

Health Misinformation in Search and Social Media

8/7/17

Presented by: Amira Ghenai

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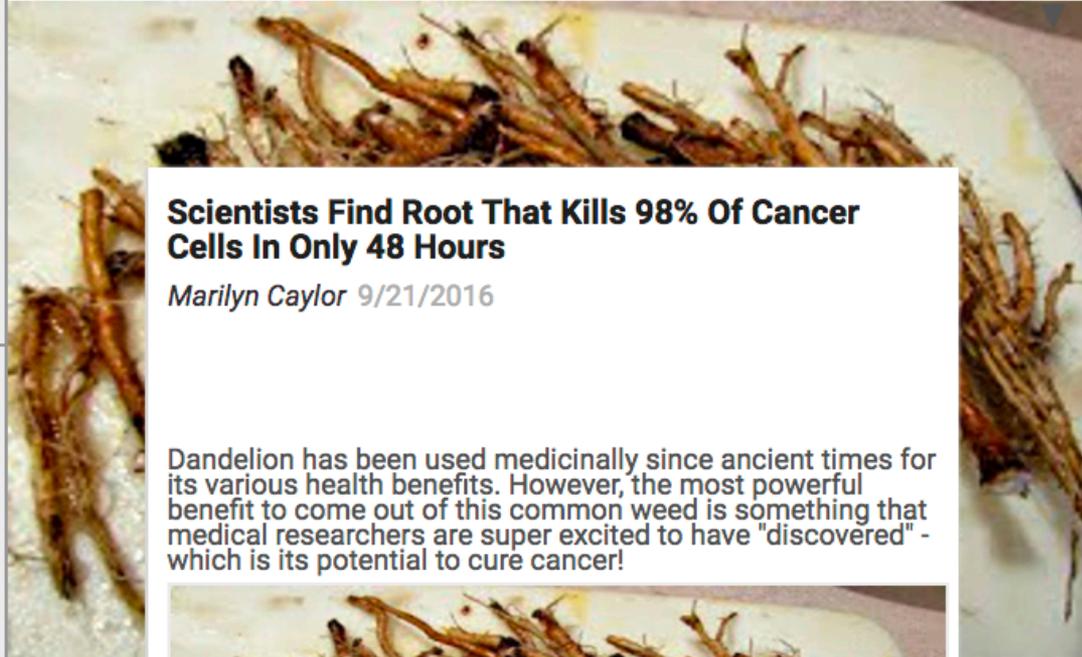
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Scientists Find Root That Kills 98% Of Cancer Cells In Only 48 Hours

Marilyn Caylor 9/21/2016

Dandelion has been used medicinally since ancient times for its various health benefits. However, the most powerful benefit to come out of this common weed is something that medical researchers are super excited to have "discovered" - which is its potential to cure cancer!



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Stage-4 Cancer Survivor - From New Cancer Treatments

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I'm a 10-Year Survivor Because I Had New Cancer Treatments At A Mexican Clinic.
Cost of Treatments · Get Clinic Recommendation · 6 Treatments I Used · Types of Cancer Treated

Dandelion Root Cancer Treatment - Cancer Tutor

<https://www.cancertutor.com/dandelionroot/>

Dandelion Root has been used in China for certain kinds of cancers for centuries. I hoe them when needed and keep the weeds and grass out of them.

The Cancer Fighting Medicine That's Growing in Your Yard

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Discover the cancer fighting medicine that's likely hiding in plain sight on your front ... Science is revealing that the dandelion (which many consider a weed) is ...

Cancer-fighting tea set for clinical trials in Ontario - Calgary - CBC News

www.cbc.ca/news/canada/calgary/calgary-anti-cancer-tea-1.3370691

Dec 18, 2015 - 'Dandelion root extract has very potent anti-cancer activity,' biochemist ... to harness the potential cancer-fighting properties of a common weed.

30 patients to test dandelion's cancer-killing potential - Windsor - CBC ...

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Feb 17, 2015 - ... are being recruited to take part in a study looking at the anti-cancer abilities of dandelion root extract, taken from the common yellow yard weed.

Dandelion Root Kills 98% of Cancer Cells in 48 Hours? - Snopes.com

www.snopes.com/dandelion-kills-cancer/

Claim: Dandelion root can kill 98 percent of cancer cells in 48 hours.

Claimed by: Internet

Fact check by Snopes.com: MOSTLY FALSE

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Holistic Cancer Treatment - Dandelion Tea Kills Cancer Cells

<https://www.tylertolman.com/health-articles/holistic-cancer-treatment/>

I am a huge proponent when it comes to holistic cancer treatment. This common weed has shown to be super effective against cancer cells in just 48 hours and ...

Dandelion root far more effective in fighting cancer cells than ...

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INDY/PULSE

THREE WOMEN 'LEFT BLINDED AFTER BOTCHED STEM CELL TRIAL'

Patients taking part in clinical trials involving stem cells should consider any preclinical data first, experts warn / Getty

The patients are said to have each paid \$5,000 (£4,100) to participate in the trial

KATIE FORSTER
@katieforster
Wednesday 15 March 2017 21:56 GMT



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Three women have reportedly been left blind after they took part in a botched clinical trial of an unproven **stem cell** treatment.

