Using Social Media to Improve Foodborne Illness Reporting

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Many people get sick, but few report it...

- The annual health and financial toll of foodborne illness...
  - 1 in 4 Americans get sick
  - 128,000 are hospitalized
  - 3,000 die of foodborne diseases
  - Costs approximately $2-$4 Billion annually in the US

2.9% of people who get sick seek medical care and few report their illness
but they do complain about it on social media

DJ Hickey
@DJHickey_
Huge shoutout to @Wendys for the food poisoning. #bothends

Brendan Bognar
@bbognar12
Well food poisoning sucks. Thanks @olivegarden

Houston
@GaymerNerd
Applied for a place; battled food poisoning (!?); Forced servitude for the White Queen - Porcelina. DAY

9:49 PM - 18 Feb 2016
Social media use in the US

86% online
US social media users by the numbers

Sex
- Women: 68%
- Men: 62%

Race/Ethnicity
- White non-Hisp: 65%
- Black non-Hisp: 56%
- Hispanic: 65%

Age
- 18-29: 90%
- 30-49: 77%
- 50-64: 51%
- 65+: 35%

Urbanicity
- Urban: 64%
- Suburban: 68%
- Rural: 58%

Education
- HS or less: 54%
- Some college: 70%
- College+: 76%

Income
- < $30k/yr: 56%
- $30k - $49.9k: 69%
- $50k - $74.9k: 72%
- $75k+: 78%

How can we tap into social media to improve surveillance and reporting?

Chicagoan tweets about possible foodborne illness

Twitter tool captures the tweet and sends to health department

Health department replies to the tweet with a message and form to report the foodborne illness
Identify and reply to tweets

Tamara Ramirez @Marilady

Food poisoning is a bitch. Never eating Chinese again. And I hate this damn hospital 😞😞

3:45 AM - 2 Nov 2013

Reply to @Marilady

Foodborne Chicago @Foodbornechi • Nov 5

@Marilady We’re sorry to hear you’re so sick. We can help you by clicking on this link to report it:

foodborne.smartchicagobees.org/39655870105558... Details

DaMediaGuy @DaMediaGuy

UPDATE: I’m back, after 5 days of having what my doctor says is a stomach virus/food poisoning from eating at @LouMalnatis
Lincoln Park 😞😞😞

2:16 PM - 24 Apr 2013

Reply to @DaMediaGuy • @LouMalnatis

Foodborne Chicago @Foodbornechi • 24 Apr 2013

@DaMediaGuy Sorry to hear you were sick. The city can help you here:

foodborne.smartchicagobees.org/3273385154459... Details

DaMediaGuy @DaMediaGuy • 25 Apr 2013

@Foodbornechi Thankies!

Details

Foodborne Chicago @Foodbornechi • 25 Apr 2013

@DaMediaGuy You’re welcome!

Details
Foodborne Chicago first 10 months

- 2,241 Tweets identified and classified
- 270 Response tweets
- 193 Reports submitted
- 179 Food establishments identified
- 133 Inspections
- 21 (15.8%) failed inspection
Percent of inspections finding serious and critical violations after complaints from Twitter vs. other sources in Chicago

- **Serious**
  - Twitter: 22%
  - Other: 28%

- **Critical**
  - Twitter: 20%
  - Other: 16%
Taking the show on the road

FOODBORNE CHICAGO
Report food poisoning
A project of the SmartChicago

If you think you have food poisoning in Chicago, please complete this form. The info will be sent to the Chicago Department of Public Health so they can take any necessary action.

Did we @reply you on Twitter? Here’s why.

We use computers & code to search Twitter for tweets related to food poisoning in Chicago. We do as much as we can to automatically zero-in on the tweets we think are really about a possible food poisoning case and really coming from Chicago. Then real humans review the tweets and @reply back to people with a link back to this page. More detail here.

Food Safety STL
Helping City of St. Louis residents report cases of foodborne illness to the Department of Health through social media

What is Food Safety STL?

Food Safety STL (@FoodSafetySTL) is a Twitter account set up for residents to report cases of suspected foodborne illness, and further interact with the Department of Health. Meanwhile, a corresponding internal social media application will capture tweets that mention and use keywords related to foodborne illness located within a 25-mile radius from the center of the City of St. Louis. These captured tweets will prompt a response from the Food Safety STL Twitter account. In most cases, the department will notify the individual who submitted the tweet. If more information is needed, they will follow up with a call and may submit an official case. Compliance with the Food Safety Act will be appropriately referred to the corresponding local health department and the state health department.

