Healthy Influencers?

Social Media Use, Misinformation, and Health Behavior Change

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"I came here to tell you how it's going to begin."

○ My talk today will cover four main themes from four separate studies.

1. Social Media, Social Stigma: An Examination of Media Consumption and Creation in Attitudes toward and Knowledge of Inflammatory Bowel Disease (in press). *Journal of Medical Internet Research*. w/Miles Basil, Ling Guo, Sarah Parker Ward, Francis Farraye, & Jason Reich.

2. Media Use and Antimicrobial Resistance Misinformation and Misuse: Survey Evidence of Information Channels and Fatalism in Augmenting a Global Health Threat (in press). *Cogent Medicine.* w/Brittany Andersen, James Katz, Chelsea Cutino, & Qiankun Zhong.

How might we understand & use social media for health behavior change?

3. Understanding and Diagnosing Antimicrobial Resistance on Social Media: A Yearlong Overview of Data and Analytics. (in press). *Health Communication.* w/Brittany Andersen, Lee Hair, Arunima Krishna, & Dylan Walker.

4. Addressing Antimicrobial Resistance (Mis)information and (Mis)use Contagion on Social Media Through Survey, Diffusion Modeling, and Real-Time Social Interventions. (pending review). National Institutes of Health. w/Dylan Walker & Arunima Krishna

So, to begin, Study 1: Social Media, Social Stigma and IBD

o Inflammatory Bowel Disease (IBD) is a chronic gastrointestinal condition affecting over 5 million people globally and 1.6 million in the United States, but currently lacks a precisely determined cause or cure.

o The range of symptoms IBD patients experience are often debilitating, and the societal stigmas associated with some such symptoms can further degrade their quality of life.

What do we know about IBD knowledge and perceptions?

○ Among the American public (N = 1200), IBD is the most stigmatized of seven diseases, including genital herpes, alcoholism, breast or testicular cancer, diabetes, obesity, and HIV/AIDs.

○ What's more, IBD knowledge is generally low with 11.1% of the sample indicating no familiarity with the disease and 85.5% of participants inaccurately answering two-thirds of the IBD index questions.

○ Increased knowledge of IBD is associated with lower levels of stigma.

Does the influence of social media shape knowledge or stigma?

- Increased social media use is currently related to lower levels of IBD knowledge ($p<.05$).

- What's more, findings indicate that participants most frequently engaged in producing social media content are less knowledgeable about IBD ($p<.10$).

- **This highlights the potential for a dangerous cycle of misinformation when they contribute to the IBD dialogue online.**

Steps to Decreasing IBD Stigma

○ Higher knowledge levels was one of the key mechanisms shown to reduce stigma ($p < .05$).

○ Greater efforts must be taken to stymie IBD misinformation across all media, but especially in social media channels, in order to increase IBD knowledge and reduce stigma surrounding IBD.

○ Findings have informed the development of a campaign at Boston University

    ○ #IBDefined

Now, Study 2: Media Use and AMR Misinformation and Misuse

○ The excessive use of antibiotics has markedly increased antimicrobial resistance (AMR) among community-acquired bacterial infections (Goossens, Guillemot & Ferech, 2006), which suggests that drug resistance presents an ever-increasing global public health threat that involves all major microbial pathogens and antimicrobial drugs (Levy & Marshall, 2004).

○ Importantly, however, this risk has not been well understood by the general public from countries around the world (McCullough et al., 2016) even though the prevalence of antimicrobial drug use has been shown to be as high as 96.2% among acute care inpatients (Magill et al., 2014) in the US.

AMR misinformation and misuse

- To begin, being misinformed about AMR and having misused antimicrobial-related products was set as a binary proposition where respondents (N = 1321) that scored less than the mean on each scale were considered to have a "low" level of AMR misinformation (M = 2.41, SD =0.82) and misuse (M = 2.19, SD = 1.10).

- Those individuals that scored higher than the respective means were at a "high" level for both.

- 46.9% of the sample could be considered highly misinformed about AMR

- 42.2% of respondents demonstrated a relatively high level of misusing AMR-related products.

A brief (animated) look at our results

AMR misinformed and consuming media

- Respondents that consumed traditional media more frequently were 1.48 times (p < .001) more likely to have high AMR misinformation levels as consumption increased from zero (never) to four (all of the time).

- Heavier reliance and use of social network sites for news was not significant (*Exp(B)* = 1.14, p = .14).

- More frequently creating and sharing online media (*Exp(B)* = 1.27, p < .05) positively related to the likelihood of respondents being highly misinformed about AMR.

