):

- health information management
- health management
- health care information
- health care
- information technology
- health information technology
- information on health
- what is health information
- information about health
- health information system
- health information jobs
- patient health information
- health information systems
- health information services
- health information act
- health insurance information
- health insurance
- public health information
- public health
- health and safety
- protected health information
- health department
- mental health information
- WHO (World Health Organization)
- mental health

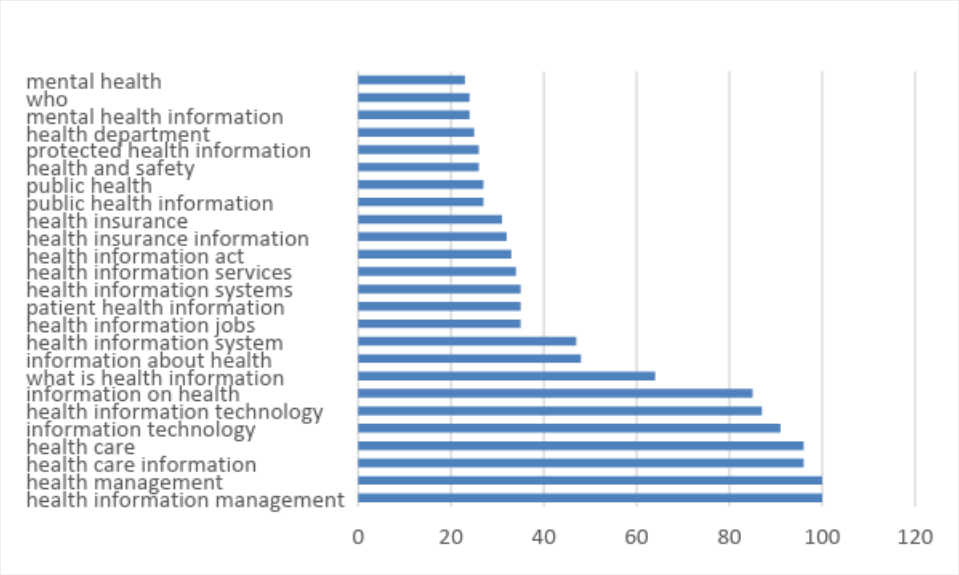

Fig. 12 Similar search by related terms of *health information.*
Source: http://www.google.com/trends/, 2018

SIMILARITIES AND DIFFERENCES REGARDING HEALTH INFORMATION SCIENTIFIC RESEARCH AND SEARCH TERMS ON THE GOOGLE SEARCH ENGINE

Words in title and author keywords were analysed. The results from both searches are not only similar to each other in a sufficient degree to support the results, but could also complement one another. This method has been proved to be an effective approach for mapping global health information research and could also be adapted in other studies for the characterization of a given research field.

CONCLUSIONS

As far as medical research is concerned, all researchers would be honoured and eager to publish in Web of Science, as this is considered to be one of the most prestigious databases globally because it provides quality and up-to-date information, and is searched by the most education and research institutions worldwide.

Our research showed that the most used terms in publications titles are about the analysis of health information, health literacy and electronic health records, case studies and studies about healthcare and health information technology.

Users accessing Google search engine are mostly interested in: health information management, health information system, health insurance and public health, as we showed in our Google trends analysis.

Analysing the number of searches, and also what countries have the highest number of accessing, we reach the conclusion that there are similarities between searches in Web of Science and in Google regarding the search terms. We also see that the countries which are

most interested in the field have the most users searching health information on Google. According to fig.11, it seems that the most interested users come from English speaking countries from North-America, Africa, Australia and a few from Europe, and that this is because most of the research is published in English.

The implications and challenges for the libraries and librarians are two-fold: First, to support the medical profession in their training of patients to find reliable health information, and second, to support the patients/users in their searches. Some of the ways this can be done will be through offering specific courses and workshops in "searching and evaluating information in the internet" or more specific: "searching and evaluating *health* information in the internet". Also, nation-wide access to health information databases for all medical practitioners and the public must be secured, and here the librarians can make a case to the authorities, using scientometric data to underscore the message.

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