INFORMATICS PROFESSIONALS. LEADING THE WAY.

Understanding the Patterns of Health Information Dissemination on Social Media during the Zika Outbreak

Improving Population Health Using Novel Data Sources

S47

Xinning Gui[1] and Yue Wang[2]

1. University of California, Irvine
2. University of Michigan

Twitter: #AMIA2017

Disclosure

We and our spouses/partners have no relevant relationships with commercial interests to disclose.

Learning Objectives

After participating in this session the learner should be better able to:

- Utilize a mixed methods approach, in addition to machine learning, to monitor and assess the dissemination of health information (e.g. that related to Zika) on social media
- Formulate effective strategies for communicating public health information on social media
- Identify opportunities and challenges that social media present to risk communication

Motivation

Source: https://npin.cdc.gov/training/know-social-media-public-health

Research Goals

- To analyze the risk communication on Twitter during 2016 Zika outbreak
- To understand the information created by **general public** and **public health authorities**, and different information dissemination patterns
- To provide implications for effective risk communication strategies on social media

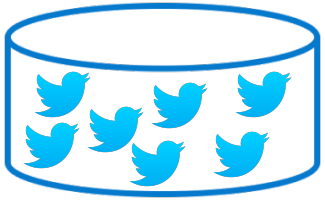
Source: http://www.newsweek.com/zika-testing-fda-blood-donated-united-states-microcephaly-florida-brazil-493985

Collecting Zika-related tweets

10% of twitter in 2016

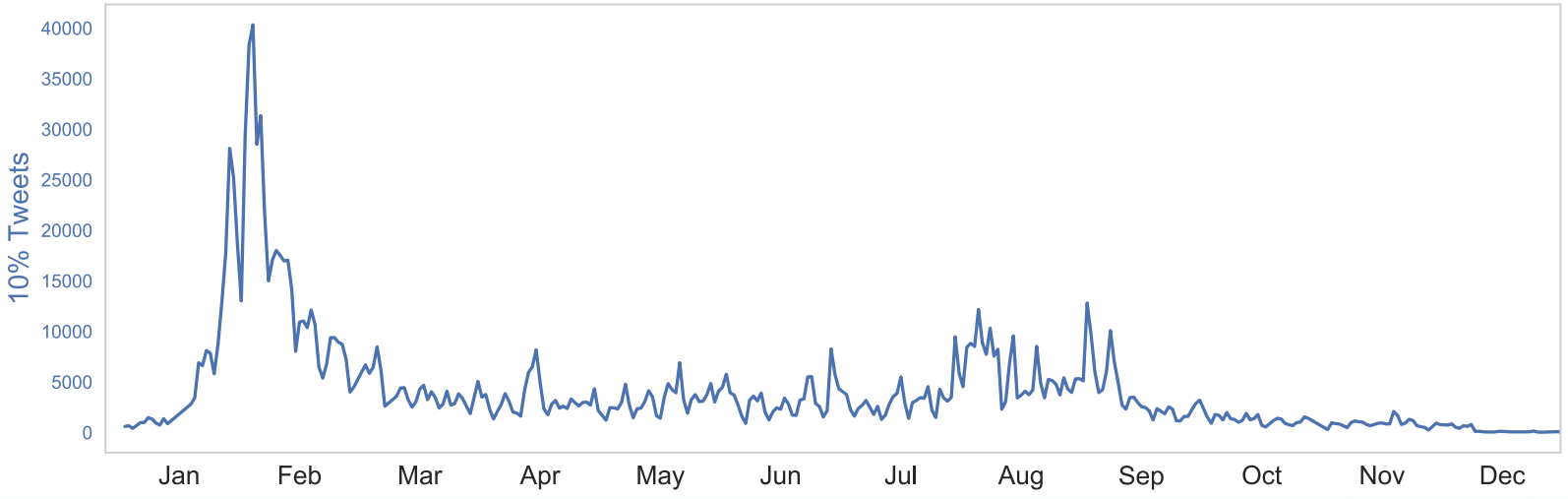
"zika"