A DIME A DOZEN
BY KUMAR

WEB: WWW.BINARY.COM
HealthMap Foodborne Dashboard

Kara Sewalk, MPH
Program Coordinator
HealthMap | Innovation and Digital Health Accelerator
Boston Children’s Hospital

Boston Children’s Hospital
Innovation & Digital Health Accelerator
The Digital Phenotype
Foodborne Outbreaks Reported Online in past year
Twitter #DataGrants selections

Thursday, April 17, 2014 | By Raffi Kikorian (@raffi), Vice President, Platform Engineering [18:34 UTC]

In February, we introduced the Twitter #DataGrants pilot program, with the goal of giving a handful of research institutions access to Twitter’s public and historical data. We are thrilled with the response from the research community — we received more than 1,300 proposals from more than 60 different countries, with more than half of the proposals coming from outside the U.S.

After reviewing all of the proposals, we’ve selected six institutions, spanning four continents, to receive free datasets in order to move forward with their research.

- Harvard Medical School / Boston Children’s Hospital (US): Foodborne Gastrointestinal Illness Surveillance using Twitter Data
- NICT (Japan): Disaster Information Analysis System
- University of Twente (Netherlands): The Diffusion And Effectiveness of Cancer Early Detection Campaigns on Twitter
- UCSD (US): Do happy people take happy images? Measuring happiness of cities
- University of Wollongong (Australia): Using GeoSocial Intelligence to Model...
Real-time detection

1. Real-time detection
2. Symptom onset
3. Visit doctor
4. Seek medical care
5. Report to public

“Man I don’t feel good. I think I have food poisoning!”

If you send out a public tweet, we’ll hear you.
@WholeFoods I already have an APOLOGY letter from your GM for the first incident, my gf got sick from food poisoning, and my lawyer is on it.
Manual classification – relevant/irrelevant

Build a machine-learning classifier

Evaluate classifier performance
<table>
<thead>
<tr>
<th>Date</th>
<th>Comment</th>
<th>Details</th>
<th>Respond</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.25.15</td>
<td>@toddyrockstar I rewatched ur shows on my birthday, I got sick (food poisoning from the restaurant) &amp; it cheered me up. Music makes me happy. Ty</td>
<td>details</td>
<td>respond</td>
</tr>
<tr>
<td>10.25.15</td>
<td>before I got food poisoning 🙄</td>
<td>details</td>
<td>respond</td>
</tr>
<tr>
<td>10.24.15</td>
<td>Hey it might not even be my gallbladder 😐 I could have food poisoning this is so bad though, LOL way to cheat day yesterday!</td>
<td>details</td>
<td>respond</td>
</tr>
<tr>
<td>10.23.15</td>
<td>Via @NPR: Yelp Reviews Can Take Food Poisoning Viral</td>
<td>details</td>
<td>respond</td>
</tr>
<tr>
<td>10.22.15</td>
<td>@ky_jamme yeah food poisoning is a bitch... I swear my body is so stiff I can barely move</td>
<td>details</td>
<td>respond</td>
</tr>
<tr>
<td>10.22.15</td>
<td>#FoodSafety and #Internet can be your best friend or worst enemy</td>
<td>details</td>
<td>respond</td>
</tr>
<tr>
<td>10.22.15</td>
<td>I’ll never eat fast food again... Make my words!! Food poisoning is a MF</td>
<td>details</td>
<td>respond</td>
</tr>
</tbody>
</table>
### Classifying tweets in the Dashboard

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<table>
<thead>
<tr>
<th>Label</th>
<th>Definition</th>
<th>Example Tweets</th>
</tr>
</thead>
</table>
| **Relevant**   | Tweet about a possible current case of foodborne illness                  | • I’m straight hella sick with food poisoning  
• Well, things didn’t go my way this weekend in St. Louis. I got some bad food poisoning and couldn’t… https://t.co/dmYeuyfG9R |
| **Unclear**    | Unable to distinguish whether tweet is relevant or not relevant            | • Woohoo possible food poisoning 😊  
• BREAKING: Food Poisoning SUCKS  
• Chipotle will close restaurants briefly on Feb.8 to address food safety issues: Successive food poisonings… https://t.co/ZbbTgTh77Zm |
| **Not Relevant** | Not about a possible current case of foodborne illness                  | • Hope I don’t get food poisoning from Ikea.  
• Food poisoning makes you terrified to eat any food ever again  
• 48 Million People Get Ill from Food Poisoning Says Chef Remi https://t.co/Sj7hepmmwF#pr |
Real-time detection
Citizen Engagement

Respond to Tweet

<table>
<thead>
<tr>
<th>EMPATHY</th>
<th>AUTHORITY</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorry to hear you're ill.</td>
<td>The City of STL Dept. of Health can help.</td>
<td>Click here:</td>
</tr>
<tr>
<td>Sorry to hear that.</td>
<td>The City of STL Dept. of Health can assist you.</td>
<td>Report here:</td>
</tr>
<tr>
<td>That sounds terrible!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

@adrienneleigh

send tweet

104 characters remaining
Citizen Engagement

Matthew Kissel @STLMANIAC · Oct 15
Hey @ChickfilA thank you. Thank you for the food poisoning. All I wanted was a nice chicken sandwich dinner and you do me like this. Wow.

