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# Advances in Digital Health Research

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# Advances in Digital Health Research

## Abstract

Social media and emerging mobile technologies have sparked radical shifts in human behavior, with people worldwide spending an average of 2 hours and 15 minutes daily on social networks. Facebook, Instagram, and Twitter have more than 2 billion users globally. Social networking site use has risen dramatically by all age groups, with the highest use among 18-29 year olds (see Figure below).

Every second, Twitter users send 6,000 tweets, amounting to 500 million tweets per day. Instagram users post approximately 95 million photos, generating 4.2 billion likes, each day. A newer platform, Snapchat, has 178 million daily users, 60% of whom are under 25 years of age. They share an average of 3 billion snaps, or rapidly vanishing photos, every day. Researchers at Penn are turning these Tweets, posts, and snaps into innovative data sources that hold vital clues about behaviors, emotions, preferences, opinions, and social networks—all with potential implications for population health. Through the analysis of keywords, images, phrases, emoticons, likes, and hashtags, Penn teams are turning troves of digital information into human-centered health interventions and educational initiatives.

## Disciplines

Public Health

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## ADVANCES IN DIGITAL HEALTH RESEARCH

Written by Graceann Palmarella, MPH and Colleen McGrath, with consultation from Sara Solomon, MPH RD, Roxanne Dupuis, MSPH, and Carolyn Cannuscio, ScD

### BACKGROUND

Social media and emerging mobile technologies have sparked radical shifts in human behavior, with people worldwide spending an average of 2 hours and 15 minutes daily on social networks. Facebook, Instagram, and Twitter have more than 2 billion users globally.<sup>1</sup> Social networking site use has risen dramatically by all age groups, with the highest use among 18-29 year olds (see Figure below).

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an average of 3 billion snaps, or rapidly vanishing photos, every day.<sup>2</sup>

Researchers at Penn are turning these Tweets, posts, and snaps into innovative data sources that hold vital clues about behaviors, emotions, preferences, opinions, and social networks—all with potential implications for population health. Through the analysis of keywords, images, phrases, emoticons, likes, and hashtags, Penn teams are turning troves of digital information into human-centered health interventions and educational initiatives.

“People share so much about their lives—their relationships, behaviors, opinions, and preferences—using social media. It’s our job as researchers to turn that digital information into valuable insights for human health.”

—Raina Merchant, MD MSHP FAHA, Director of CDH and CPHI Senior Fellow

### THE CENTER FOR DIGITAL HEALTH

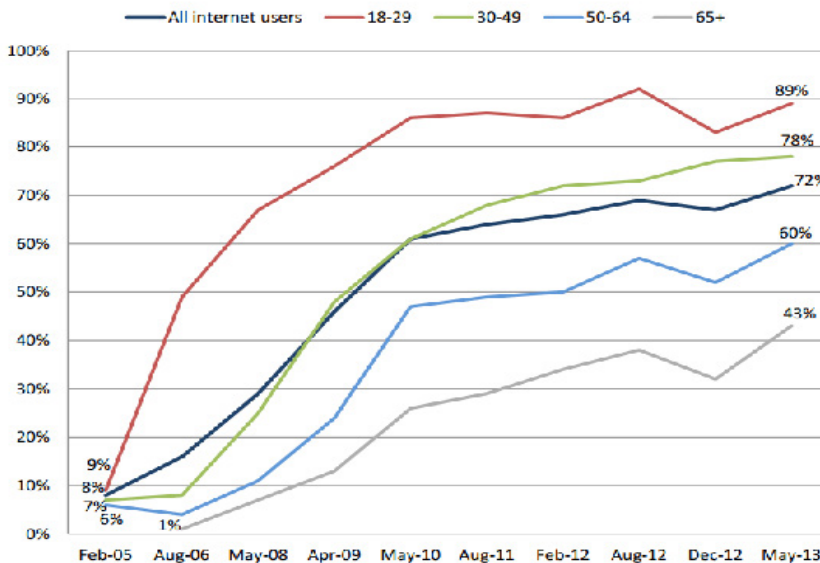
The Penn Medicine Center for Digital Health (CDH) “leverage[s] digital tools to engage patients, providers, and

communities to improve health.”The Center also serves as an incubator for evaluating and promoting digital health ideas and solutions for providers and patients at Penn Medicine.<sup>1</sup> The Center for Digital Health is funded by Penn Medicine and the University of Pennsylvania, as well as grants from the NIH, Robert Wood Johnson Foundation, PA Department of Health, and the Penn Center for Precision Medicine.

The Center for Digital Health engages in diverse studies related to social media and health. The Penn Heart Study, which was recently published in JAMA Cardiology, examined 4.9 million tweets related to heart disease, showing how Twitter can be used for sharing information with and receiving information from patients with hypertension and diabetes. Another analysis of tweets, conducted during the 2013 government shutdown, demonstrated the value of tracking social media posts—including hashtags—to assess public response to major health-related events.

