LAWSON

HEALTH RESEARCH INSTITUTE

# eHealth 2011

21-23 November 2011 - Málaga, Spain

4th ICST International Conference on eHealth

EAI European Alliance for Innovation

LAWSON HEALTH RESEARCH INSTITUTE

*I-Think Research*

# *Social Media: A systematic review to understand the evidence and application in infodemiology*

Stacey Guy, Alexandria Ratzki-Leewing,
Raphael Bahati, and Femida Gwadry-Sridhar

Lawson Health Research Insitute
Commissioners Rd E. 801, N6C 5J1 London, Canada
stacey.guy@sjhc.london.on.ca
(alexandria.ratzkileewing, raphael.bahati)@lawson research.com
femida.gwadry-sridhar@lhsc.on.ca

London Health Sciences Centre

St JOSEPH's HEALTH CARE LONDON

Western

LAWSON
HEALTH RESEARCH INSTITUTE

# OVERVIEW...

1. Background
2. Methods
3. Results
4. Discussion/Conclusions
5. Question period

LAWSON
HEALTH RESEARCH INSTITUTE

# BACKGROUND

LAWSON
HEALTH RESEARCH INSTITUTE

# Social Media:

- # of users skyrocketing
  - ***Why?***
    - Sense of community
    - Accessible (time/place)
    - Cost-effective
    - Interoperable
- *Open-source social media presents excellent opportunities in health research*

LAWSON
HEALTH RESEARCH INSTITUTE

# Infoveillance:

- *Systematically mine, aggregate, & analyze real-time, online data*
- Enables instant access to information around the world
- Provides insight into abnormal disease patterns

LAWSON
HEALTH RESEARCH INSTITUTE

# Relevance:

- ***Acute:***
  - Detect potential outbreaks
  - Allow for appropriate resource allocation
- ***Chronic:***
  - Improving health care delivery planning
  - Drawing awareness: public and HCPs
  - Address gaps: treatment, care

LAWSON
HEALTH RESEARCH INSTITUTE

# Objective:

To illustrate how data generated through social media can be used to inform planning and implementation of strategies to predict and address disease outbreaks.

LAWSON
HEALTH RESEARCH INSTITUTE

# METHODS

LAWSON
HEALTH RESEARCH INSTITUTE

# Data Sources

## Databases:

embase®
BIOMEDICAL ANSWERS

PubMed

## Limits:

- English
- Journal articles and conference paper/proceedings
- Published from 1999-2011

LAWSON
HEALTH RESEARCH INSTITUTE

# Keywords and MeSH Headings:

| | Disease | Medium | Methodology |
|---|---|---|---|
| **Keywords** | • Early detect$<br>• Pandemic$<br>• Epidemic$<br>• Communicable diseae$<br>• Early diagnosis | • Information technol$<br>• Internet<br>• Mass medium<br>• Medical computing<br>• Social media<br>• Social network$<br>• Geolocation | • Disease surveillance<br>• Monitor$<br>• Disease control<br>• Algorithm$<br>• Data min$<br>• Query process$<br>• Information retriev$ |
| **MeSH** | • Pandemics<br>• Communicable diseases<br>• Disease outbreaks<br>• Early diagnosis | • Communications media<br>• Databases<br>• Factual<br>• Internet*<br>• User-computer interface* | • Population surveillance<br>• Information storage and retrieval<br>• Forecasting<br>• Data mining<br>• Sentinel surveillance |