FoodSafetySTL @FoodSafetySTL · Oct 16
@STLMANIAC Sorry to hear you're ill. The City of STL Dept. of Health can help. Report here: http://foodborne.healthmap.org/requestInfo?tw...
Citizen Engagement

HealthMap Foodborne Illness

Food Safety STL

Additional Case Details

Was this food eaten at home or at a restaurant?
- Home
- Restaurant

* Required Fields

What restaurant did you eat at?
- e.g., Pete's Lobster Pit

What is the restaurant address?
- e.g., 70 Lake St, St. Louis, MO

What type of food did you eat?
- e.g., Lobster

When did you eat it?
- 12/4/15

What happened?
- Please be as specific as possible, e.g., "I ate a lobster from Pete's around 6pm, and had multiple bouts of diarrhea and vomiting starting at 2am. I was up all night and felt horrible until the next afternoon."

How many people got sick?
- e.g., 1

The City of St. Louis Department of Health would like the following information in order to contact you directly if needed:

Name
- e.g., Joe Citizen

Phone number*
- e.g., 314.555.4525

Email address
- e.g., Joe.Citizen@Example.com

By clicking here, you agree to the contents outlined in our Privacy Policy.

submit
THE FOOD SAFETY STL PROJECT

Using Social Media to Detect Potential Foodborne Outbreaks

Candace Da Silva, MPH
City of St. Louis Department of Health
City of St. Louis Department of Health (STL-DOH)

• Existing Surveillance
Foodborne Illness in City of St. Louis

2016 Annual Environmental Health report,
City of St. Louis Department of Health
Foodborne Illness Complaints

Table 1. Total food establishment complaints reported to City of St. Louis Department of Health from 2010-2016

Table 2. Total foodborne illness complaints reported to City of St. Louis Department of Health from all sources (2009-2016)

2016 Annual Environmental Health report, City of St. Louis Department of Health
Implementation at STL-DOH

- Social Media surveillance prep
  - Website pages, live feed
  - Twitter handle posts
  - Knowledge, staff training, troubleshooting
In the first seven months of use...

- 442 tweets captured by Dashboard
- 193 relevant and received a reply
- 13 reports filed
- 5 in jurisdiction
- 31 reports filed via other mechanisms
Inspection results for Food Safety STL Dashboard vs. other reporting mechanisms

No significant difference in proportions (p=.60).
Dashboard Reports By Jurisdiction

January 2016 - December 2016

In Jurisdiction

• City of St. Louis: 10 Reports
  • 9 Inspections Completed
  • No Violations: 4
  • Non-Critical Violations: 3
  • Critical Violations: 2
  • 1 Attempt to inspect; seasonal facility

Out of Jurisdiction

• St. Louis County: 4 Reports
• St. Charles County: 2 Reports
• Out of State: 3 Reports
  • Clinton County, IL
  • Walton County, GA
  • Riverside County, CA
For 2017, thus far...

Reports received: 7

• St. Louis County: 4 Reports
  • 1 Inspection discovered 5 Critical Violations & 4 Non-Critical Violations

• Springfield-Green County: 1 Report
  • Inspection discovered 3 Critical Violations

• St. Charles County: 1 Report
  • Inspection discovered 1 Critical Violation

• City of St. Louis: 1 Report
  • Partially completed form
Strengths of the Dashboard

• Encourages interaction with residents on foodborne illness

• Increases transparency and trust of health department

• Increases public knowledge of reporting processes
Challenges of the Dashboard

• People like us but they don’t report!

• Reports from out of jurisdiction

• Big Brother is watching (trust issues)
Looking Forward... next steps

- Increasing support from STL-DOH staff
  - Developing promotion strategy for staff & citizens
- Collaboration with Yelp
  - To post most recent inspection grades/ratings
- Application to other health topics

![Hospital Quality (Current)](image1)

![Suicidality (Current)](image2)

![Zika](image3)

Alert LHDs to concerns like standing water and mosquitoes (potential)
Project Team

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