LETTERS TO THE EDITOR

To the Editor

"Magic Google in my Hand, Who is the Sickest in my Land?"

Infodemiology and Epidemiology of Multiple Sclerosis and Lyme Disease in Italy

Each day millions of people worldwide use Internet as a source for health information. The increasing number of online searches conducted through popular web engines generates trend data which can be analyzed over time to detect regional outbreaks of diseases, hence representing a real-time surveillance method adding to more traditional ones.[1]

Google is a popular search engine which may 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, a software which allows users to graph the frequency of searches for single or multiple terms.[2-5] The obtained graphs are normalized on a relative basis and can focus on specific time intervals or geographic regions.[4]

We entered the set of key-words "Sclerosi multipla" (multiple sclerosis, MS), "Lyme", "Zecca" (Tick) at the "Google Trends" main page (available at: http://www.google.com/trends, accessed 11th September 2013), restricting results to Italy in order to assess search trends for terms related to MS and Lyme disease (LD) in our Country (Figure A,B).

The relative normalized search volume (RNSV) numbers were analyzed to assess changes in interest in these search terms over time.[4] 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 to 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 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 descriptively analyzed the changes over time of web search queries and we evaluated the search volume by region by analyzing reported search volumes relative to the highest point, conventionally set at 100.[3]

The city with the highest amount of search traffic for the key-word "sclerosis multipla" (multiple sclerosis) was Cagliari (RNSV 100/100), located in Sardinia, a high-risk area for MS, with prevalence rates of 150 per 100,000 population and mean
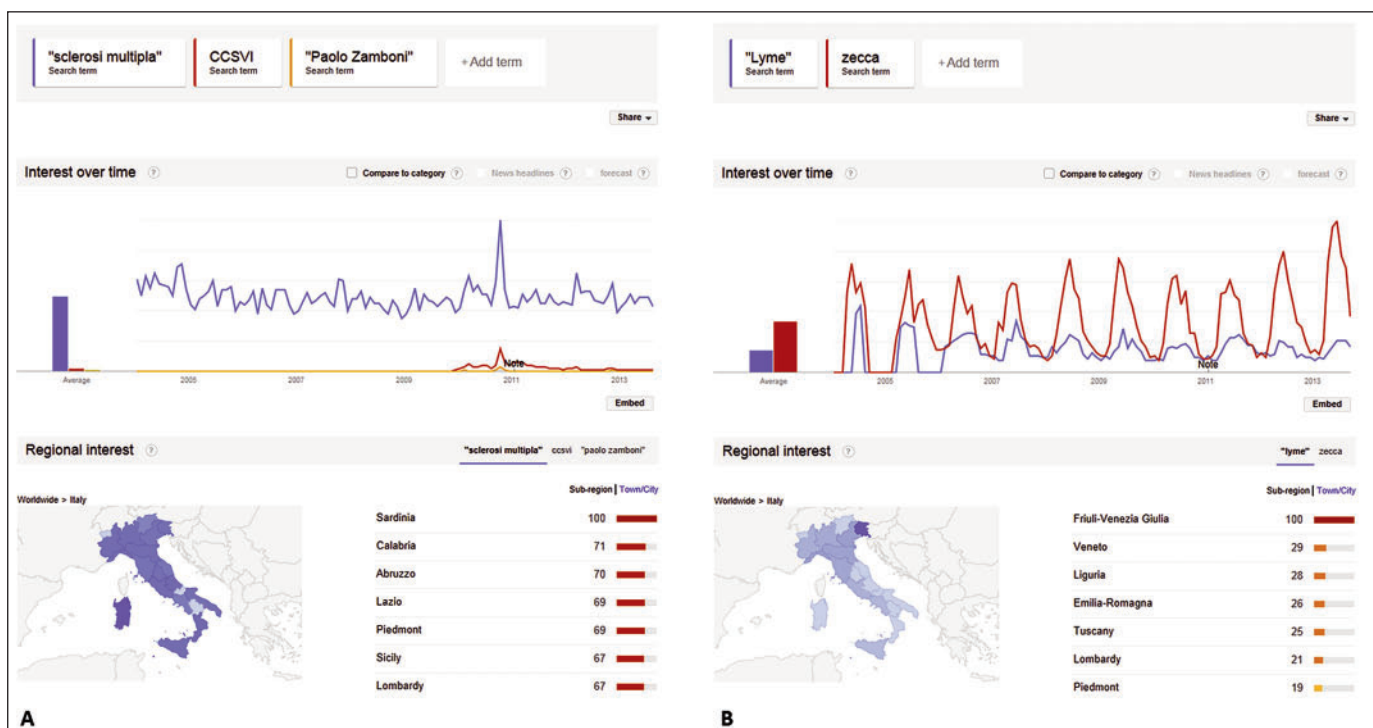