The patients are said to have each paid \$5,000 (£4,100) to participate in the procedure, which was advertised online and has been described by experts as "off-the-charts dangerous".

Within a week of undergoing the therapy at a US clinic the patients, ranging in age from 72 to 88, are said to have suffered complications including vision loss, detached retinas and bleeding, according to a report in *The New England Journal of Medicine*.

They are now totally **blind** and unlikely to recover, said Thomas Albin, associate professor of clinical ophthalmology at the University of Miami, where the women were treated after the complications arose.

Experts investigating the case said the study

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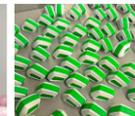
Women left in pain by 'botched' surgery fear losing compensation

Multiple miscarriages 'caused by lack of stem cells in womb'

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PROBLEM DEFINITION

- How does online health misinformation in web search and social media effect people's health?
- **Misinformation:** a piece of information spreading in the web confirmed to be false by reliable sources

OUTLINE

- Background
- Research Methodology
- Current progress
 - Web Search
 - Research Question
 - Experiment
 - Results
 - Social Media
 - Research Question
 - Dataset & Classification Task
 - Results
- Future Research Plan

BACKGROUND

- [White et al, TOIS 2015] found that web search engines have an uncontrolled bias towards medical treatments “*help*”
 - People are biased towards “*help*” belief
- [Dredze et al, NCBI 2016] analyzed misleading theories about Zika vaccination in Twitter
 - Observed the effect of vaccine-skeptic communities over other users’ vaccination opinion
 - People hold the wrong beliefs even before the vaccine is released
 - The Zika vaccine misconceptions are more influential because there were existing claims about vaccine

RESEARCH METHODOLOGY

Web Search

- Measure the influence of search engine results on people health care decisions
- Method: Controlled lab studies
- Goal:
 - Understand how people use web online content in health search
 - Develop better search engines to support people's health decision making process

Social Media

- Analyze the effect of health misinformation in social media on people's behavior
- Method: Observational studies
- Goal:
 - Automatically Detect/Track health rumors
 - Online behavior: sharing, spreading more information
 - Offline behavior: anxiety level, event/outcome/personal experience

CURRENT PROGRESS

- 1. The Positive and Negative Influence of Search Results on People's Decisions about the Efficacy of Medical Treatments.** Frances Pogacar, Amira Ghenai, Mark D. Smucker, Charles L. A. Clarke, 2017, October. In Proceedings of the 3rd ACM International Conference on the Theory of Information Retrieval (ICTIR17). Amsterdam
- 2. Catching Zika Fever: Tracking Health Misinformation in Twitter.** Amira Ghenai, Yelena Mejova, 2017, January. In the Fifth IEEE International Conference on Healthcare Informatics (ICHI17), Park City, Utah

RESEARCH QUESTION

Web search

Social Media

- Measure the influence of health misinformation in search results for 10 medical treatments on people's decisions
 - Influence of **correct/incorrect bias** on the decision about the efficacy of the treatment for medical condition
 - Influence of **rank** on the decision about the efficacy of the treatment for medical condition



EXPERIMENT

Web search

Social Media

- 60 participants in the experimental user study
- Participants were told to pretend to be searching for the answer to a question about the effectiveness of a treatment for a health issue
- Participants had to classify the medical treatments as *helpful, inconclusive, or unhelpful*
- They either received a search engine result page, or the control condition, with no SERP

EXPERIMENTAL CONDITIONS

Web search

Social Media

Search Result Bias

- 8:2 ratio of results
- 8 correct, 2 incorrect
- 2 correct, 8 incorrect

Topmost Correct Rank

- Always had a correct result at rank 1 or rank 3
- Remaining correct results were placed randomly in the lower ranks.

Question number 2 out of 10:

Task Question: Does cinnamon help diabetes?

Treatment: Cinnamon is a sweet spice made from the bark of an Asian tree and used in cooking and baking.

Health issue: Diabetes is a serious disease in which the body cannot properly control the amount of sugar in your blood because it does not have enough insulin.

Showing results 1 to 10

[Is it true that cinnamon can lower blood sugar in people who have diabetes?](#)

Whether cinnamon can lower blood sugar is a topic of debate – but recent research suggests that cinnamon may be helpful as a supplement to regular diabetes treatment in people with type 2 diabetes. A 2012 review of several recent studies concluded that the use of cinnamon had a potentially beneficial effect on glycemic control. One study published in 2009 found that a 500 mg capsule of cinnamon taken twice a day for 90 days improved hemoglobin A1C levels – a reflection of average blood sugar level for the past two to three months – in people with poorly controlled type 2 diabetes (hemoglobin A1C levels greater than 7 percent).

