Infodemiology

A Publishers' view (but also as scientist!)

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WHO, April 2020

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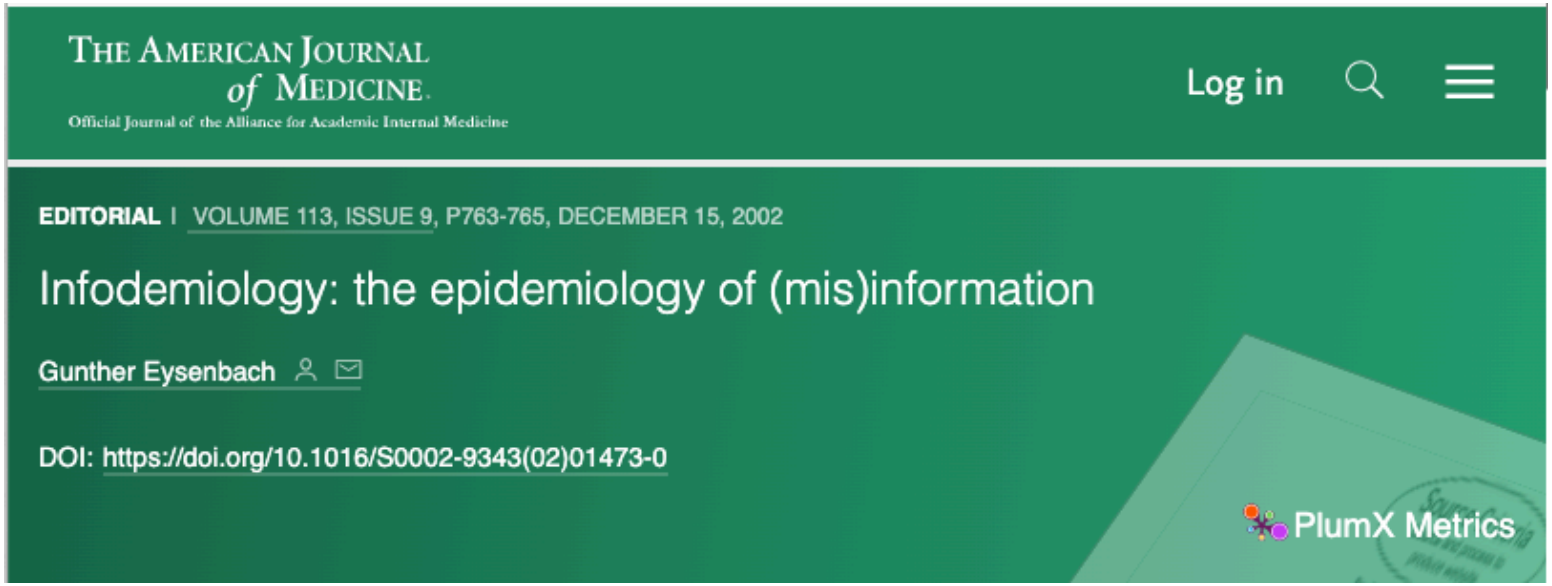
Infodemiology (2002)



A new research discipline and methodology has emerged - the study of the determinants and distribution of health information (…): Information epidemiology, or infodemiology" (Eysenbach, 2002)

Eysenbach G. Infodemiology. Am J Med 2002

An early paper on
“infodemiology” (Eysenbach 2006):
Internet searches correlate with Flu

Infodemiology: Tracking Flu-Related Searches on the Web for Syndromic Surveillance

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Abstract

Background: Syndromic surveillance uses health-related data that precede diagnosis and signal a sufficient probability of a case or an outbreak to warrant further public health response.

Objective: While most syndromic surveillance systems rely on data from clinical encounters with health professionals, I started to explore in 2004 whether analysis of trends in Internet searches can be useful to predict outbreaks such as influenza epidemics and prospectively gathered data on Internet search trends for this purpose.

Results: There is an excellent correlation between the number of clicks on a keyword-triggered link in Google with epidemiological data from the flu season 2004/2005 in Canada (Pearson correlation coefficient of current week clicks with the following week influenza cases r=.91). The “Google ad sentinel method” proved to be more timely, more accurate and – with a total cost of Can$365.64 for the entire flu-season – considerably cheaper than the traditional method of reports on influenza-like illnesses observed in clinics by sentinel physicians.

Conclusion: Systematically collecting and analyzing health information demand data from the Internet has considerable potential to be used for syndromic surveillance. Tracking web searches on the Internet has the potential to predict population-based events relevant for public health purposes, such as real outbreaks, but may also be confounded by “epidemics of fear”. Data from such “infodemiology studies” should also include longitudinal data on health information supply.