Another misinformation cycle, here contributing to misuse

○ In specific, this study outlines how increased consumption of traditional media is linked to a greater likelihood of both AMR misinformation and misuse, even when controlling for the endogenous relationship among these AMR measures.

○ Social media creation was also shown to be a potent factor in increasing AMR misinformation.

○ Being AMR misinformed was one of the key factors in having misused antibiotics.

○ **To some extent, the confluence of these findings suggest a misinformation cycle whereby traditional media exposure may well connect with increased posting of potentially misinformed content about AMR to social media.**

And, Study 3: Understanding and Diagnosing AMR on Social Media

- The five most "influential" users by reach, engagement, & following on Twitter include:

  - @Jinariggs1: pharmacologist, 221k followers, unverified, likely a bot

  - @GeorgeMonbiot: reporter, 163k followers, unverified, likely a human

  - @Medscape: physician resource, 118k followers, verified

  - @SCMP_News: South China Morning Post, 345k followers, verified

  - @NICECOMMS: National Institute for Health and Care Excellence, 114k followers, verified

Most retweeted 'antibiotic' (1-year, n = 602,100 twts; 552,569 usrs)

Original Tweet	Username	Date Tweeted	Number of Retweets
Antibiotics DOCTOR: why did you take your antibiotic Medicine at 6 am , when I told you 9 am? PATIENT: I wanted to surprise the Bacteria	@akashahghazi	June 23, 2016	7,096
Doctor: Why did you take your antibiotic medicine at 6 a.m when I told you 9 a.m? Patient : I wanted to surprise the Bacteria..	@Azaammmmmmmmmm	August 9, 2016	4,031
It's World Antibiotic Awareness Week! #AntibioticResistance is one of the biggest threats to global health https://goo.gl/Lutlmz	@WHO	November 14, 2016	3,456
Sleep as a target of antibiotic use in chronic fatigue syndrome? - http://allscienceglobe.com/sleep-as-a-target-of-antibiotic-use-in-chronic-fatigue-syndrome/ …	@MoreScienceNews	February 6, 2016	2,851
Biologists develop method for antibiotic susceptibility testing - http://ln.is/allscienceglobe.com/CsGoE …	@MoreScienceNews	January 31, 2016	2,457

Most co-occurring keywords with "antibiotic" (1 year)
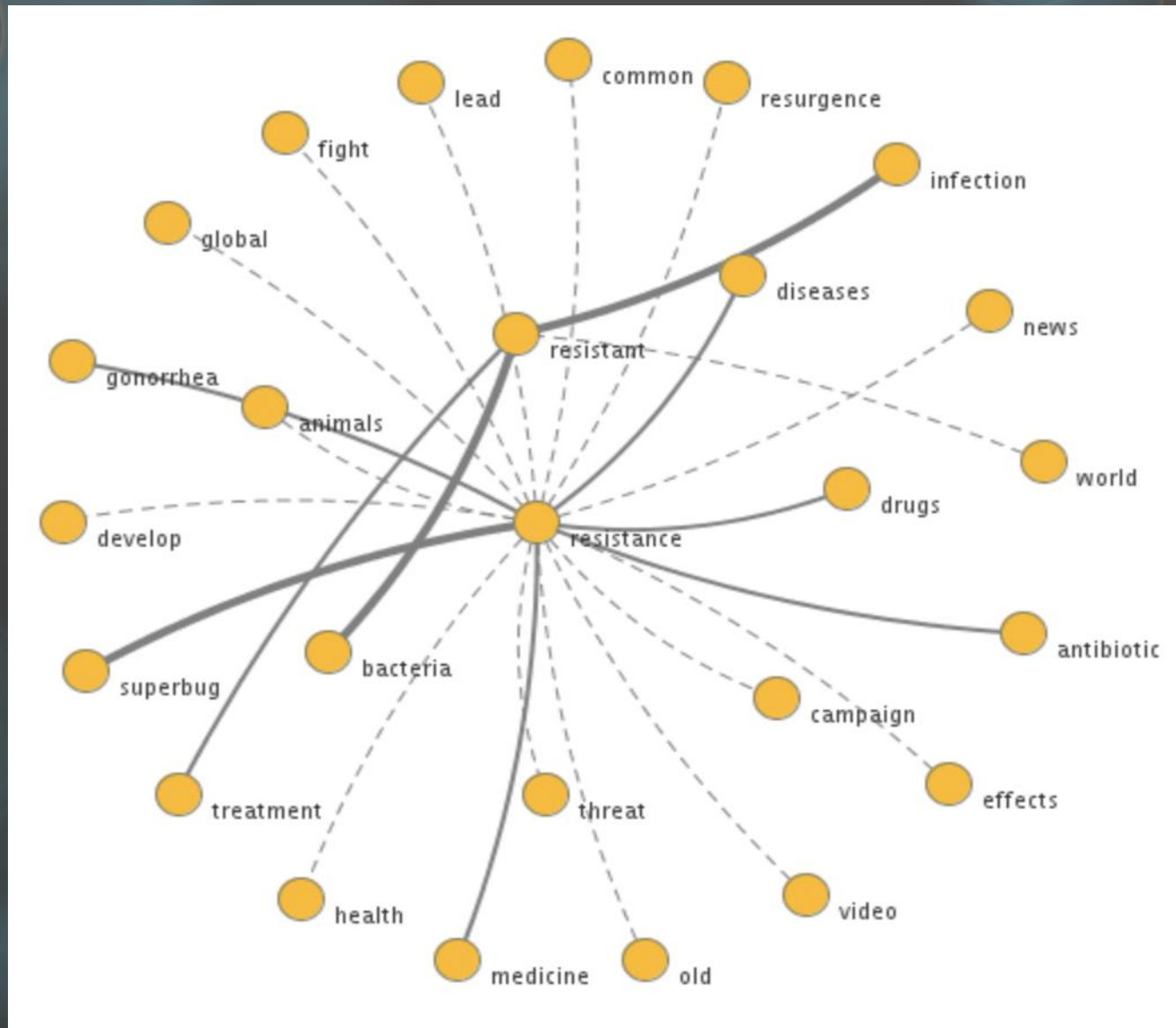
Overview of AMR data on social media