<http://www.mayoclinic.org/diseases-conditions/diabetes/expert-answers/diabetes/faq-20058472>

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<http://care.diabetesjournals.org/content/26/12/3215>

[Is honey and cinnamon a hoax?](#)

Honey is almost entirely composed of different sugars, with water and trace minerals. Excess sugar (and we really get enough carbohydrates of different sorts in our diet anyway) gets stored as fat. So this diet cannot work unless you reduce your food intake to compensate for the excess sugar you are consuming. Certain types of cinnamon may well have useful properties that might influence insulin levels, but probably not at the recommended concentrations.

http://www.answers.com/Q/Is_honey_and_cinnamon_a_hoax

[Article: Cinnamon Helps Diabetics](#)

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Instructions: Use the search engine results to help you determine the effectiveness of the specified treatment for the corresponding health issue. Once you believe you have determined the effectiveness of the treatment, go to the bottom of the page and click the "Submit Answer" button to submit your answer on the next page.

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Inconclusive	The effectiveness of a medical treatment is inconclusive if medical professionals are still unsure if the treatment will have a positive, negative, or no influence on the illness.
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Cinnamon a spice found in many kitchens around the world especially at Christmas time. Although it is used by Jewish people at Rosh Hashona (the Jewish New Year that falls in September each year). It has been found that this flavoursome spice has its uses for people who are Type 2 Diabetics and helps to control their Blood Sugar. What Is Diabetes? Diabetes is a disorder, where the body is unable to control the Blood Sugar. Insulin a hormone secreted by the Pancreas is essential in helping to control the Blood Sugar. Some unfortunate people are resistant to Insulin so they have to very strictly adhere to a reduced fat intake in their diet.

<http://www.naturalhealthweb.com/articles/Moffat3.html>

Clickable link, to take to document page

Instructions: Use the search engine results to help you determine the effectiveness of the specified treatment for the corresponding health issue. Once you believe you have determined the effectiveness of the treatment, go to the bottom of the page and click the "Submit Answer" button to submit your answer on the next page.

Category	Explanation
Helps	A medical treatment helps if the treatment is effective and has a direct positive influence on the specified illness.
Inconclusive	The effectiveness of a medical treatment is inconclusive if medical professionals are still unsure if the treatment will have a positive, negative, or no influence on the illness.
Does not help	A medical treatment does not help if the treatment is ineffective and either has no effect or has a direct negative influence on the specified illness.

Submit Answer

Document title, snippet, url

Definitions of the treatment and health issue

“Does X help Y?”

Question number 7 out of 10:

Task Question: Does cinnamon help diabetes?

Treatment: Cinnamon is a sweet spice made from the bark of an Asian tree and used in cooking and baking.

Health issue: Diabetes is a serious disease in which the body cannot properly control the amount of sugar in your blood because it does not have enough insulin.

Showing results 1 to 10

[Is it true that cinnamon can lower blood sugar in people who have diabetes?](#)

Whether cinnamon can lower blood sugar is a topic of debate – but recent research suggests that cinnamon may be helpful as a supplement to regular diabetes treatment in people with type 2 diabetes. A 2012 review of several recent studies concluded that the use of cinnamon had a potentially beneficial effect on glycemic control. One study published in 2009 found that a 500 mg capsule of cinnamon taken twice a day for 90 days improved hemoglobin A1C levels – a reflection of average blood sugar level for the past two to three months – in people with poorly controlled type 2 diabetes (hemoglobin A1C levels greater than 7 percent).

<http://www.mayoclinic.org/diseases-conditions/diabetes/expert-answers/diabetes/faq-201504>

[Cinnamon Improves Glucose and Lipids of People With Type 2 Diabetes](#)

OBJECTIVE – The objective of this study was to determine whether cinnamon improves blood glucose, triglycerides, total cholesterol, HDL cholesterol, and LDL cholesterol levels in people with type 2 diabetes. **RESEARCH DESIGN AND METHODS** – A total of 60 people with type 2 diabetes, 30 men and 30 women aged 52.2 ± 6.32 years, were divided randomly into six groups. Groups 1, 2, and 3 consumed 1, 3, or 6 g of cinnamon daily, respectively, and groups 4, 5, and 6 were given placebo capsules corresponding to the number of capsules consumed for the three levels of cinnamon.

<http://care.diabetesjournals.org/content/26/12/3215>

[Is honey and cinnamon a hoax?](#)

Honey is almost entirely composed of different sugars, with water and trace minerals. Excess sugar (and we really get enough carbohydrates of different sorts in our diet anyway) gets stored as fat. So this diet cannot work unless you reduce your food intake to compensate for the excess sugar you are consuming. Certain types of cinnamon may well have useful properties that might influence insulin levels, but probably not at the recommended concentrations.

http://www.answers.com/Q/Is_honey_and_cinnamon_a_hoax

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Instructions & classifications

Submit Answer

Document title, snippet, url

RESULTS - ACCURACY

Web search

Social Media

- Results biased towards **incorrect** information reduced people's accuracy from 43% to 23%
- Results biased towards **correct** information increased accuracy from 43% to 65%.