> “A new research discipline and methodology has emerged—the study of the determinants and distribution of health information (…): Information epidemiology, or infodemiology [1]

Introduction

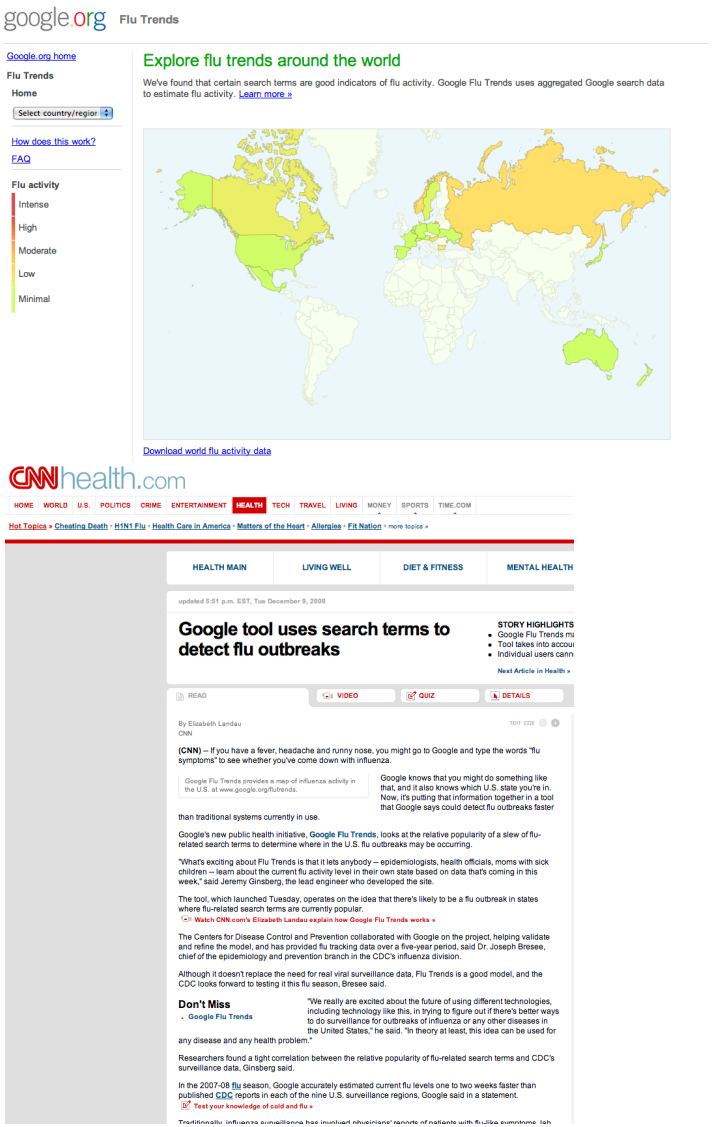
An increasing proportion of people in industrialized countries is using the Internet to seek health information [2;3]. An interesting question is whether tracking health information seeking behaviour of populations over time can be used for public health purposes, particularly syndromic surveillance. The CDC defines syndromic surveillance as “surveillance using health-related data that precede diagnosis and signal a sufficient probability of a case or an outbreak to warrant further public health response.” While most syndromic surveillance systems rely on data from clinical encounters with health professionals, monitoring for example sick-leave prescriptions, house calls, hospital- or pharmacy-based data [4;5], there have also been previous experiments with unconventional methods to use preclinical “health information seeking” data for syndromic surveillance, for example monitoring calls to a “NurseLine” such as NHS Direct [6-8]. However, there does not seem to be any prior evaluation of the use of Internet search data for syndromic surveillance, and most evaluations of surveillance systems for detecting bioterrorism and emerging infections have been described as “insufficient to characterize the timeliness or sensitivity and specificity” [4]

I explored whether an automated analysis of trends in Internet searches could be useful to predict outbreaks such as influenza epidemics. To do so, I first had to develop a method for gathering data from Google. I then developed a model for predicting an influenza outbreak on the basis of changes in Internet search activity for flu-related information. The model was evaluated against a traditional surveillance method which utilizes “sentinel physicians”, who manually report encounters with sick patients to a public health agency.