1,495,480 tweets

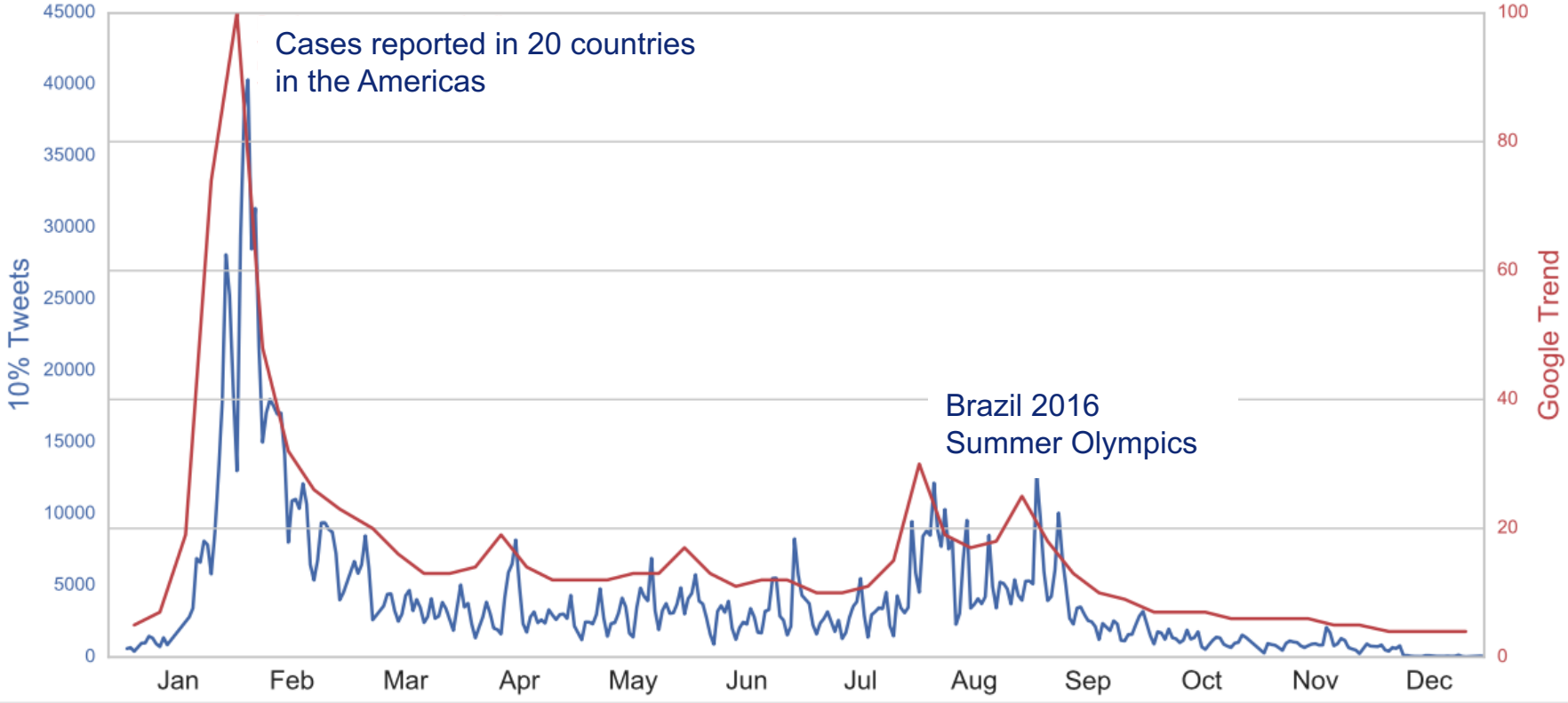


Top languages

English	54%
Spanish	27%
Portuguese	12%



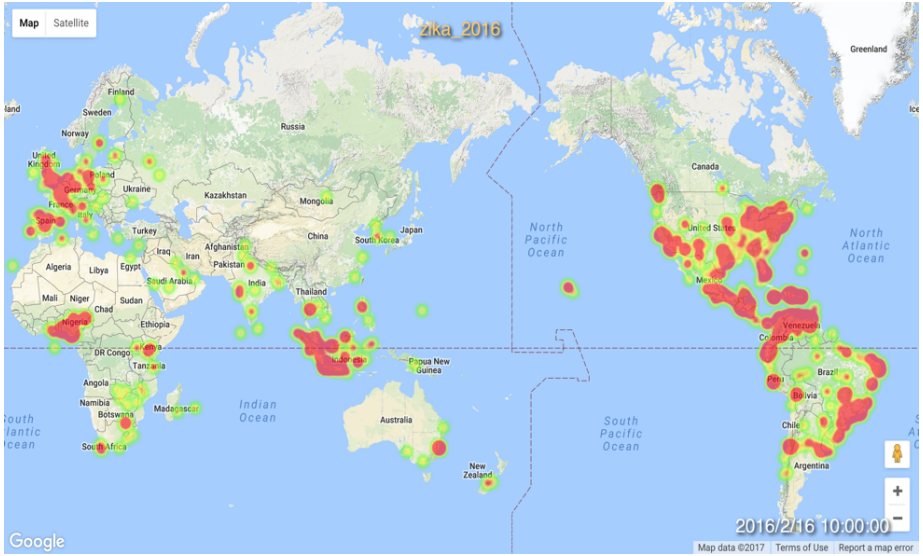
Zika tweets & Google trend



Worldwide Zika discussion on Twitter

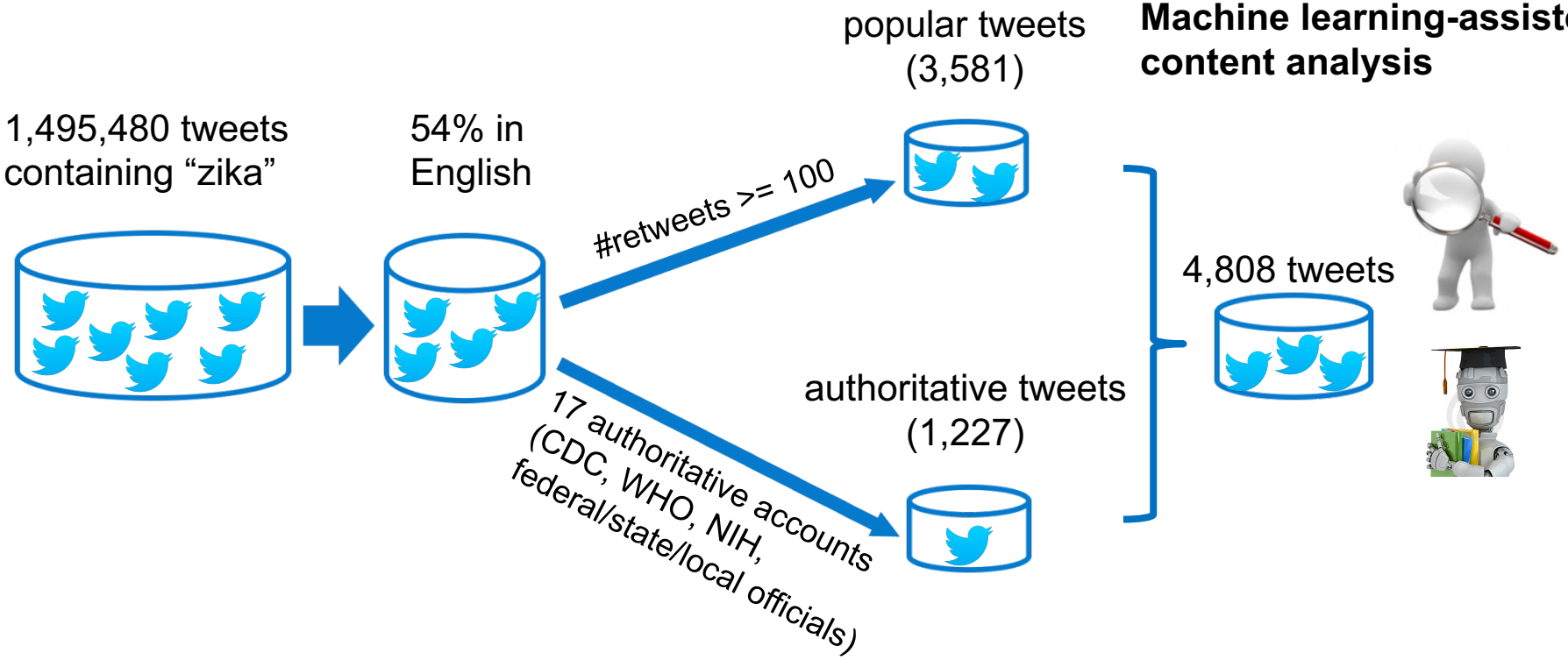
