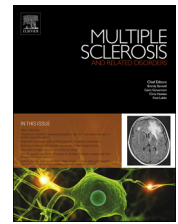Available online at www.sciencedirect.com

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Web search behavior for multiple sclerosis: An infodemiological study

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Abstract

Objective: Millions of people worldwide use the Internet daily as a source of health information. Google is the most popular search engine and is used by patients and physicians to search for online health-related information. This study aimed to evaluate changes in Web search behavior occurring in English-speaking countries over time for the term "multiple sclerosis" (MS).

Methods: Using Google Trends, data on global search queries for the term "multiple sclerosis" between January 2004 and December 2013 were analyzed.

Results: Over time there was a reduction in tendency to search for the term "multiple sclerosis". Most terms associated with the search queries for MS were related to causes and symptoms (including pain) of the disease, and most peaks in search volume over the period studied corresponded to news of celebrities having MS.

Conclusions: Most people appear to use search engines to look for MS to obtain information on symptoms, possibly to aid initial self-diagnosis. News on celebrities with MS seem to be a major factor that influences online search behavior.

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1. Introduction

Every day millions of people worldwide use the Internet as a source of health information. The increasing number of online searches conducted using popular web search engines such as Google generates trend data that can be analyzed over time to detect regional outbreaks of diseases. In this

way, such meta-data can act as a real-time surveillance method to complement more traditional ones (Ginsberg et al., 2009). A new research discipline has therefore emerged, termed "infodemiology", which is the study of the determinants and distribution of health information (Eysenbach, 2009; Brigo and Ausserer, 2014).

Google is the most popular search engine and is likely to be used by patients and physicians to look for online health-related information. Trend data generated by the number of Google searches over time can be analyzed by Google Trends, an online tool which allows users to graph the frequency of searches for single or multiple terms (Thornton et al., 2006; Google Trends, 2013; Foley et al., 2013; Brigo et al., 2013). The obtained graphs are normalized on a relative basis and can focus on specific time intervals or geographic regions (Brigo et al., 2013).

The aim of this study was to evaluate and interpret changes over time of Web search queries for the term "multiple sclerosis" in English-speaking countries.

2. Methods

The keyword "multiple sclerosis" was entered in the "Google Trends" main page (available at: http://www.google.com/trends, accessed 10th December 2013). The relative normal ized search volume numbers (RNSN) were analyzed to assess changes in interest in these search terms over time (Google Trends, 2013). All the results returned by Google Trends are normalized, with sets of data divided by a common variable to cancel out the variable's effect on the data, and presented on a scale from 0–100. Doing so allows the underlying characteristics of the data sets to be compared; if this normalization was not performed and absolute rankings were used, data from regions generating the largest search volume would always be ranked highly. The RNSN, i.e. the numbers on the graphs obtained by such an analysis, reflect how many searches have been performed for a particular term, relative to the total number of searches performed using Google over time. Each point on the graph is divided by the highest point, which is conventionally set at 100.

We also analyzed search volume numbers over time reported as a percentage of growth by applying the "health" category filter (Google Trends, 2013). The obtained graphs show changes over time as a percentage of growth with respect to the first date on the graph (or the first date that has data). Consequently, the values on the y-axis of the category comparison graph range between -100% and $+100\%$, assuming a starting point of 0.

We descriptively analyzed the changes over time of Web search queries and evaluated possible correlations with news headlines also reported in Google Trends. Furthermore, we
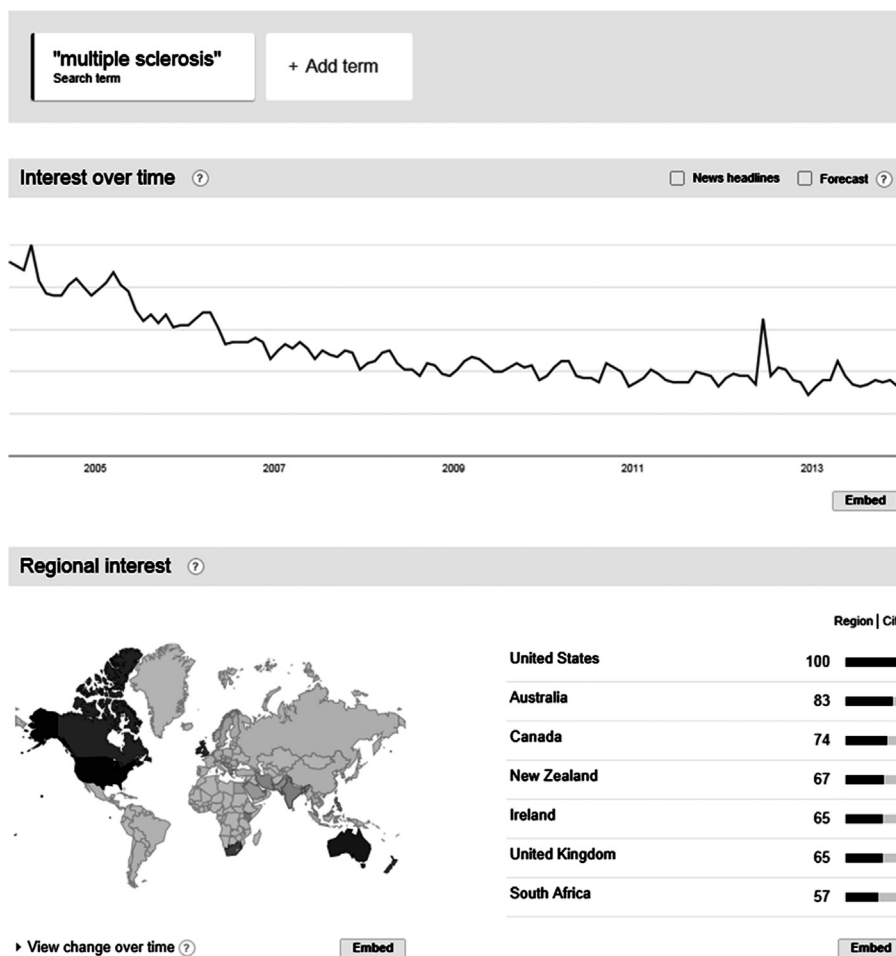

Fig. 1 Google Trends graph depicting tendency over time of Internet search queries for the term "multiple sclerosis" worldwide from January 2004 to December 2013. Results are expressed as relative normalized search volume numbers.