RESULTS - RANK

Web search

Social Media

- Top most rank of a correct result appears to have some effect on people's accuracy
- When biased towards correct, the accuracy was 59% if the correct result was at **rank 3** (incorrect at rank 1&2) compared to 70% accuracy when the **rank 1** item was correct



RESULTS - KNOWLEDGE

Web search

Social Media

- Self-reported knowledge reduces the effect of incorrect information on accuracy ($p= 0.04$)
- Like [White and Hassan, TWEB 2014] we found that participants are biased towards saying treatment are helpful

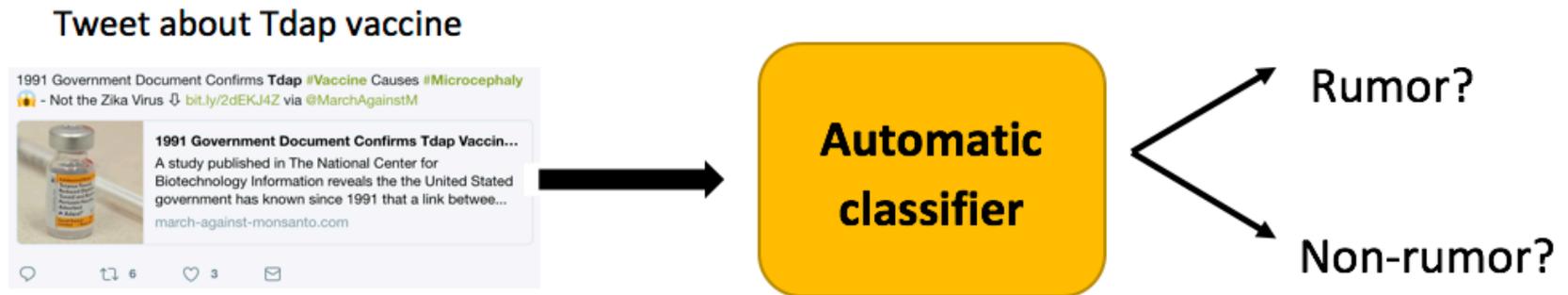


RESEARCH QUESTION

Web search

Social media

- Can we automatically detect tweets containing rumors about a health condition?



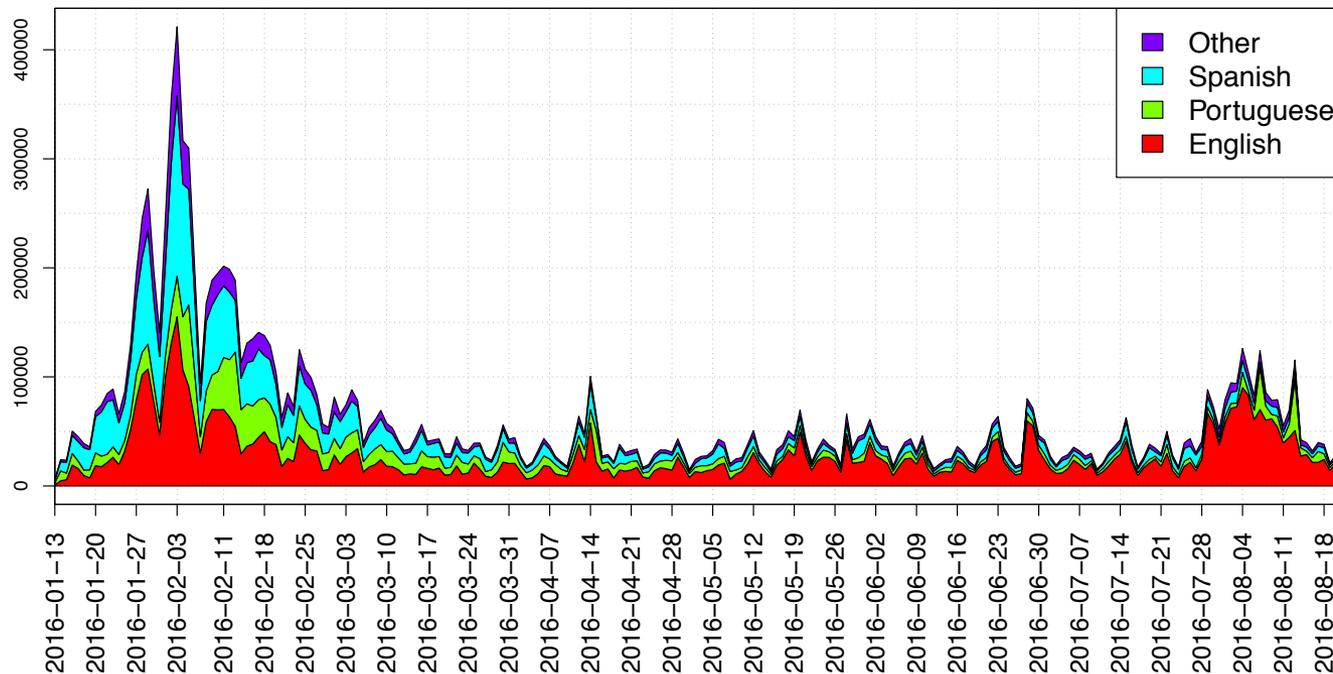
- Understand the behavior of rumor-related topics in social media