LAWSON
HEALTH RESEARCH INSTITUTE

# Search Strategy

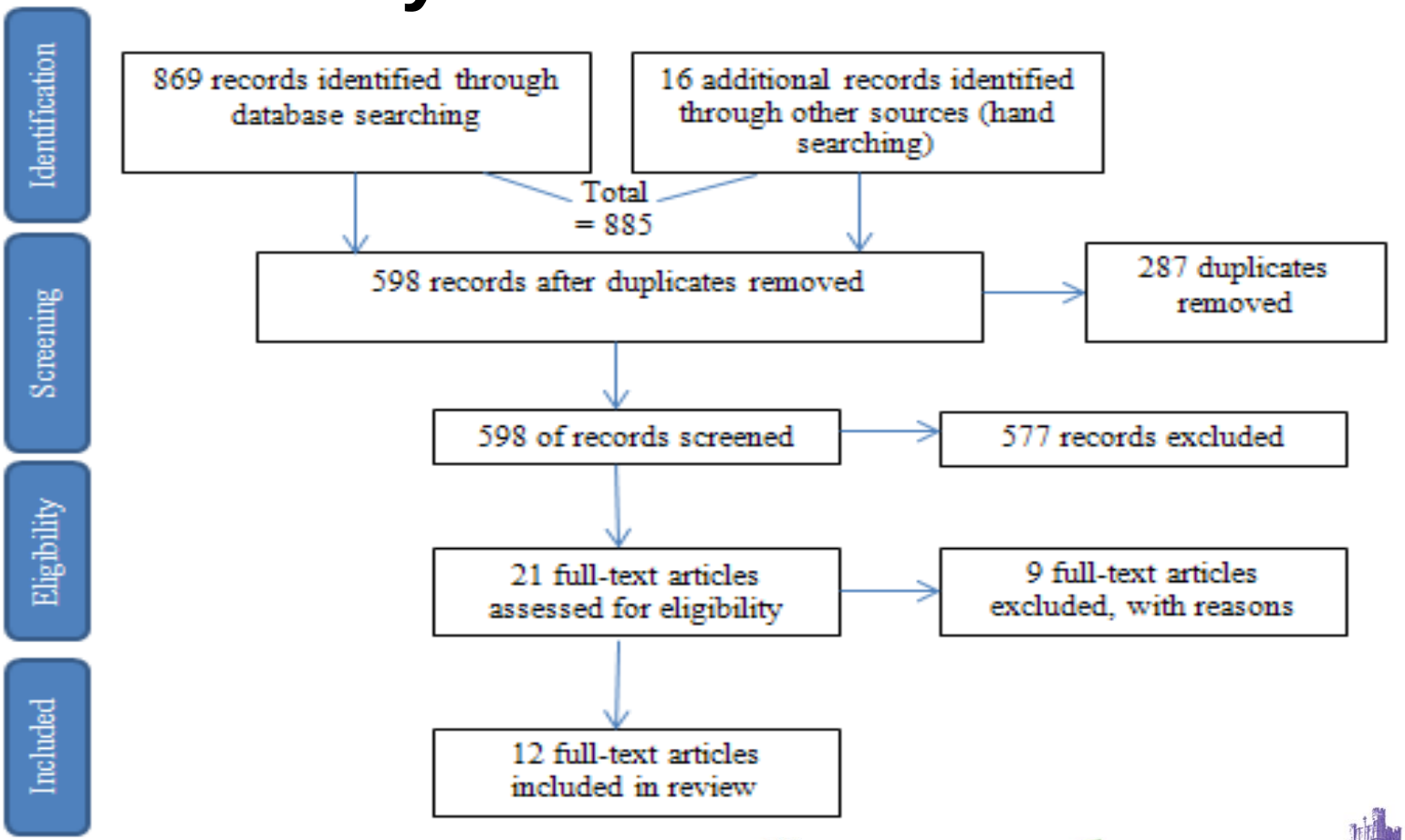
- Literature search conducted June-11
- Searched articles on 3 categories (*Disease, Medium, Methodology*)
  - Keyword in which article was indexed
  - Title and abstract of article
- Search terms chosen to reflect our objective
  - Conducted generalized search in Google to further inform search term selection