mid January, 2016

mid February, 2016

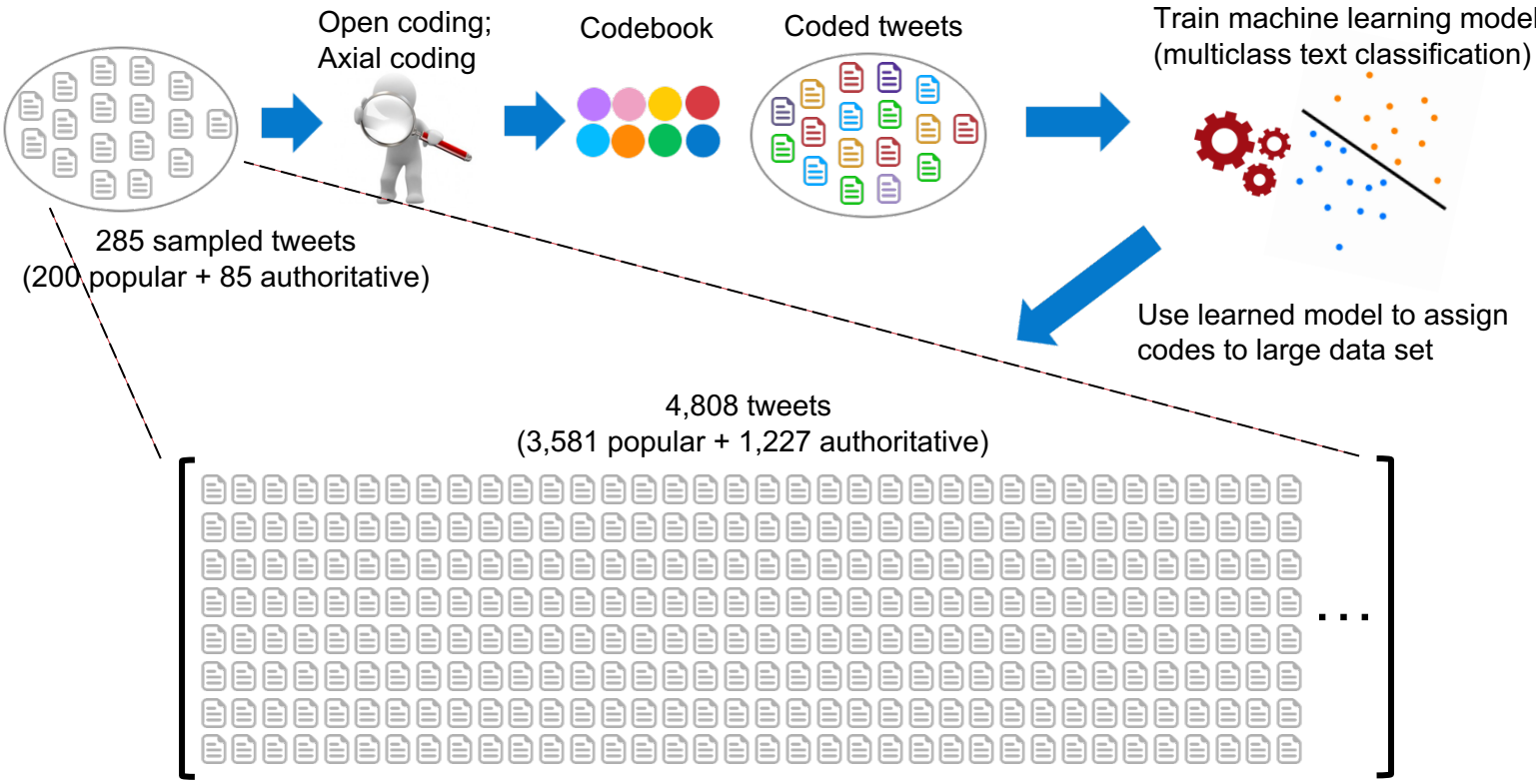


WHO declared emergency on Feb 1st, 2016

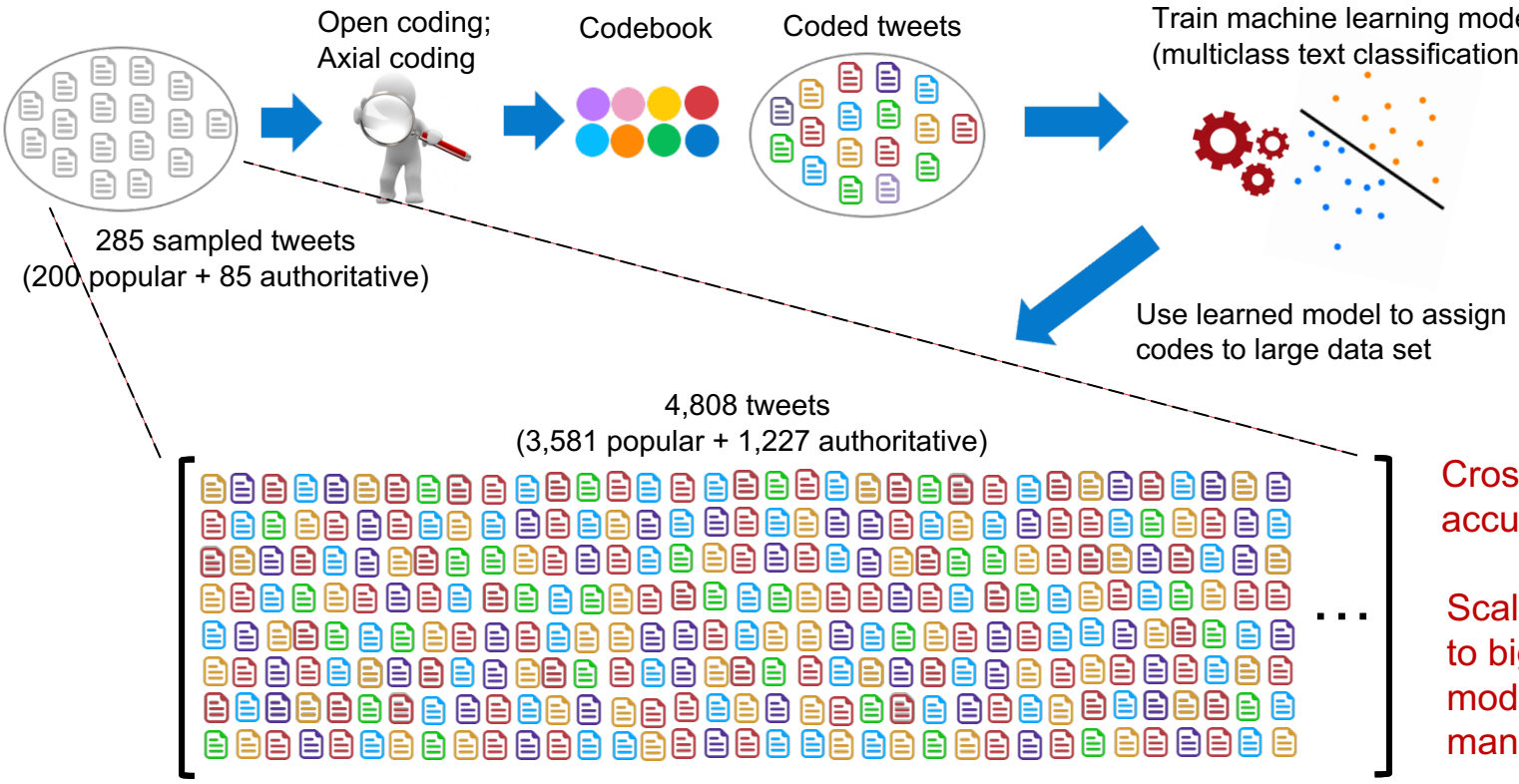
Content analysis roadmap



Machine Learning-Assisted Content Analysis



Machine Learning-Assisted Content Analysis