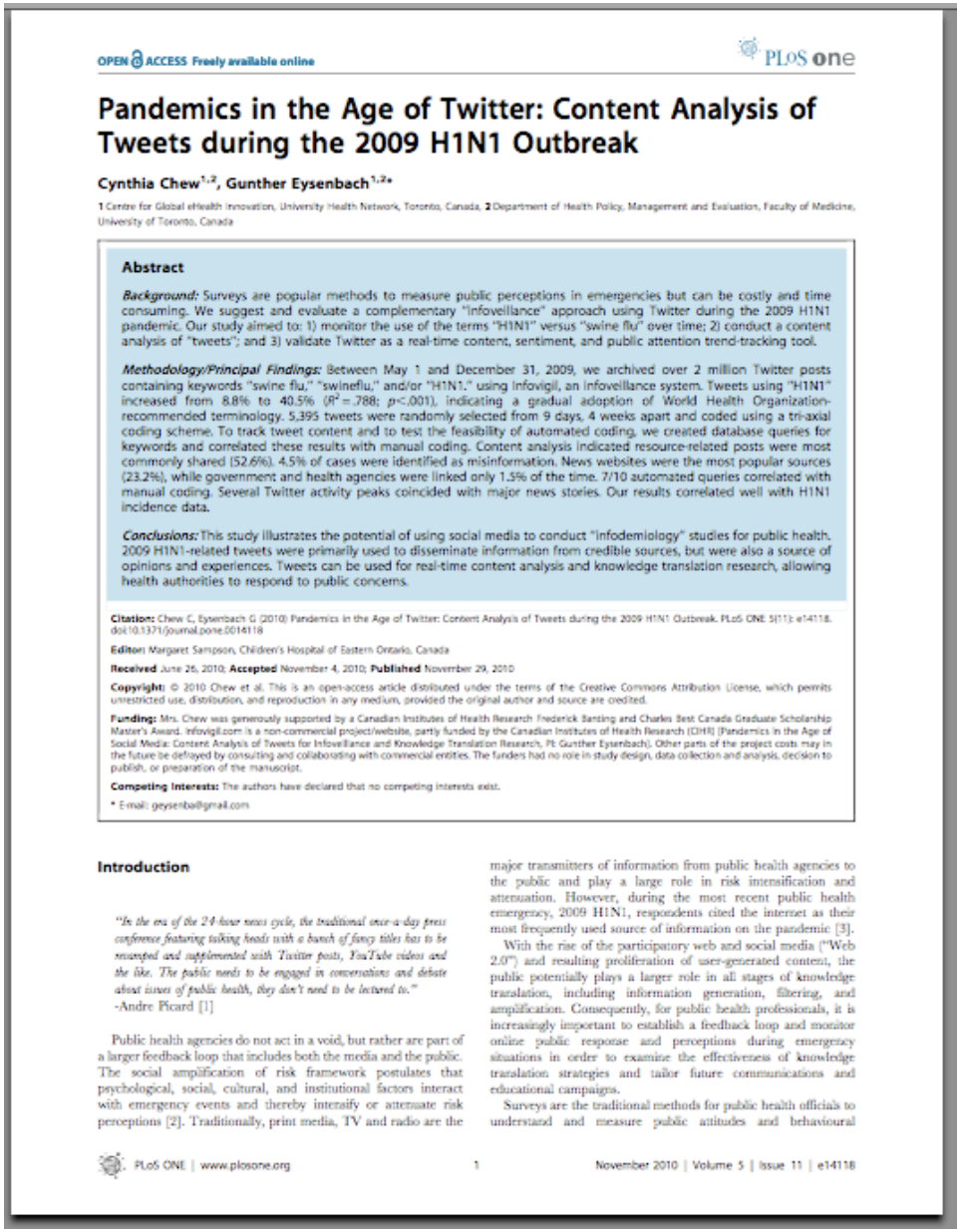
Methods

I aimed to correlate data from the Canadian flu season 2004/2005 over a period of 33 weeks from week 41/2004 (Oct 3-9) to week 20/2005 (May 15-21) with Internet data for flu-related searches.

-> Google Flutrends
(Ginsberg 2009)



"H1N1 marks the first instance in which a global pandemic has occurred in the age of Web 2.0 and presents a unique opportunity to investigate the potential role of these technologies in public health emergencies."



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PLoS one

Pandemics in the Age of Twitter: Content Analysis of Tweets during the 2009 H1N1 Outbreak

Cynthia Chew[1,2], **Gunther Eysenbach**[1,2]*

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Abstract

Background: Surveys are popular methods to measure public perceptions in emergencies but can be costly and time consuming. We suggest and evaluate a complementary "infoveillance" approach using Twitter during the 2009 H1N1 pandemic. Our study aimed to: 1) monitor the use of the terms "H1N1" versus "swine flu" over time; 2) conduct a content analysis of "tweets"; and 3) validate Twitter as a real-time content, sentiment, and public attention trend-tracking tool.

Methodology/Principal Findings: Between May 1 and December 31, 2009, we archived over 2 million Twitter posts containing keywords "swine flu," "swineflu," and/or "H1N1," using Infovigil, an infoveillance system. Tweets using "H1N1" increased from 8.8% to 40.5% (R^2=.788; p<.001), indicating a gradual adoption of World Health Organization-recommended terminology. 5,395 tweets were randomly selected from 9 days, 4 weeks apart and coded using a tri-axial coding scheme. To track tweet content and to test the feasibility of automated coding, we created database queries for keywords and correlated these results with manual coding. Content analysis indicated resource-related posts were most commonly shared (52.6%). 4.5% of cases were identified as misinformation. News websites were the most popular sources (23.2%), while government and health agencies were linked only 1.5% of the time. 7/10 automated queries correlated with manual coding. Several Twitter activity peaks coincided with major news stories. Our results correlated well with H1N1 incidence data.