LAWSON
HEALTH RESEARCH INSTITUTE

# RESULTS

LAWSON
HEALTH RESEARCH INSTITUTE

# Study Selection Process:



LAWSON HEALTH RESEARCH INSTITUTE

# Studies Included:

| Author | Date Published | Country | Methods | Summary of Findings |
|---|---|---|---|---|
| Achrekar et al. | 2011 | US | SNEFT – Aggregated anonymous data stored in repositories; web crawler | 4.7 million tweets<br>High correlation between tweets and CDC data (r = 0.984 |
| Chen et al. | 2010 | US | SNEFT – Aggregated anonymous data stored in data repositories; web crawler | 2 million tweets<br>Tweet patterns influenced by media<br>Very little misinformation found in tweets |
| Chew & Eysenbach | 2010 | Canada | Infovigil; mine & analyze tweets; over 8 mos | 2 million tweets<br>Tweet patterns influenced by media<br>Very little misinformation found in tweets |
| Eysenbach | 2011 | Canada | Infovigil; mine & anlyze tweets; over 8 mos | 2 million tweets<br>Tweet patterns influenced by media<br>Very little misinformation found in tweets |
| Corley et al. | 2009 | US | Evaluated blog posts; over 3 mos | 44 million tweets<br>Sig. Correlation between posts and CDC data (r = 0.626) |
| Corley et al. | 2010 a, b | US | Evaluated weblogs, microblogs, social media items; English | High correlation between posts and CDC data (r = 0.626) |
| Culotta et al. | 2010 | US | Developed regression model; evaluated tweets over 10 weeks | Multiple regression model out-performs simple regression (r = 0.78) |
| de Quincey & Kostkova | 2010 | UK | Code developed to retrieve tweets; over 1 wk | 135, 428 tweets<br>Analyzed content of tweets for swine flu |
| Lampos & Christianini | 2010 | UK | Developed monitoring tol; ILI; Flue-score created | 160,000 tweets/day<br>High correlation between flu-scores & weekly HPA reports<br>Independent of language<br>Geo-located |
| Lopes et al. | 2009 | Portugal | Developed web-crawler: Data Collector; H1N1 | Collected tweets from 6 EU countries<br>700 pertaining to H1N1 |
| Signorini et al. | 2011 | US | Track tweets; H1N1; over 34 days; plot spikes of public interest | 951,697 tweets – 34 days<br>4 million tweets – 3 mos<br>No sustained interest in vaccine-related issues |

LAWSON
HEALTH RESEARCH INSTITUTE

# Summary of Results:

- All studies mine & analyze
- 2009 onwards
- Design
- ILI & H1N1
- Medium
- High correlations between posts and national data

LAWSON
HEALTH RESEARCH INSTITUTE

# DISCUSSION/CONCLUSIONS

LAWSON
HEALTH RESEARCH INSTITUTE

# *Summary*: Effect of infodemiology...

| Advantages | Disadvantages |
|---|---|
| ➢Provides real-time, relevant info | ➢Textual data can be hard to interpret |
| ➢Improves public access to health info | ➢Data may not reflect entire population |
| ➢Operating costs can be low | ➢Geo-location of data hard to confirm |
| ➢Opportunity for “Mash-ups” | |

LAWSON
HEALTH RESEARCH INSTITUTE

# Study Limitations:

- Diffuse search
- Depended on hand-searching

LAWSON
HEALTH RESEARCH INSTITUTE

# What's next?

- Identify target audiences
- Determine user interactions
- Role of evidence-based medicine tools

LAWSON
HEALTH RESEARCH INSTITUTE

# References


1. Evans, D.: Social Media Marketing: An Hour a Day. Wiley Publishing, Indiana (2008)
2. McNab, C.: What Social Media Offers to Health Professionals and Citizens. Bulletin of the WHO 87, 566 (2009)
3. Bacigalupe, G.: Is There a Role for Social Technologies in Collaborative Healthcare? Families, systems & health 29, 1-14 (2011)
4. Culotta, A.: Towards Detecting Influenza Epidemics by Analyzing Twitter Messages. In: 1st Workshop on Social Media Analytics (SOMA'10), Washington DC (2010)
5. Wilson, N., Mason, K., Tobias, M., Peacey, M., Huang, Q.S., Baker, M.: Interpreting Google Flu Trends Data for Pandemic H1N1 Influenza: The New Zealand Experience. Euro Surveill. 14, 19386 (2009)
6. Chew, C., Eysenbach, G.: Pandemics in the Age of Twitter: Content Analysis of Tweets During the 2009 H1N1 Outbreak. PLoS ONE, 5 (2010)