Figure: A) Google Trends graph depicting tendency over time of Web search queries for the terms "Sclerosi multipla" (blue line), "CCSVI" (red line), and "Paolo Zamboni" (yellow line) in Italy from January 2004 to September 2013. B) Graph depicting the trends of Web search queries for the terms "Zecca" (tick) (red line), and "Lyme" (blue line) in Italy from January 2004 to September 2013.

annual incidence rate of 5.8 per 100,000 population.[6] As expected, the region with highest amount of search volume was Sardinia (RNSV 100/100). The trend for MS peaked in October 2010. Interestingly, the trend of search-terms "CCSVI" and "Paolo Zamboni" also peaked in the same time frame, indicating that the sudden rise in trend data of the term "multiple sclerosis" was not due to an outbreak of this disease, but was a reaction to media reports on the venous angioplasty proposed as a treatment for chronic cerebrospinal venous insufficiency by the Italian surgeon Paolo Zamboni. The high search volume for the term "multiple sclerosis" in Sardinia reflects MS distribution over decades and the high prevalence of this disease in this region. Conversely, the peak of MS volume search in 2010 is due to mediatic rise of interest on multiple sclerosis. No major news report were found in coincidence with the more modest spike in MS queries occurring in late 2008.

The two cities with the highest amount of search traffic for "Lyme" and "zecca" (tick) were Trieste (RNSV 100/100 for "Lyme", 77/100 for "zecca") and Udine (RNSV 91/100 for "Lyme", 100/100 for "zecca"), located in Friuli Venezia-Giulia, a high-risk areas for LD with the highest amount of search volume (RNSV 100/100). The trend for both terms "Lyme" and "zecca" (tick) showed a seasonal pattern, reflecting increasing likelihood of exposure during spring and summer. Furthermore, the trend for key-word "Lyme" peaked always later than the key-word "zecca" (tick), reflecting their temporal correlation. These data are consistent with a previous study assessing the Google trends for the string "Lyme disease".[3]

In conclusion, the search trend data produced by Google Trend showed a good correlation with geographic distribution of MS and LD, and seasonality of LD.

To be most effective, Google Trend requires large populations of Web search users and its use requires some informatic skills, as the available data may be prone to non-representative sampling bias.[3,4] Hence, this type of "Google Trends analysis" research is descriptive only and could be used to generate hypotheses that could be confirmed or refuted by more rigorous classical epidemiological designs. However, the use of Internet is enormously increasing, and maybe one day the "magic Web" in our hand will be able to reflect reality.

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BOOKS RECEIVED

THE EPILEPSY PRESCRIBER'S GUIDE TO ANTIEPILEPTIC DRUGS. SECOND EDITION. 2014. By Philip N. Patsalos, Blaise F. D. Bourgeois. Published by Cambridge University Press. 339 pages. C$75.00 approx.

HANDBOOK OF PEDIATRIC NEUROLOGY. 2014. Edited By Katherine B. Sims, Jurriaan M. Peters, Patricia L. Musolino, M. Zelime Elibol. Published by Wolters Kluwer/Lippincott Williams & Wilkins. 542 pages. C$70.00 approx.

NEUROPATHIC PAIN: CAUSES, MANAGEMENT, AND UNDERSTANDING. 2013. Edited By Cory Toth, Dwight E. Moulin. Published by Cambridge University Press. 368 pages. C$100.00 approx.

