Epidemiology and the Internet: Google Catches the Flu

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The people have spoken and the world has witnessed yet another example of the organizing power of the Internet. NASA announced on April 14th that they will name a piece of exercise equipment on the international space station, the Combined Operational Load Bearing External Resistance Treadmill, or COLBERT, in honor of comedian Stephen Colbert [1]. This was not intended to reflect Colbert's dedication to the space agency (or a reaction to his threat to, reject democracy and seize power as spaceis evil tyrant overlordi [2]), but rather the outcome of an online contest wherein individuals suggested names for a newly incorporated node within the space station. Colbert's viewers responded en masse and he handily won the contest. While NASA ultimately opted to name the node Tranquility instead of branding it Colbert, their nod to Colbert's viewers demonstrates the power of the Internet as a mechanism for the collective voice of individuals to translate into tangible action.

It goes without saying that the Internet has changed the face of communication. The strength of the Internet rests not only upon its ability to serve as a public forum for individual thought; the speed at which information can be transmitted, organized, and eventually utilized is beyond anything we've seen before. We see examples of this immediate transmission of information every day with such tools (distractions?) as Twitter (Congratulations Ashton!) and Facebook. Researchers at Google, however, have taken the power of the Internet search engine and have used it as a tool for the incredibly accurate tracking of flu activity that was consistently one to two weeks faster than traditional Center for Disease Control (CDC) reports [3]. Albeit unintentionally, the people have again spoken and we all stand to benefit from their collective voice.

Influenza Epidemics and Pandemics

Within a given year, between 5% and 20% of Americans suffer from the flu [4] and seasonal flu
epidemics cause tens of millions of respiratory illnesses and between 250,000 and 500,000 deaths worldwide [5]. Influenza is, therefore, a major public health concern. At epidemic levels, influenza can be devastating and at pandemic levels, catastrophic. In recent history, four influenza pandemics highlight the massive loss of life possible. For example, over 1 million individuals died during the Asiatic (Russian) Flu pandemic of 1889-1890, 40 to 100 million died during the Spanish Flu pandemic of 1918-1920, 1 to 1.5 million died during the Asian Flu pandemic of 1957-1958, and .75 to 1 million died during the Hong Kong Flu pandemic of 1968-1969 [6].

Given the ever-present specter of such an outbreak happening again, health professionals worldwide have developed and maintain detection methods to track the progression of flu annually as well as alert officials in the event of a large-scale influenza event. Early detection is, of course, paramount in prompting appropriate and immediate response to such an event; a response that could save countless lives.

**Traditional Detection Methods**

Traditionally, both the European Influenza Surveillance Scheme (EISS) and the US Centers for Disease Control and Prevention (CDC) utilize clinical and virological data obtained primarily through physician visits to track the progression of influenza in a given population [7]. While this method is highly-accurate in identifying not only existing influenza strains within the population, it can also detect new strains as they appear. This method, however, is a labor intensive process that is highly decentralized and often time consuming. In fact, even though the CDC provides both regional and national data from such surveillance on a weekly basis, there is typically a reporting lag of 1 to 2 weeks [8]. Keep in mind as well that systems such as these are present within developed nations; they are either absent or woefully underfunded and understaffed in many other parts of the world.

A reporting lag, as previously mentioned, is of concern when dealing with an influenza outbreak that can spread very rapidly. As a result, public health officials are often left scrambling to allocate appropriate resources in an effective manner. In response to this situation, researchers at Google have established a free Web service that they say can pinpoint globally and much more rapidly than existing detection methods where there is an increasing number of influenza cases [9].

**The Google Search Method**

Google Flu Trends is part of Google.org, an arm of Google that is focused on projects for the public good that may or may not directly benefit Google itself [10]. Extending work wherein Yahoo search engine queries were found to correlate with virological data [11], researchers at Google.org compiled and evaluated literally hundreds of billions of Internet searches from five years of Google.com data. From this data, a model was created that could estimate the probability that a visit to a physician (in a particular region) was related to an influenza-like illness (an ILI) [12].
Utilizing this model, the researchers at Google.org applied its predictive power in real time to Google searches during the 2007-2008 influenza season. The resulting estimates were shared with the US Center for Disease Control (CDC) and both the timeliness and accuracy of the predictions were determined. It was found that the Google search method was able to consistently and rather successfully estimate ILI percentages (across all nine regions of CDC analysis) one to two weeks earlier than reports published by the CDC's US Influenza Sentinel Provider Surveillance Network [13].

**Benefits and Limitations**

The ability to detect influenza outbreaks quickly and accurately is fundamental to establishing appropriate lines of defense. By being able to identify a sudden spike in flu activity within a particular geographic region, public health officials can more rapidly deliver additional resources such as bolstering vaccine capacity and alerting local media outlets in order to raise public awareness [14]. The strength of the Google search method is its ability to provide such data in a relatively short time, generally within a single day as compared to the 1-2 week turnaround of traditional detection methods.