7. Moher, D., Liberati, A., Tetzlaff, J., Altman, D,G., PRISMA Group.: Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. Annals of Internal Medicine, 151, 264 --9 (2009)
8. Achrekar, H., Avinash, G., Lazarus, R., Yu, S., Liu, B.: Predicting Flu Trends using Twitter Data. In: International Workshop on CPNS. Shanghai, China (2011)
9. Chen. L., Achrekar, H., Liu, B., Lazarus, R.: Vision: Towards Real Time Epidemic Vigilance through Online Social Networks: Introducing SNEFT. In: 1st ACM Workshop on Mobile Cloud Computing. San Francisco, California (2010)
10. Corley, C.D., Mikler, A.R., Singh, K.P., Cook, DJ.: Monitoring Influenza Trends through Mining Social Media. In: International Conference on Bioinformatics and Computational Biology. Las Vegas, Nevada (2009)
11. Corley, C.D., Cook, DJ., Mikler, A.R., Singh, K.P.: Text and Structural Data Mining of Influenza Mentions in Web and Social Media. International Journal of Environmental Research and Public Health 7: 596--615(2010)
12. Corley, C.D., Cook, D.J., Mikler, A.R., Singh, K.P.: Using Web and Social Media for Influenza Surveillance. Advances in Experimental Medicine and Biology; 680: 559--564 (2010)
13. de Quincey, E., Kostkova, P.: Early Warning and Outbreak Detection Using Social Networking Websites: The Potential of Twitter. In: eHealth 2099, LNICST, pp. 21-24 (2010)
14. Eysenbach, G.: Infodemiology and Infoveillance Tracking Online Health Information and Cyberbehavior for Public Health. American Journal of Preventive Medicine; 40: S154-8 (2011)
15. Lampos, V., Cristianini, N.: Tracking the Flu Pandemic by Monitoring the Social Web. In: Int Workshop on CIP. Elba Island, Italy (2010)
16. Lopes, LF., Zamite, J.M., Tavares, B.C., Couto, F.M., Silva, F., Silva, M.J.: Automated Social Network Epidemic Data Collector. In: INForum (2009)
17. Signorini, A., Segre, A.M., Polgreen, P.M.: The Use of Twitter to Track Levels of Disease Activity and Public Concern in the U.S. during the Influenza A H1N1 Pandemic. PloS One; 6: e19467 (2011)
18. Wilson, K., Brownstein, J.S.: Early Detection of Disease Outbreaks Using the Internet. CMAJ : Canadian Medical Association Journal; 180: 829--831 (2009)
19. Brownstein, J.S., Freifeld, C.C., Madoff, L.C.: Digital Disease Detection--Harnessing the Web for Public Health Surveillance. The New England Journal of Medicine; 360: 2153--5, 2157 (2009)

LAWSON
HEALTH RESEARCH INSTITUTE


The research institute of London Health Sciences Centre and St. Joseph's Health Care, London.