MOYAMOYA DISEASE: DIAGNOSIS AND TREATMENT. 2014. Edited By John E. Wanebo, Nadia Khan, Joseph M. Zabramski, Robert F. Spetzler. Published by Thieme Medical Publishers, Inc. 199 pages. C$150.00 approx.

THE TEXTBOOK OF NANONEUROSCIENCE AND NANONEUROSURGERY. 2014. Edited By Babak Kateb, John D. Heiss. Published by CRC Press, Taylor & Francis Group. 576 pages. C$325.00 approx.

THE NEUROBIOLOGY OF LEARNING AND MEMORY. SECOND EDITION. 2014. By Jerry W. Rudy. Published by Sinauer Associates, Inc. 435 pages. C$100.00 approx.

MAGNETIC RESONANCE IMAGING IN MOVEMENT DISORDERS: A GUIDE FOR CLINICIANS AND SCIENTISTS. 2013. Edited By Paul Tuite and Alain Dagher. Published by Cambridge University Press. 281 pages. C$170.00 approx.

CONTROVERSIES IN NEUROSURGERY II. 2014. Edited By Ossama Al-Mefty. Published by Thieme Medical Publishers, Inc. 440 pages. C$175.00 approx.

NEUROANATOMY OF LANGUAGE REGIONS OF THE HUMAN BRAIN. 2014. By Michael Petrides. Published by Academic Press – An Imprint of Elsevier. 186 pages. C$165.00 approx.

BOOKS REVIEWED

HYPERKINETIC MOVEMENT DISORDERS: DIFFERENTIAL DIAGNOSIS AND TREATMENT. 2012. Edited by: Alberto Albanese, Joseph Jankovic. Published by Wiley-Blackwell. 390 pages. C$165 approx.

Rated ★★★☆

As neurologists we classify movement disorders as either hypokinetic or hyperkinetic. The hypokinetic movement disorders are essentially Parkinson's disease and other parkinsonian conditions. Books on movement disorders typically focus on these conditions as they are relatively common and more is known about them compared to other movement disorders. This book, edited by Albanese and Jankovic, is devoted to hyperkinetic movement disorders – movements we see as opposed to movements which are lacking. The text is organized into seven parts and 24 chapters, which progress logically from general issues of hyperkinetic movement disorders, followed by tremor and dystonia, to the less common movement disorders including chorea, myoclonus, and ataxias. The book concludes with disorders not previously covered including paroxysmal movements and psychogenic movement disorders.

Chapters are of reasonable length with varying degrees of depth. I was especially impressed with the coverage of secondary dystonias and clinical and pathophysiological features of cerebellar dysfunction. The figures and tables are generally well done and provided useful supplements to the text. Some are used more as a reference of very specific topics, such as a summary of DBS outcomes for chorea.

This book succeeds in providing a practical approach to hyperkinetic movement disorders. The text is available online with purchase of the book and includes 73 different videos. Even without purchasing the book, one can search for videos on the student companion site (www.wiley.com/go/albanese/movement). The option of using the QR application to view the videos with a phone or tablet is a valuable feature and overall I was very pleased with the quality of the videos and online access.

This book would have benefited from more careful proofreading . The contents of some tables are essentially repeated within a chapter and there are some typos including misspelled medications. While treatment options are listed, the details including dosage and potential adverse effects were lacking as a rule.

Hyperkinetic Movement Disorders: Differential Diagnosis and Treatment is a good book to improve one's diagnostic skills and learn a practical amount about these disorders without overwhelming the reader. However one may need another reference for details on therapy and pathology. For those clinicians who see movement disorders other than tremor and parkinsonism, it is a solid addition to one's library.
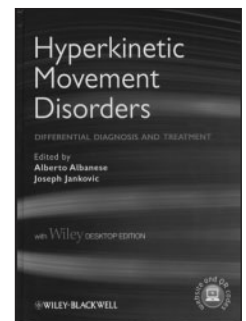
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