Conclusions: This study illustrates the potential of using social media to conduct "infodemiology" studies for public health. 2009 H1N1-related tweets were primarily used to disseminate information from credible sources, but were also a source of opinions and experiences. Tweets can be used for real-time content analysis and knowledge translation research, allowing health authorities to respond to public concerns.

Citation: Chew C, Eysenbach G (2010) Pandemics in the Age of Twitter: Content Analysis of Tweets during the 2009 H1N1 Outbreak. PLoS ONE 5(11): e14118. doi:10.1371/journal.pone.0014118

Editor: Margaret Sampson, Children's Hospital of Eastern Ontario, Canada

Received June 26, 2010; **Accepted** November 4, 2010; **Published** November 29, 2010

Funding: Mrs. Chew was generously supported by a Canadian Institutes of Health Research Frederick Banting and Charles Best Canada Graduate Scholarship Master's Award. Infovigil.com is a non-commercial project/website, partly funded by the Canadian Institutes of Health Research (CIHR) [Pandemics in the Age of Social Media: Content Analysis of Tweets for Infoveillance and Knowledge Translation Research, PI: Gunther Eysenbach]. Other parts of the project costs may in the future be defrayed by consulting and collaborating with commercial entities. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Competing Interests: The authors have declared that no competing interests exist.

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Introduction

"In the era of the 24-hour news cycle, the traditional once-a-day press conference featuring talking heads with a bunch of fancy titles has to be revamped and supplemented with Twitter posts, YouTube videos and the like. The public needs to be engaged in conversations and debate about issues of public health, they don't need to be lectured to."
-Andre Picard [1]

Public health agencies do not act in a void, but rather are part of a larger feedback loop that includes both the media and the public. The social amplification of risk framework postulates that psychological, social, cultural, and institutional factors interact with emergency events and thereby intensify or attenuate risk perceptions [2]. Traditionally, print media, TV and radio are the major transmitters of information from public health agencies to the public and play a large role in risk intensification and attenuation. However, during the most recent public health emergency, 2009 H1N1, respondents cited the internet as their most frequently used source of information on the pandemic [3].

With the rise of the participatory web and social media ("Web 2.0") and resulting proliferation of user-generated content, the public potentially plays a larger role in all stages of knowledge translation, including information generation, filtering, and amplification. Consequently, for public health professionals, it is increasingly important to establish a feedback loop and monitor online public response and perceptions during emergency situations in order to examine the effectiveness of knowledge translation strategies and tailor future communications and educational campaigns.

Surveys are the traditional methods for public health officials to understand and measure public attitudes and behavioural