DATASET

Web search

Social media

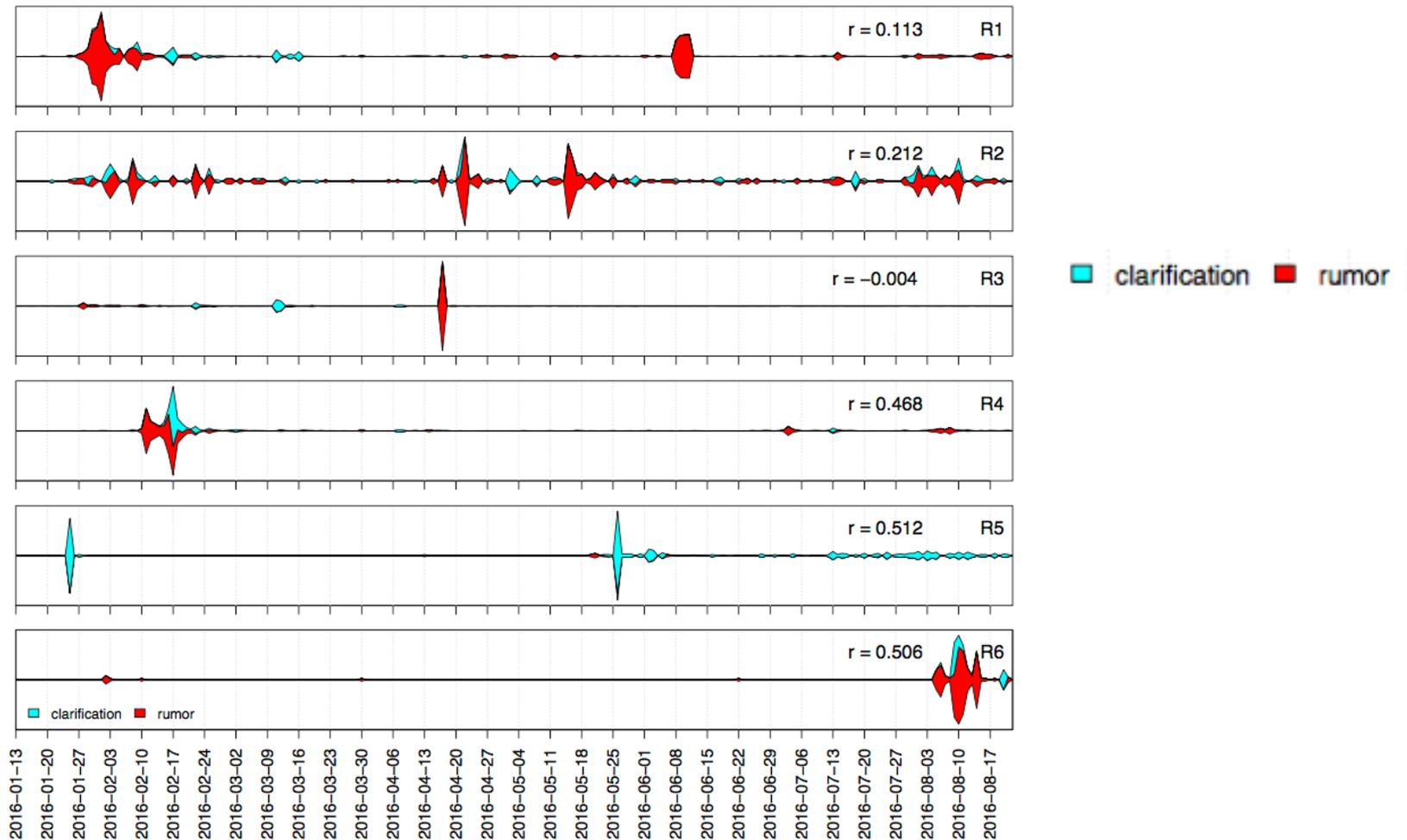
- 13 million tweets regarding the Zika outbreak from January 13 to August 22, 2016
- 6 Zika related rumors posted by WHO



RESULTS – RUMOR OR CLARIFICATION?

