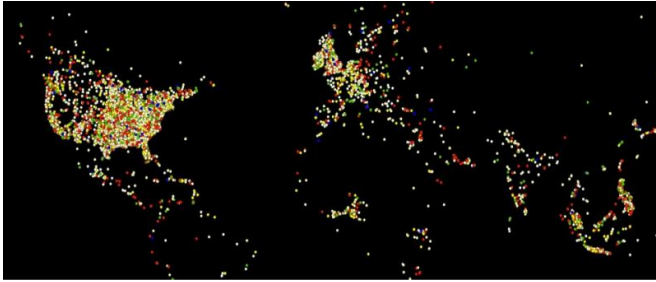


How Twitter can help predict emergency room visits

15 April 2015, by Alexis Blue



Researchers tracked asthma-related tweets around the world, shown in the visualization above, then zoomed in on a particular region to see how the social media posts, when analyzed alongside other data, could help them predict asthma-related emergency room visits.

Twitter users who post information about their personal health online might be considered by some to be "over-sharers," but new research led by the University of Arizona suggests that health-related tweets may have the potential to be helpful for hospitals.

Led by Sudha Ram, a UA professor of management information systems and computer science, and Dr. Yolande Pengetnze, a physician scientist at the Parkland Center for Clinical Innovation in Dallas, the researchers looked specifically at the chronic condition of [asthma](#) and how asthma-related tweets, analyzed alongside other data, can help predict asthma-related [emergency room visits](#).

Ram and her collaborators—including Wenli Zhang, a UA doctoral student in management information systems, and researchers from the Parkland Center for Clinical Innovation—created a model that was able to successfully predict approximately how many asthma sufferers would visit the emergency room at a large hospital in Dallas on a given day, based on an analysis of data gleaned from

[electronic medical records](#), air quality sensors and Twitter.

Their findings, to be published in the forthcoming *IEEE Journal of Biomedical and Health Informatics*' special issue on big data, could help hospital emergency departments nationwide plan better with regard to staffing and resource management, said Ram, the paper's lead author.

"We realized that asthma is one of the biggest traffic generators in the emergency department," Ram said. "Often what happens is that there are not the right people in the ED to treat these patients, or not the right equipment, and that causes a lot of unforeseen problems."

Over a three-month period, Ram and her team collected air quality data from environmental sensors in the vicinity of the Dallas hospital. They also gathered and analyzed asthma-related tweets containing certain keywords such as "asthma," "inhaler" or "wheezing." After collecting millions of tweets from across the globe, they used text-mining techniques to zoom in on relevant tweets in the ZIP codes where most of the hospital's patients live, according to electronic medical records.

The researchers found that as certain air quality measures worsened, asthma visits to the emergency room went up. Asthma visits also increased as the number of asthma-related tweets went up. The researchers additionally looked at asthma-related Google searches in the area but found that they were not a good predictor for asthma emergency room visits.

By analyzing tweets and [air quality](#) information together, Ram and her collaborators were able to use machine learning algorithms to predict with 75 percent accuracy whether the emergency room could expect a low, medium or high number of asthma-related visits on a given day.

The research highlights the important role that big data, including streams from social media and environmental sensors, could play in addressing health challenges, Ram said.

She and her team hope that their findings will help them create similar predictive models for emergency room visits related to other chronic conditions, such as diabetes.

"You can get a lot of interesting insights from social media that you can't from [electronic health records](#)," Ram said. "You only go to the doctor once in a while, and you don't always tell your doctor how much you've been exercising or what you've been eating. But people share that information all the time on social media. We think that prediction models like this can be very useful, if we can combine various types of data, to address chronic diseases."

Ram is co-director of the UA's INSITE Center for Business Intelligence and Analytics in the Eller College on Management. The INSITE Center focuses on predictive analytics through the use of data from a variety of sources, including [social media](#), sensors, mobile applications and Web-based platforms.

Health care—and how various forms of data can be used to address health-care issues—is a key area of interest for the center.

Big data analysis already has been used to predict the spread of contagious disease. The Google Flu Trends Web service, for example, estimates when and where flu will spread based on analysis of flu-related Google searches.

The model developed by Ram and her collaborators is different in that it focuses on a chronic condition.

"People often end up in the [emergency room](#) not necessarily for contagious diseases but for complications resulting from chronic conditions like asthma or diabetes or cardiac problems, which cost a lot to our health care system," Ram said.

More than 25 million Americans are affected by

asthma, which accounts for approximately 2 million emergency department visits, half a million hospitalizations and 3,500 deaths annually, incurring more than \$50 billion in direct medical costs, Ram and her collaborators write in their paper.

Although hospitals can make risk predictions about when individual asthma patients might return, based on medical histories, the model created by Ram and her collaborators makes predictions at the population level.

"The CDC gets reports of [emergency department](#) visits several weeks after the fact, and then they put out surveillance maps," Ram said. "With our new model, we can now do this in almost real time, so that's an important public health surveillance implication."

Ram's co-author Pengetnze said the research represents a creative new approach to population health.

"The multidisciplinary collaboration in this study combines clinical expertise, health services knowledge, electronic health records, and non-traditional [big data](#) sources to address the major health challenge that is asthma," she said. "This multifaceted approach could have important implications for the timeliness of [public health surveillance](#), hospital preparedness and clinical workflows, first for asthma then for other burdensome [chronic conditions](#) like childhood obesity, Type 2 diabetes, and cardiovascular diseases, to name a few."

With the first phase of their research complete, Ram and her team now plan to expand the asthma study to 75 hospitals in the Dallas-Fort Worth area.

"We've got really good results," Ram said, "and now we're working on building even more robust models to see if we can increase the accuracy level by using more types of datasets over a longer time period."

More information: "Predicting Asthma-Related Emergency Department Visits Using Big Data." ieeexplore.ieee.org/stamp/stam...

[tp=&arnumber=7045443](#)

Provided by University of Arizona

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