- Users are talking about "antibiotics" on social media, with 602,100 tweets in a year-long period.
  - Only 45,976 tweets used the term "antimicrobial resistance" in the same period, and this suggests a lack of salience.
- Influential users may be key to the dissemination of corrective information to combat any AMR-related misinformation.
- We suggest scholars to engage with practice, specifically with influential users in order to promote informative content regarding AMR and even collaborate with the users within the medical and pharmaceutical fields to create and disseminate AMR and antibiotic-related posts on social media.
  - Beyond that, we can explore interventions…

Finally, Study 4: Real-Time Social Media Interventions for Behavior change

- How do most AMR organizations and medical professionals use social media now?
- PSA-style approach: Broadcast the same information to everyone
- Preaching to the choir? Are those who follow CDC the right targets?
- Impersonal – doesn't really leverage the "social" of social media

Some more examples of what people are saying about antibiotics on social media...

Justin Chan @esti_d · May 22
Crap. This better not be an **antibiotic** resistant **virus**

Ielaaa @Ielaax · Jan 18
11 days, 2packs of cold & flu tablets, 1 bottle of cough syrup,1/2 a tub of Vicks,& the start of an antibiotics course later..& im still ill
1   2

In reply to epobirs

Sam 🐰 Janney @PolitiBunny · Jan 18
@epobirs @hboulware **I started taking antibiotics this morning JUST IN CASE I catch a virus.**
3   2   8

Mike Nivad @snowyred96 · Jul 13
@Novorossiyan #Wars are like a **virus**, you find an **antibiotic** treat it it goes a way,then it gets immune to the treatment and it starts again
1   View conversation

romance anagram @_fromthehart · 23h
just found out both my antibiotics for my cold + possum bite were penicillin, meaning i've been taking 5 times the recommended dose 🙃 🙃 🙃
2

140 FROM NOWHERE @DUDZLANI · Aug 2
@b50 Stomach **virus**! Couple of doses of **antibiotic** and he be running around!
11:30 AM - 2 Aug 2015 · Details
                                          Hide conversation

Bingo★ 🌐 @BingoGreenPig · 22h
im an idiot i took antibiotics for my cold without eating

Rara™ @firdahamizar · Jun 26
I took **antibiotic** pills everyday but that doesnt defend any **virus**

Rumpel Stiltskin @_DonTaughtMe
Anybody have some amoxicillin. Flu kicking my ass.
3:13 PM - 18 Jan 2017

Kate @sunflowerkx · 2h
Another virus evolved. Multiple antibiotics now useless. 😖

Miss @MissMcB76
12 days with this snotty nose...... might be time for an antibiotic.......
12:37 PM - 18 Jan 2017

The Potential of Real Time Interventions & RCTs

Precedence: The NHTSA & Twitter

The National Highway Traffic Safety Administration previously performed interventions

However, these interventions were not part of a randomized controlled trial, and the impact was not assessed.