Web search

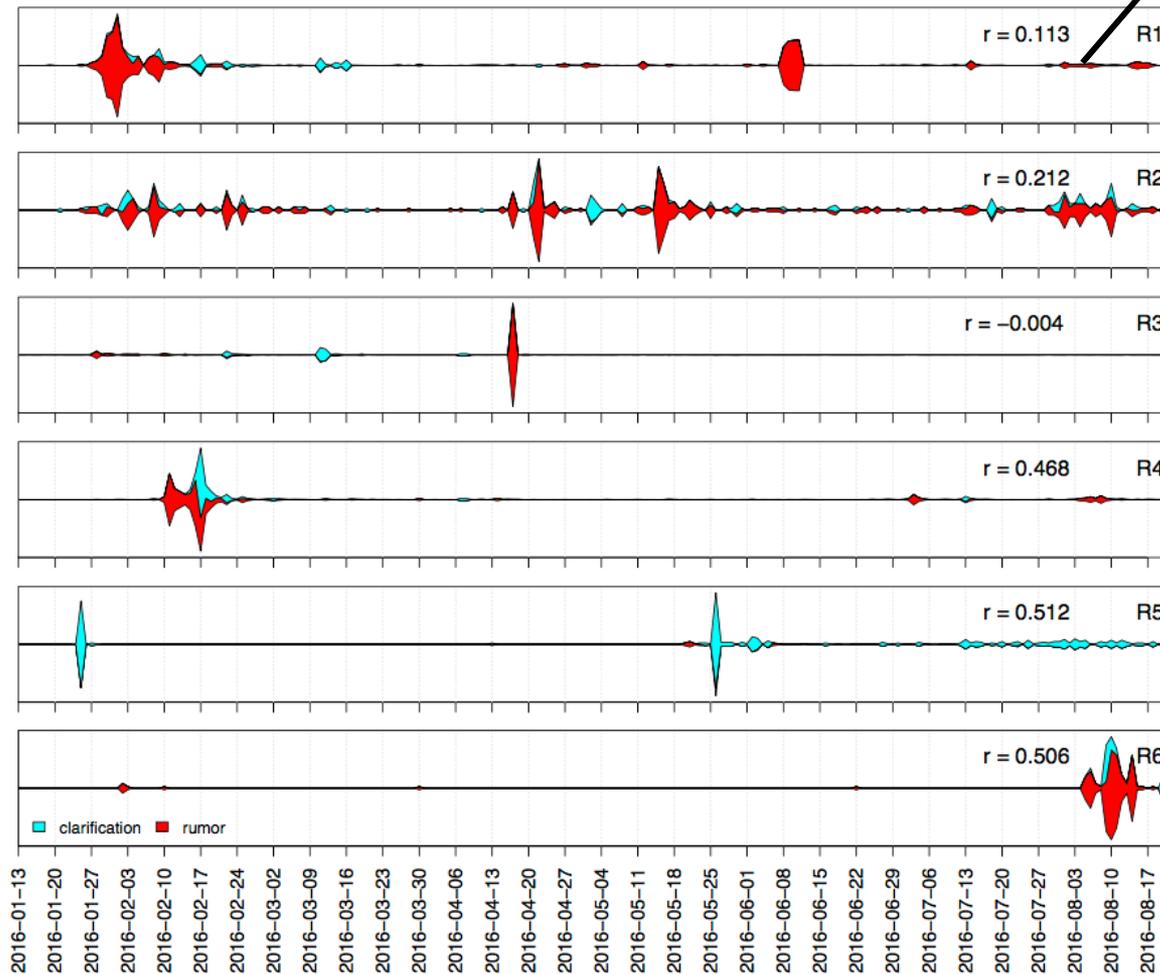
Social media



RESULTS – RUMOR OR CLARIFICATION?