**Social networking site use by age group, 2005-2013**

% of internet users in each age group who use social networking sites



Source: Pew Research Center’s Internet & American Life Project tracking surveys 2005-2013. Spring Tracking Survey, April 17 – May 19, 2013. N=1,895 adult internet users ages 18+. Interviews were conducted in English and Spanish and on landline and cell phones. The margin of error for results based on all internet users is +/- 2.5 percentage points.

# CPHI FELLOWS ADVANCE DIGITAL HEALTH RESEARCH

## Public Discourse About Zika Virus on Instagram

A study from the Penn Medicine Center for Digital Health analyzed postings related to Zika virus on Instagram, an image-based social media platform. The objective of the study was to assess information dissemination during the 2015 Zika outbreak. The research team analyzed 500 images tagged with “#zika,” and authors found that health-related posts were primarily focused on disease transmission and prevention. Of the posts related to prevention, 84% described mosquito bite prevention, while 16% described safe sex practices. The team also found that 60% of the posts included “misleading, incomplete, or unclear information about the virus.”<sup>3</sup> This research finding is particularly relevant to the design of future interventions. The results also suggest the need for officials to remain attentive to real-time public discourse and sentiment, and social media offers just this opportunity.

## Twitter Accounts Followed by Congressional Health Staff

Social media can help close the communication gap between researchers and policy makers, according to research from CPHI Fellows David Grande, Zachary Meisel, and Raina Merchant. In a recent study, the team measured Congressional health policy staffers’ use of Twitter and the types of individuals and organizations they follow.<sup>4</sup> They found that out of the 30,843 accounts followed by the 115 Congressional health policy staff, 1,273 accounts were potentially policy-related and followed by three or more staff. Of those accounts, the majority were general news media sources (50.9%) and political and governmental sources (36.4%). A small proportion of the accounts followed by multiple staffers were from academically affiliated users (2.4%)—suggesting that researchers could dramatically improve their social media engagement and impact.

## Digital Health Privacy

The use of social media and digital technologies leaves a “digital health footprint” that may reveal more about consumers’ lives than they recognize. This raises potential privacy concerns for users and potential ethical considerations for researchers. CPHI Fellows David Grande, Raina Merchant, and Carolyn Cannuscio, with University of Pennsylvania’s David Asch and Nandita Mitra, have secured NIH funding to examine how experts and consumers view the relatively unregulated world of health-relevant digital information. The goal is to develop best practice guidelines in this rapidly evolving landscape.<sup>5</sup>

## CONCLUSION

The growth of social media and digital technologies presents key opportunities to improve health outcomes, patient care, patient engagement, and communication among stakeholders. CPHI Fellows are leading the way in defining robust methods and ethical standards for digital health research and practice.

"We are creating a new framework for health information privacy that considers individuals' health-relevant digital footprints, beyond the boundaries of information gathered in medical encounters. This work challenges the traditional and limited definition of health information as identifiable information generated within the health care system, including new sources of digital information that can reveal a great deal about personal health."

—David Grande, MD, MPA, CPHI Senior Fellow and Director of Policy at the Leonard Davis Institute of Health Economics

## ABOUT CPHI

The Center for Public Health Initiatives was founded in 2007 by the University of Pennsylvania to act as an interdisciplinary hub that brings together faculty, staff, and students from across Penn’s campus. The mission of CPHI is to educate and train new and emerging public health leaders, foster multi-disciplinary collaborations, and promote excellence in public health research and community partnerships.

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1. Center for Digital Health. Social Mediome. <https://centerfordigitalhealth.upenn.edu/social-mediome>
2. Social Pilot. *171 Amazing Social Media Statistics You Should Know in 2018*. <https://www.socialpilot.co/blog/social-media-statistics>
3. Seltzer, EK., Horst-Martz, E., Lu, M., Merchant, RM (2017). “Public sentiment and discourse about Zika virus on Instagram.” *Public Health* 150: 170-175.
4. Grande, D., Meisel, Z., Merchant, RM., et al. (2017).

- “Twitter Accounts Followed by Congressional Health Staff.” *The American Journal of Managed Care* 23(7):e238-e244.
5. NIH RePORT. Patient Preferences for Collecting and Repurposing Genetic, Consumer, and Health Care Information. [https://projectreporter.nih.gov/project\\_info\\_description.cfm?aid=9362094&icid=38135135&ddparam=&ddvalue=&ddsub=&cr=1&csb=default&cs=ASC&pball=](https://projectreporter.nih.gov/project_info_description.cfm?aid=9362094&icid=38135135&ddparam=&ddvalue=&ddsub=&cr=1&csb=default&cs=ASC&pball=)