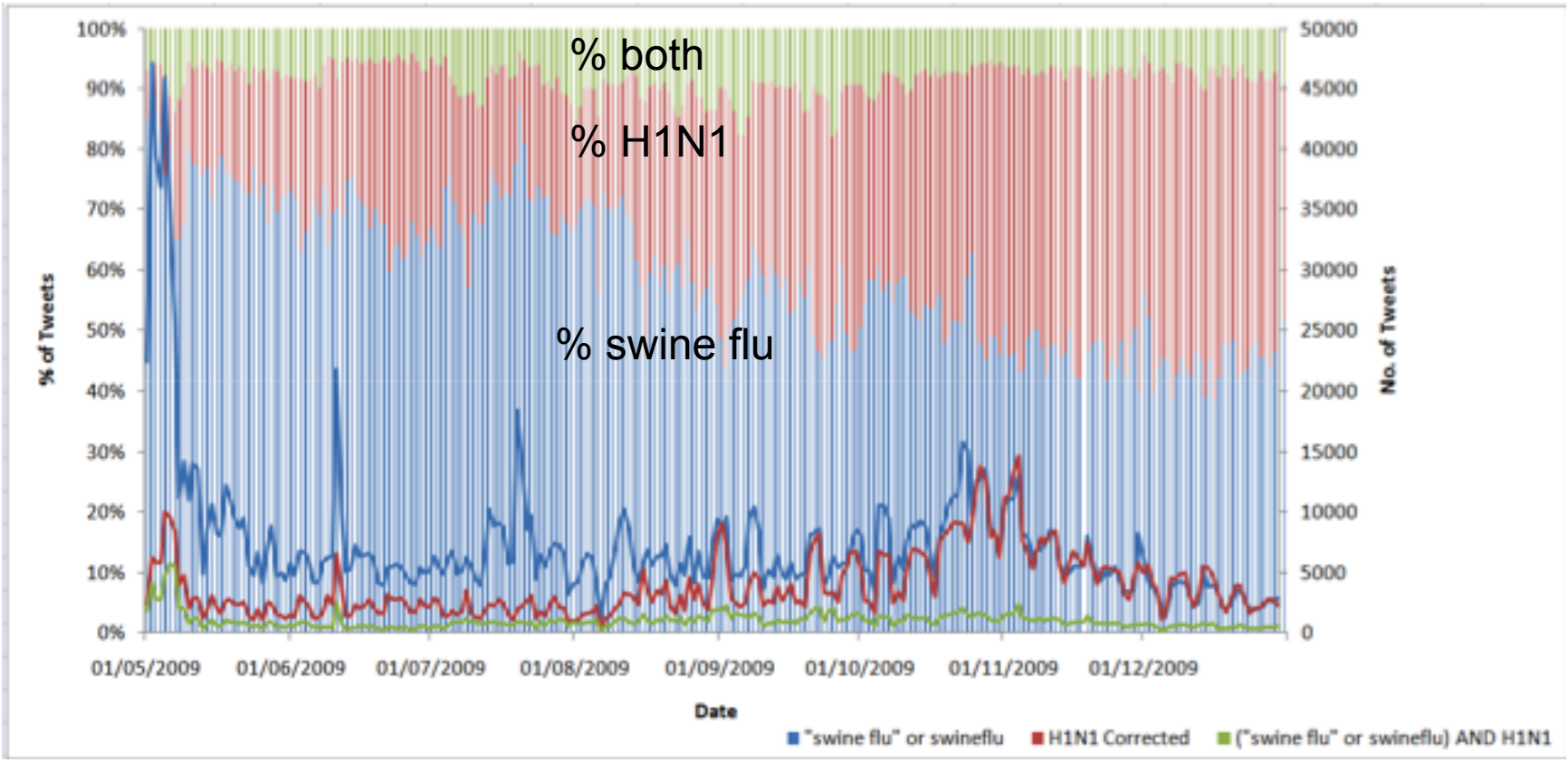
Chew C, Eysenbach G (2010) Pandemics in the Age of Twitter: Content Analysis of Tweets during the 2009 H1N1 Outbreak. PLoS ONE 5(11): e14118

Table 1. Descriptions and Examples of Content Categories

Content	Description	Example Tweets
Resource 53 %	Tweet contains H1N1 news, updates, or information. May be the title or summary of the linked article. Contents may or may not be factual.	*"China Reports First Case of Swine Flu (New York Times): A 30-year-old man who flew from St. Louis to Chengdu is.. http://tinyurl.com/rdbhcg"* *"Ways To Prevent Flu http://tinyurl.com/r4l4cx #swineflu #h1n1"*
Personal Experience 23 %	Twitter user mentions a direct (personal) or indirect (e.g. friend, family, co-worker) experience with the H1N1 virus or the social/economic effects of H1N1.	*"Swine flu panic almost stopped me from going to US, but now back from my trip and so happy I went :-))"* *"Oh we got a swine flu leaflet. clearly the highlight of my day"* *"My sister has swine flu!"*
Personal Opinion and Interest 14 %	Twitter user posts their opinion of the H1N1 virus/situation/news or expresses a need for information.	*"More people have died from Normal Flu than Swine flu, its just a media hoax, to take people's mind off the recession"* *"Currently looking up some info on H1N1"* *"Swine flu is scary!"*
Jokes/Parody 8 %	Tweet contains a H1N1 joke told via video, text, or photo; or a humourous opinion of H1N1 that does not refer to a personal experience.	*"If you're an expert on the swine flu, does that make you Fluent?"*
Marketing 1 %	Tweet contains an advertisement for an H1N1-related product or service.	*"Buy liquid vitamin C as featured in my video http://is.gd/y87r #health #h1n1"*
Spam 2 %	Tweet is unrelated to H1N1	*"musicmonday MM lamarodom Yom Kippur Polanski Jay-Z H1N1 Watch FREE online LATEST MOVIES at http://a.gd/b1586f"*

Chew C, Eysenbach G (2010) Pandemics in the Age of Twitter: Content Analysis of Tweets during the 2009 H1N1 Outbreak. PLoS ONE 5(11):

Absolute and relative number of H1N1/Swine-Flu Tweets



The relative proportion of tweets using "H1N1" increased from 8.8% to 40.5% in an almost linear fashion (R^2= .788; $p < .001$), indicating a gradual adoption of the WHO-recommended H1N1 terminology as opposed to "Swine Flu"