Web search

Social media

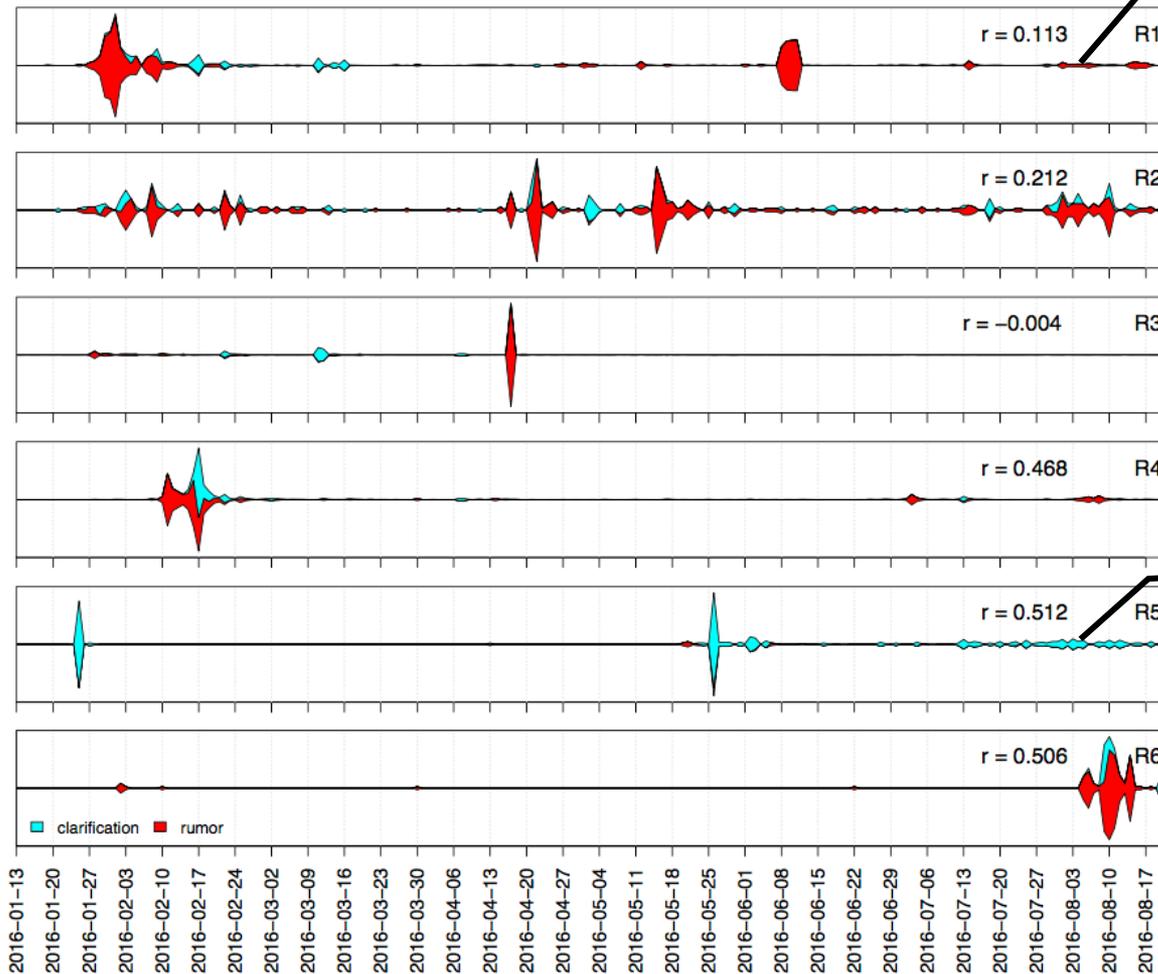


R1: Zika virus is linked to genetically modified mosquitoes

RESULTS – RUMOR OR CLARIFICATION?

Web search

Social media



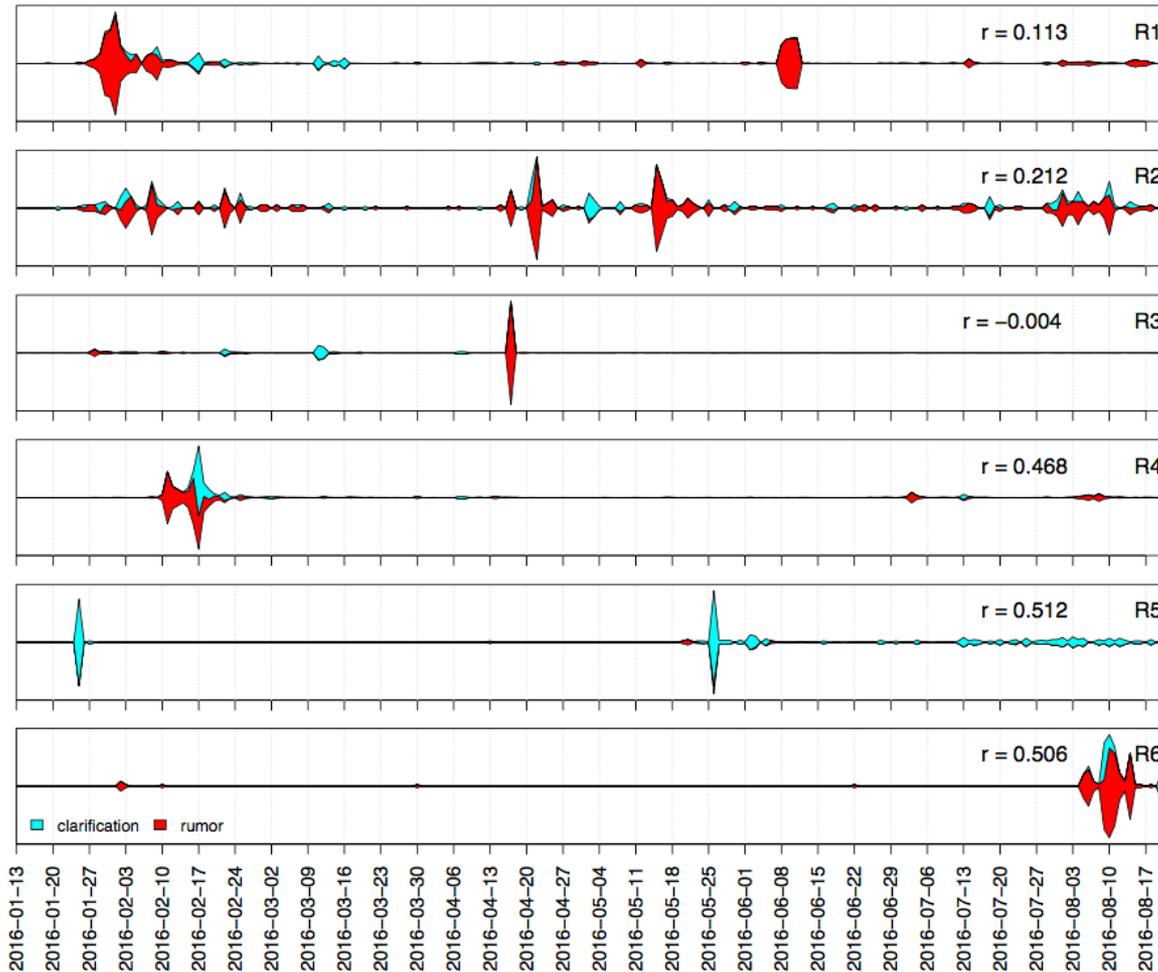
R1: Zika virus is linked to genetically modified mosquitoes

R5: Americans are immune to Zika virus

RESULTS – RUMOR OR CLARIFICATION?