This method, however, is not the ultimate panacea. The researchers at Google themselves stress that the Google system is not designed to be a replacement for traditional surveillance networks or supplant the need for laboratory-based diagnoses and surveillance [15]. The researchers further explain that a lack of demographic data collected along with search terms is limiting. Also, there is no way to determine if the individual conducting the search is suffering from the flu or is simply curious. Furthermore, Google searches are likely to spike in the event of happenings beyond flu activity as well such as a drug recall or media influence, thus triggering a false alert.

As one might imagine, public response to the use of Google searches as a data collection tool has not been uniformly praised. Negative reactions have ranged from the facetious posting of the iGoogle Evangelistj saying, jWe've found certain search terms are good indicators of sin activity. Google Heaven/Hell Trends uses aggregated Google data to estimate sin activity in your state up to two weeks faster than Godi [16] to the more serious concerns from privacy groups. For example, the Electronic Privacy Information Center and Patient Privacy Rights have stated, in a letter to Google CEO Eric Schmidt that if search records are disclosed and linked to a particular user, there could be adverse consequences for education, employment, insurance, and even traveli [17]. In response, Google has maintained that they don't collect identifiable information on its users and according to Mike Yang, a Google lawyer, jThere are no new privacy implicationsj [18].

**Conclusion**

Privacy implications aside, Google's flu trends analysis sets the stage for the development of future tools to serve as an adjunct to traditional detection methods. In fact, according to Rick Turoczy, a writer for Read Write Web, jWhile influenza is the first target of the experiment, one
can easily imagine the types of search data – and regional data – that could help healthcare professionals in the prediction of practically any disease. More importantly for Google, coupling this kind of anonymous aggregated data with other Google offerings could further the company’s move into the healthcare arena [19].

The future of healthcare is coming rapidly and it is being shaped by technological advancement as well as social and political change. Once again, the Internet is proving itself as a tool that can respond to the needs of those using it and, furthermore, a means to transform (and hopefully better) public policy and individual action.

Endnotes:


14 THOUGHTS ON “EPIDEMIOLOGY AND THE INTERNET: GOOGLE CATCHES THE FLU”

church of christ san diego  
on February 4, 2014 at 4:26 AM said:

What’s up mates, howw is the whkle thing, and whst you woould like to say regarding this article, in my view its rally remarkable in favor of me.

africa  
on February 4, 2014 at 10:21 AM said:

your attendees and take in pictures.

nigeria entertainment news  
on February 4, 2014 at 10:32 AM said:

Great post! I’m going for getting to verify these all out! I have observed bits of the one Scorcese film on the Stones.

nigeria entertainment news  
on February 4, 2014 at 10:42 AM said:
Awesome talk! Thank you so significantly for hosting Great.

"Underwateter" Mortgages on February 4, 2014 at 10:29 PM said:

Hi there, just became aware of your blog through Google, and found that it iss truly informative.
I am going too watch out for brussels. I will be grateful if you continue this in future. Lots off people will be benefited from your writing. Cheers!

Meridith on February 4, 2014 at 10:42 PM said:

Awesome! Its in fact awespme paragraph, I have got much clear ida regarding from this article.

understand gods on February 5, 2014 at 4:45 AM said:

Why people still make use of to read news papers wen in this technological world everything is accessible on web?

pastor young on February 5, 2014 at 5:04 AM said:

Hi there, always i used to check web site posts here in the early hours in the break of day, because i like to find out more and more.
everythinghealthynaturally.com
on February 5, 2014 at 11:01 AM said:

Hey there! I just wanted to ask if you ever have any problems with hackers? My last blog (wordpress) was hacked and I ended up losing a few months of hard work due to no data backup. Do you have any methods to protect against hackers?

on February 5, 2014 at 3:11 PM said:

Nice answer back in return of this question with real arguments and describing the whole thing on the topic of that.

http://www.sg1archive.com
on February 5, 2014 at 3:34 PM said:

Yes! Finally something about benny hill.

Blythe
on February 5, 2014 at 10:11 PM said:

Excellent goods from you, man. I have consider your stuff prior to and you’re just too magnificent.
I really like what you have acquired right here, certainly like what you’re saying and the best way wherein you say it. You make it entertaining and you still care for to keep it wise.
I can’t wait to read far more from you. This is really a wonderful website.

christian mission trips in germany
on **February 6, 2014 at 12:32 AM** said:

Please let me know if you’re looking for a author for your blog. You have some really great posts and I believe I would be a good asset. If you ever want to take some of the load off, I’d absolutely love to write some articles for your blog in exchange for a link back to mine. Please send me an email if interested. Cheers!

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**Wikikod.com**

on **February 6, 2014 at 5:05 AM** said:

I do not even know how I ended up here, but I thought this post was good. I don’t know who you are but certainly you are going to a famous blogger if you aren’t already 😎 Cheers!