CYBERINFRASTRUCTURE AND POPULATION HEALTH | VOLUME 40, ISSUE 5,
SUPPLEMENT 2, S154-S158, MAY 01, 2011

Infodemiology and Infoveillance

Tracking Online Health Information and Cyberbehavior for Public Health

Gunther Eysenbach, MD, MPH

DOI: https://doi.org/10.101

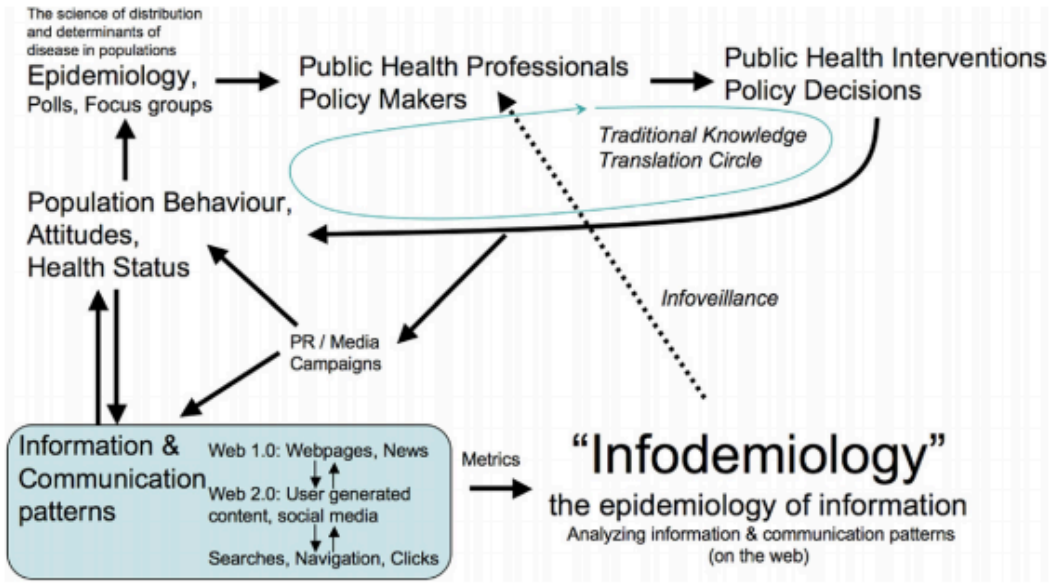


Figure 1. The role of infodemiology in public health

that (1) epidemiologic methods and terminology (e.g., prevalence) can be used to study and describe informa-

While the Internet is currently the main source of such information, in principle any consumer health informat-

“Infodemiology”

the epidemiology of information

Describing and analyzing health information & communication patterns (e.g. on the Web)

for public health purposes

Demand

Metrics
(search & navigation data)

Supply

Metrics
(what’s published e.g on webpages, Twitter etc.)

Eysenbach G
Infodemiology and Infoveillance: Framework for an Emerging Set of Public Health Informatics Methods to Analyze Search, Communication and Publication Behavior on the Internet
J Med Internet Res 2009;11(1):e11 https://doi.org/10.2196/jmir.1157

Infodemiology E-Collection: https://www.jmir.org/themes/69

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Journal of Medical Internet Research | IMPACT FACTOR 4.945 | Current Issue | Upcoming Issue | Top Articles | Browse by Year: Select... | Browse: Issues | Authors | Themes

E-collection 'Infodemiology and Infoveillance'

Infodemiology (Eysenbach 2006, Eysenbach 2009) can be defined as "the science of distribution and determinants of information in an electronic medium, specifically the Internet, or in a population, with the ultimate aim to inform public health and public policy. Infodemiology data can be collected and analyzed in near real time. Examples for infodemiology applications include: the analysis of queries from Internet search engines to predict disease outbreaks (eg. influenza); monitoring peoples' status updates on microblogs such as Twitter for syndromic surveillance; detecting and quantifying disparities in health information availability; identifying and monitoring of public health relevant publications on the Internet (eg. anti-vaccination sites, but also news articles or expert-curated outbreak reports); automated tools to measure information diffusion and knowledge translation, and tracking the effectiveness of health marketing campaigns. Moreover, analyzing how people search and navigate the Internet for health-related information, as well as how they communicate and share this information, can provide valuable insights into health-related behavior of populations. " (Eysenbach 2009)

See also related E-Collections:

Infoveillance, Infodemiology and Digital Disease Surveillance and Pharmacovigilance

Assessment of Health Information About COVID-19 Prevention on the Internet: Infodemiological Study

Ignacio Hernández-García, Teresa Giménez-Júlvez

JMIR Public Health Surveill 2020 (Apr 01); 6(2):e18717

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5

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COVID19 Infodemiology Papers

Cuan-Baltazar JY, Muñoz-Perez MJ, Robledo-Vega C, Pérez-Zepeda MF, Soto Vega E
COVID- 19 misinformation on the internet: The other epidemy
JMIR Public Health & Surveillance
https://doi.org/10.2196/18444