Web search

Social media



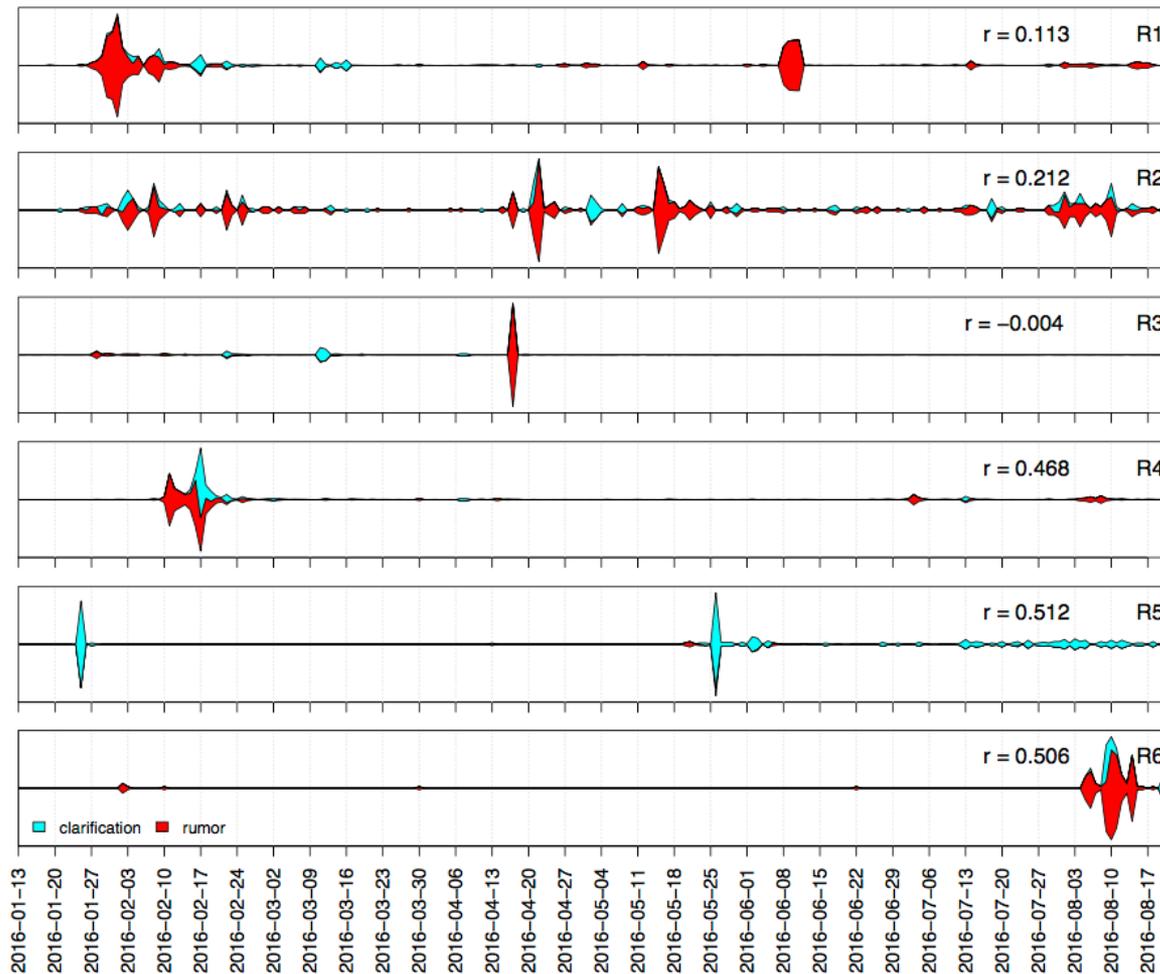
R2: Zika virus symptoms are similar to seasonal flu

■ clarification ■ rumor

RESULTS – RUMOR OR CLARIFICATION?

Web search

Social media



R2: Zika virus symptoms are similar to seasonal flu

clarification rumor

R6: Coffee as mosquito-repellent to protect against Zika



CLASSIFICATION TASK

Web search

Social media

- A total of 48 features grouped into five categories
- Twitter features
- Sentiment features
- Linguistic features: characterize different linguistic styles in Twitter text
- Readability features: less readable information are more credible
- Medical features: medical lexicon of tweets and the reliability of sources shared using URLs

RESULTS - FEATURES

Web search

Social media

- Best features to predict if a tweet is a rumor or not
 - Medical features (advocacy domains count, Wikipedia domains count)
 - Syntax of the tweet text (question marks, exclamation marks...)
 - Sentiment features (sentiment score, count positive/negative words)
 - Twitter features

RESULTS - ACCURACY

Web search

Social media

- Random training/testing set selection 80/20
 - Consider all rumor topics
 - High accuracy (0.92)
- Training on 5 topics and testing on the 6th
 - Low accuracy for new topics (we know truth but still new)

FUTURE RESEARCH PLAN

- Understand possible factors that influence people in search
 - Stimulated Recall user experiment (play screen recording with questions to participants)
 - Trustworthiness of resources
 - Rank? Exposure bias?
 - Do people use search engines in the wrong way?

FUTURE RESEARCH PLAN

- Whether people talking about a rumor are more likely to have some specific event or not
- Predict possible rumor topics
 - Study the difference in behavior of cohorts susceptible to rumors
 - Behavior: online (retweeting, social network behavior, etc.) and offline (anxiety, immunization, hospital visits, etc.)

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