London Health Sciences Centre
St. Joseph's Health Care London
Western

LAWSON
HEALTH RESEARCH INSTITUTE

# Thank you!

## http://www.ithinkresearch.com/

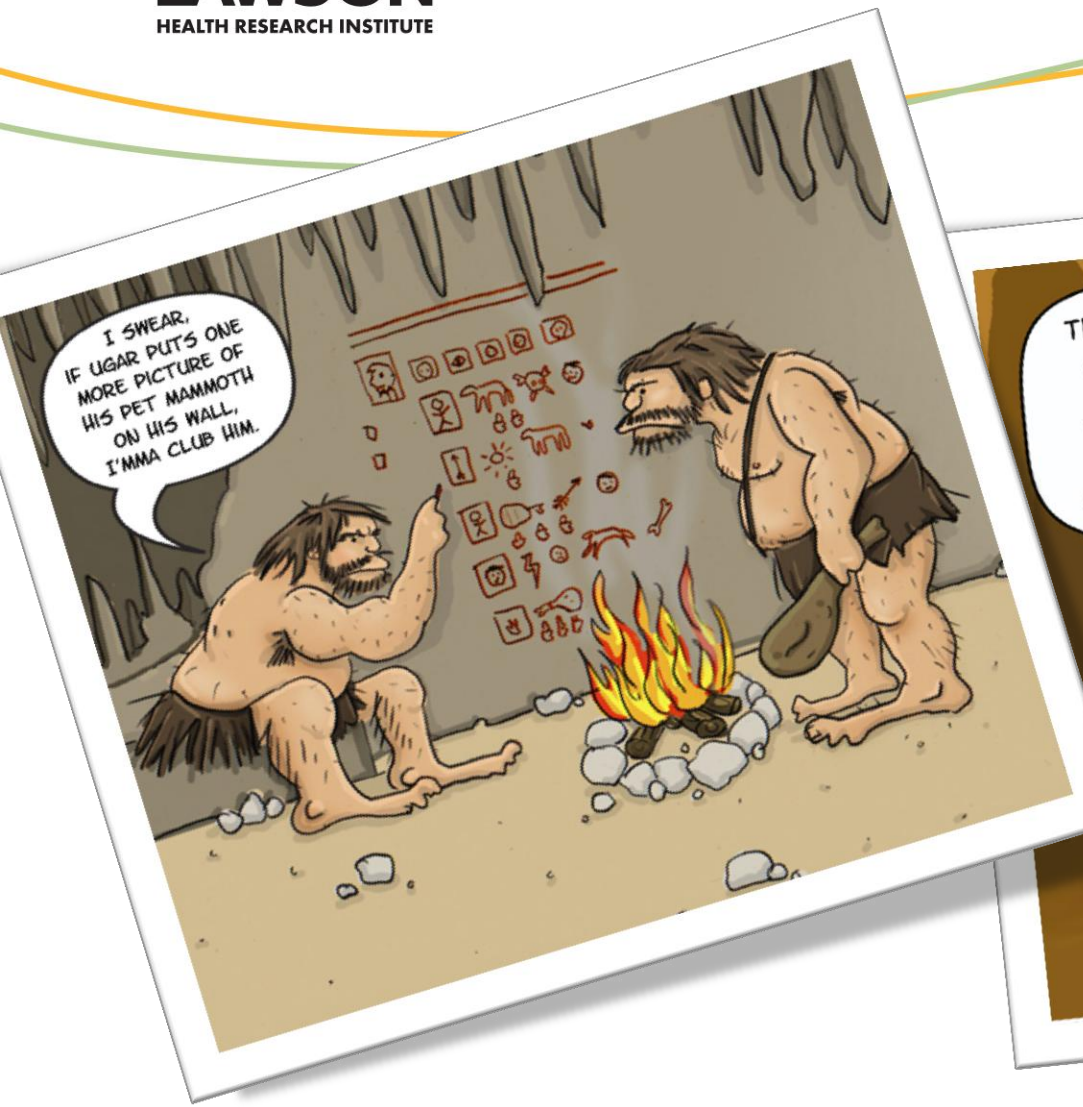
Stacey Guy, Alexandria Ratzki-Leewing, Raphael Bahati, Femida Gwadry-Sridhar

LAWSON
HEALTH RESEARCH INSTITUTE

# Questions?

LAWSON
HEALTH RESEARCH INSTITUTE

***Group Name: typed into Slide Master***
***(10 pt, Arial Bold Italic)***





The research institute of London Health Sciences Centre and St. Joseph's Health Care, London.

London Health Sciences Centre

St JOSEPH's HEALTH CARE LONDON

Western