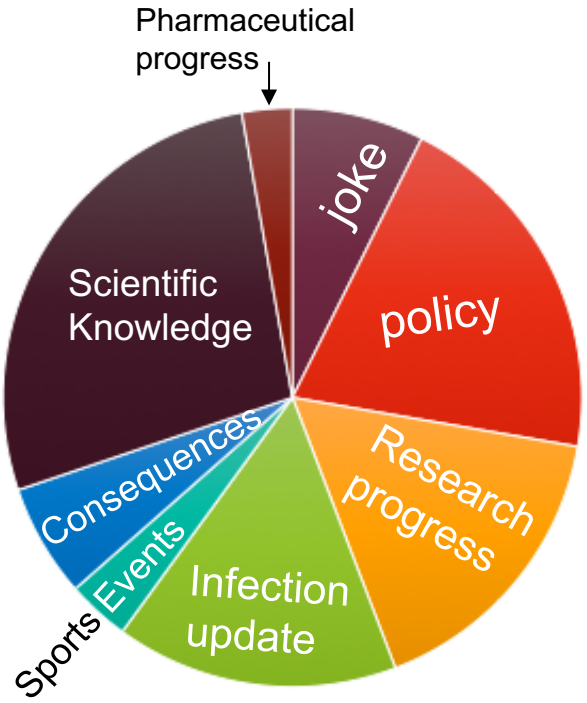


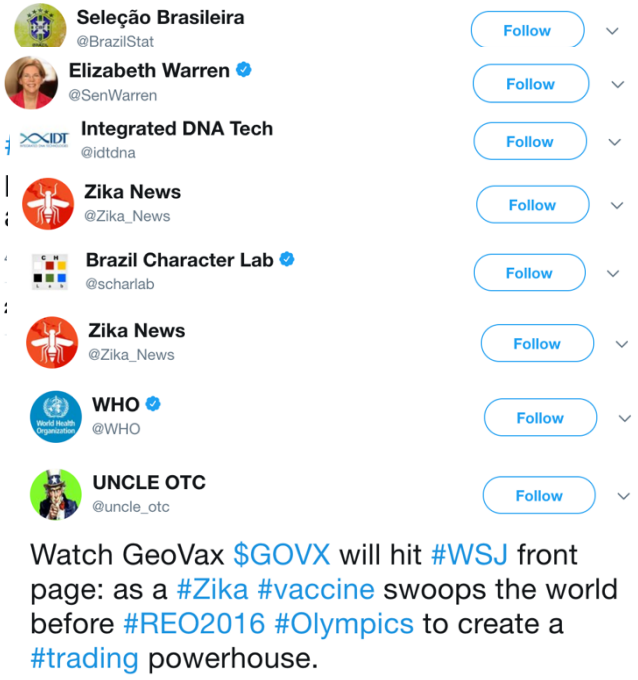
Cross-validation accuracy ~80%

Scale up analysis to big data with modest amount of manual effort

285 coded tweets: 8 categories

- Joke
- Policy
- Research Progress
- Infection Update
- Sports Events
- Consequence
- Scientific Knowledge
- Pharmaceutical Progress





Typology of Zika-related Tweet Content

Descriptive Statistics of Top Retweeted Tweets (# of retweets >=100)

Category	Retweet Count Average (std. dev.)	Like Count Average (std. dev.)	Percentage (%)
Joke	1362 (3706)	1425 (3040)	1.6
Sports Events	336 (452)	317.0 (311)	0.4

Descriptive Statistics of Authoritative Tweets

Category	Retweet Count Average (std. dev.)	Like Count Average (std. dev.)	Percentage (%)
Joke	0	0	0
Sports Events	0	0	0