Basch C, Hillyer G, Meleo-Erwin ZC, Jaime C, Mohlman J, Basch CE
Educating the Public About Reducing Exposure to SARS-CoV-2: Preventive Behaviors Conveyed on YouTube to Mitigate Transmission of COVID-19
JMIR Public Health Surveill 2020;6(2):e18807
https://doi.org/10.2196/18807

Abd-Alrazaq A, Alhuwail D, Househ M, Hamdi M, Shah Z
COVID-19 Pandemic: Analysis of COVID-19 related tweets
JMIR Preprints. 31/03/2020:19016
DOI: 10.2196/preprints.19016
URL: https://preprints.jmir.org/preprint/19016

Park HW, Park S, Chong M
An Infodemiological Study on Coronavirus (COVID-19) in South Korea: Conversations and Medical News Frames on Twitter
JMIR Preprints. 26/03/2020:18897
https://preprints.jmir.org/preprint/18897

Geldsetzer P
Use of Rapid Online Surveys to Assess People's Perceptions During Infectious Disease Outbreaks: A Cross-sectional Survey on COVID-19
J Med Internet Res 2020;22(4):e18790
https://doi.org/10.2196/18790

Online Survey Reveals Patient Knowledge, Misperceptions About COVID-19

APRIL 04, 2020
Samara Rosenfeld

Findings from an online survey could help guide information campaigns regarding appropriate coronavirus disease 2019 (COVID-19) measures and misperceptions, according to the findings of recent research.

Pascal Geldseltzer, MD, MPH, PhD, administered an online questionnaire to 6000 adults—3000 in the US and 3000 in the UK to determine knowledge and perception of COVID-19 among the general public in the 2 regions. Geldseltzer found that such surveys could be an important tool in tracking knowledge and misperceptions during rapidly moving infectious disease outbreaks. While patients had a general understanding of how the disease spreads, they still believed many misconceptions spread around the news and internet.

Pascal Geldseltzer, MD, MPH, PhD

Currently accepted at: JMIR Public Health and Surveillance
Date Submitted: Mar 27, 2020
Open Peer Review Period: Mar 27, 2020 - Mar 31, 2020
Date Accepted: Apr 1, 2020
Date Submitted to PubMed: Apr 2, 2020
(closed for review but you can still tweet)

Peer-to-Peer Contact Tracing: A Privacy Smartphone Application

Tyler M Yasaka; Brandon M Lehrich; Ronald Sahyouni;

JMIR Public Health Surveill 2020 Apr 1[Online ahead of print]

Peer-to-Peer Contact Tracing: A Privacy-Preserving Smartphone Application

Tyler M Yasaka [1], Brandon M Lehrich [2], Ronald Sahyouni [2 3]
Affiliations + expand

PMID: 32240973 DOI: 10.2196/18936

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COVID-19 SARS-CoV-2 preprints from medRxiv and bioRxiv

1148 Articles (886 medRxiv, 262 bioRxiv)

Most recent first

Analytical Validation of a COVID-19 qRT-PCR Detection Assay Using a 384-well Format and Three Extraction Methods

Nelson, A. C., Auch, B., Schomaker, M., Gohl, D. M., G
K., Fay, E. J., Bold, T., Langlois, R. A., Beckman, K. B., Yo

10.1101/2020.04.02.022186 — Posted: 2020-04-05

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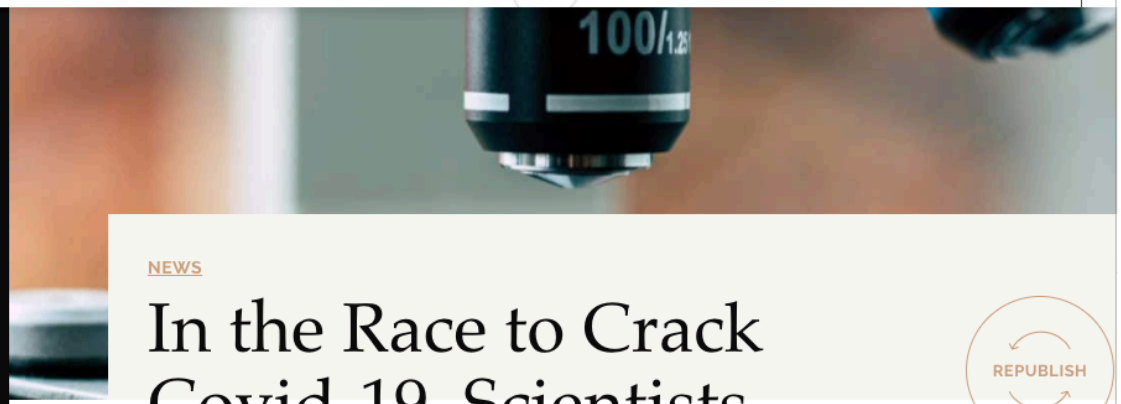


NEWS

In the Race to Crack Covid-19, Scientists Bypass Peer Review

REPUBLISH

To speed information sharing, many scientists are posting paper drafts directly online. What are the downsides of that?