Computer versus human-mediated interventions

- An intervention system could support both automated interventions or human-mediated interventions

- Automated interventions:
    - Twitter conversations involving antibiotics/AMR are classified by a computer into one of several different types.
    - An automated reply intervention is created and posted by a computer system

- Human-mediated interventions:
    - Volunteers pull Twitter conversations from a queue and conduct an intervention response according to guidelines

- We have proposed a hybrid of both schemes
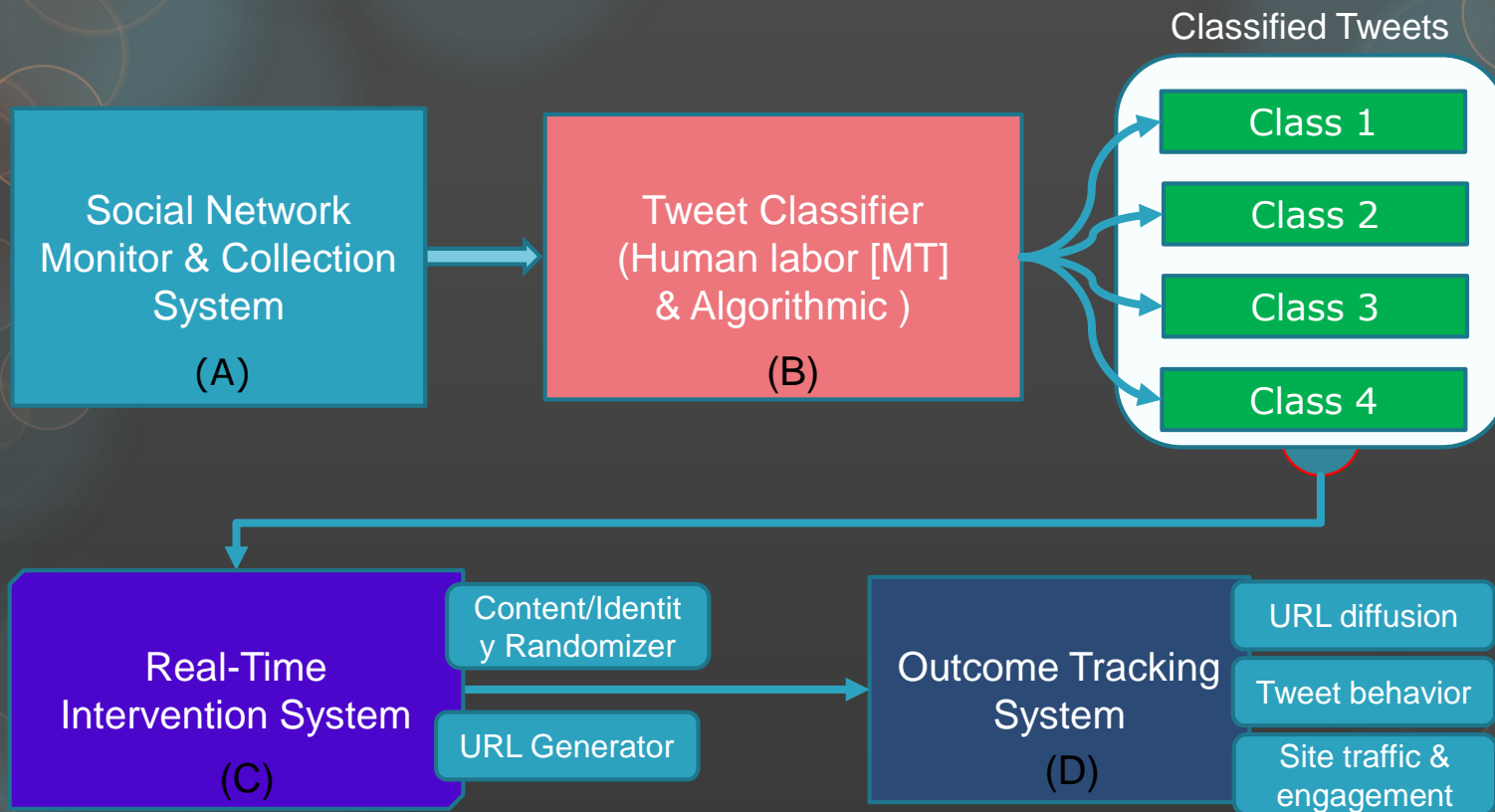
"I didn't come here to tell you how this is going to end."

- What we have found is that across several topics (IBD and AMR included) those creating content on social media are often most misinformed and spreading misinformation.

- We can see evidence of misinformation cycles through other media use potentially reinforcing these beliefs.

- Importantly, being misinformed is one of leading factors in increasing IBD stigma and AMR misuse.

- Our intervention project is still under review, however, we have received seed funding from the Knight Foundation to use social media interventions to minimize the spread of fake news.

- Currently in development but our RCTs should provide valuable insights into the effectiveness of social media interventions, and the varying conditions to initiate health behavior change.

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