Screentshots taken on Oct 31, 2017


USA
FRA
USA
1

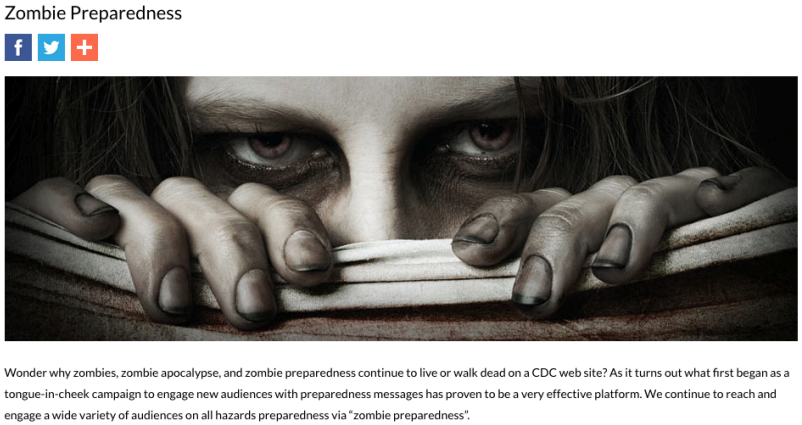
CDC has updated its interim guidance for U.S. health care providers caring for pregnant women with possible Zika virus exposure, to include the emerging data indicating that Zika virus RNA can be detected for prolonged periods in some pregnant women. To increase the proportion of pregnant women with Zika virus infection who receive a definitive diagnosis, CDC recommends expanding real-time reverse transcription–polymerase chain reaction (rRT-PCR) testing. Possible exposures to Zika virus include travel to or residence in an area with active Zika virus transmission, or sex* with a partner who has traveled to or resides in an area with active Zika virus transmission without using condoms or other barrier methods to prevent infection.† Testing recommendations for pregnant women with possible Zika virus exposure who report clinical illness consistent with Zika virus disease§ (symptomatic pregnant women) are the same, regardless of their level of exposure (i.e., women with ongoing risk for possible exposure, including residence in or frequent travel to an area with active Zika virus transmission, as well as women living in areas without Zika virus transmission who travel to an area with active Zika virus transmission, or have unprotected sex with a partner who traveled to or resides in an area with active Zika virus transmission). Symptomatic pregnant women who are evaluated <2 weeks after symptom onset should r testing. Symptomatic pregnant women who are evaluated 2–12 weeks after symptom onset should first receive a Zika virus immunoglobulin (IgM) positive or equivocal, serum and urine rRT-PCR testing should be performed. Testing recommendations for pregnant women with possible Zika viru consistent with Zika virus disease (asymptomatic pregnant women) differ based on the circumstances of possible exposure. For asymptomatic preg Zika virus transmission and who are evaluated <2 weeks after last possible exposure, rRT-PCR testing should be performed. If the rRT-PCR result is be performed 2–12 weeks after the exposure. Asymptomatic pregnant women who do not live in an area with active Zika virus transmission, who a possible exposure should first receive a Zika virus IgM antibody test; if the IgM antibody test result is positive or equivocal, serum and urine rRT-PC women with ongoing risk for exposure to Zika virus should receive Zika virus IgM antibody testing as part of routine obstetric care during the first testing should be performed when IgM antibody test results are positive or equivocal. This guidance also provides updated recommendations for th confirmed or possible Zika virus infection. These recommendations will be updated when additional data become available.

Introduction

Zika virus continues to spread worldwide, and as of July 21, 2016, 50 countries and territories reported active Zika virus transmission (locations wi in the area).¶ Although most persons with Zika virus infection are asymptomatic or have mild clinical disease, infection during pregnancy can cause (*1*). Zika virus has also been linked to other adverse pregnancy outcomes, including miscarriage and stillbirth (*1,2*). The U.S. Zika Pregnancy Registry Pregnancy Surveillance System (ZAPPS)†† were established in collaboration with state, tribal, local, and territorial health departments to monitor p virus infection to determine the risk for Zika virus infection during pregnancy and the spectrum of conditions associated with congenital Zika virus women in the 50 U.S. states and the District of Columbia, and 378 women in all U.S. territories (aggregated territories' data from the USZPR and ZA

Implications

- Conduct more interactive and engaging communication strategies
  - E.g., CDC's viral Zombie Apocalypse campaign



- Consider including more information in tweets and restating scientific messages in plain language

Typology of Zika-related Tweet Content

Descriptive Statistics of Top Retweeted Tweets (# of retweets >=100)

Category	Retweet Count Average (std. dev.)	Like Count Average (std. dev.)	Percentage (%)
Pharmaceutical Progress	1192 (1509)	607 (787)	0.4
Consequence	704 (922)	450 (680)	1.5
Research Progress	419 (672)	301.4 (529)	9.5