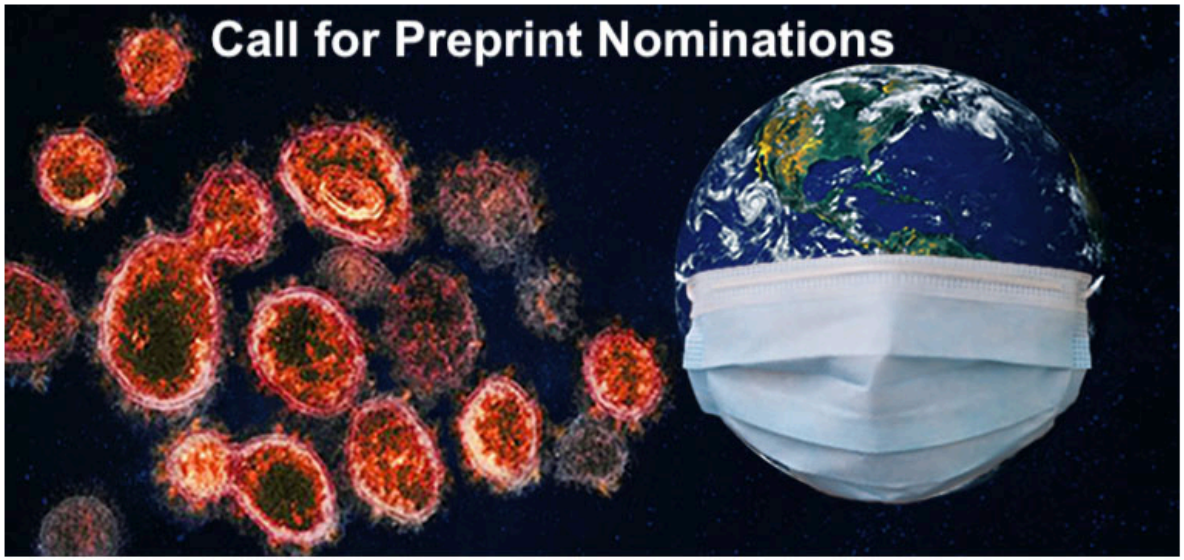
BY HANNAH THOMASY

04.01.2020

1 COMMENT

Visual: Yassine Khalfalli via Unsplash

Call for Preprint Nominations: PREreview + JMIR Publications Virtual COVID-19 Preprint Journal Club



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#covid19 #preprint #JournalClub

PREREVIEW

PREreview + JMIR Publications Virtual COVID-19 Preprint Journal Club

(Toronto/Portland, 27 March 2020) PREreview and JMIR Publications are joining forces to bring together scientists from across the globe for a virtual discussion and collaborative review of a recent preprint covering new research related to coronavirus SARS-COV-2 leading to the disease referred to as COVID-19.

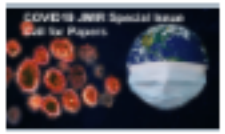
Unintended consequences: Twitter censorship

JMIR Publications @jmirpub · Mar 25

Standing Call for Papers: Coronavirus Covid19 Special Issue for JMIR Public Health and Surveillance (JPHS) - Submit for Rapid Peer-Review, Preprints, Pubmed-ahead-of-print and immediate sharing with WHO

publichealth.jmir.org/announcement/v...

https://t.co/NEpOha2MrP



- Halted

Samuel Gaye

Apr 2, 15:27 EDT

Hi team!

I hope you don't mind the email. I just got assigned to be the JMIR Publications Twitter Account Representative and wanted to reach out and introduce myself. My team focuses on personalized support to help you achieve your goals using Twitter Ads.

I noticed you had tried to launch a campaign, but it was halted. Twitter came out with some guidelines around COVID-19. I'm more than happy to discuss those and chat about how you can market your brand during this time if you have 15-20 minutes in the coming week to set up an intro call? Feel free to use my calendar (https://success.twttr.com/c/Samuel_Gaye) to put some time on my calendar if that is more convenient.

Looking forward to working with your team!

Best,

Samuel Gaye
Twitter | Client Success

Conclusions

- Infodemic Preparedness: Build Infodemiology Tools
    - WHO-backed Hackathons
    - WHO Collaborating Center(s)
- Antidot to misinformation: Openness
    - Transparency -> Trust
    - Open Science: Open Data, Open Peer-Review, Open Source, Open Access
    - Challenge: Speed vs Rigor, new peer-review models are needed