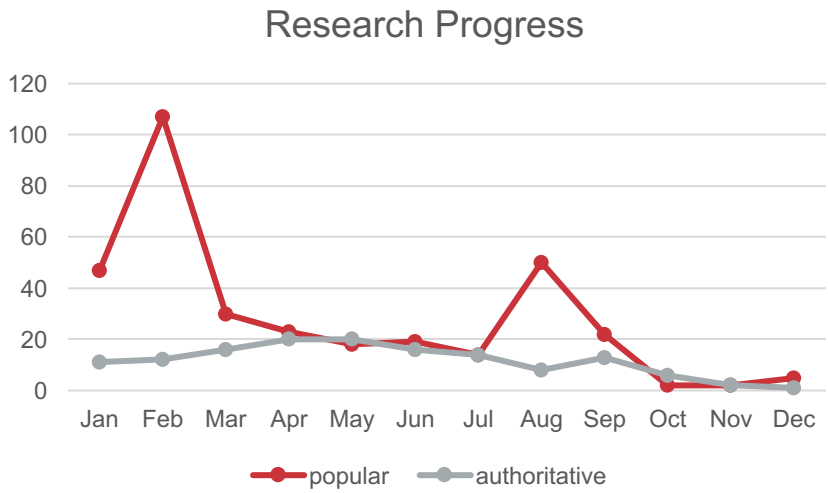
Descriptive Statistics of Authoritative Tweets

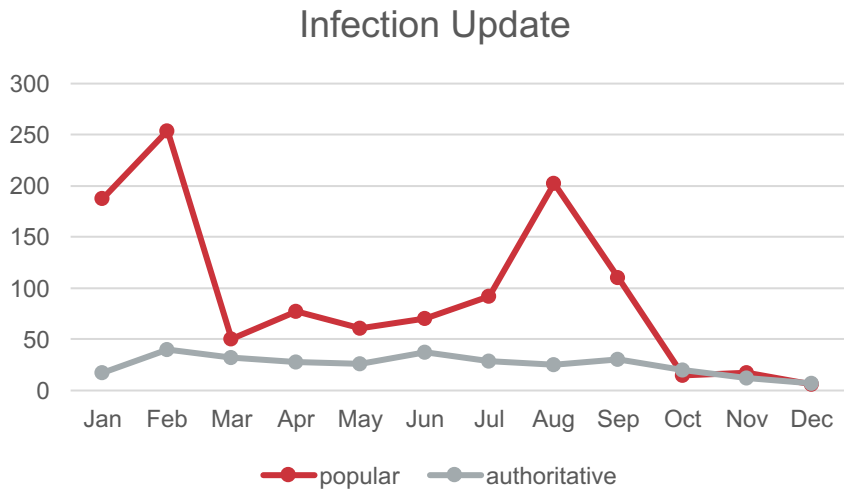
Category	Retweet Count Average (std. dev.)	Like Count Average (std. dev.)	Percentage (%)
Scientific Knowledge	43 (177)	22 (65)	47.6
Infection Update	25 (45)	87 (56)	24.8
Policy	26 (38)	19 (30)	17.0

Implications

- Consider monitoring information dissemination trends on social media to
  - gain familiarity with major conversations and debates that take place among the general public
  - evaluate the effectiveness of social media efforts

Temporal Development between Popular and Authoritative Tweets





Implication

- Consider publishing more timely content related to influential news and major events

Conclusion

- providing more engaging and straightforward health message contents that attend to people's information needs
- adopting more interactive communication strategies
- delivering messages timely after related news and major events
- monitoring information dissemination trends on social media and evaluating the effectiveness of social media efforts

Acknowledgement

The Co-authors

Yubo Kou

PhD, Purdue University

Tera Leigh Reynolds

MPH, MA, University of California, Irvine

Yunan Chen

PhD, University of California, Irvine

Qiaozhu Mei

PhD, University of Michigan

Kai Zheng

PhD, University of California, Irvine

And **Anonymous Reviewers**

AMIA
INFORMATICS PROFESSIONALS. LEADING THE WAY.

THANKS

raywang@umich.edu

guix@uci.edu