DDD

FLORENCE

2015

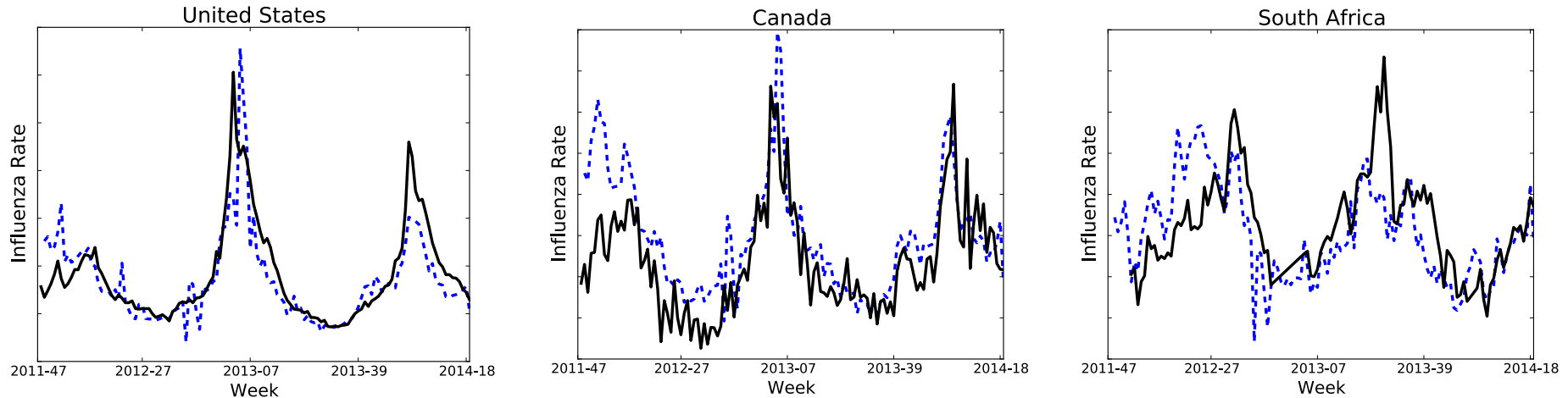3rd International Conference on Digital Disease Detection

Michael Paul

Johns Hopkins University

Influenza in Twitter

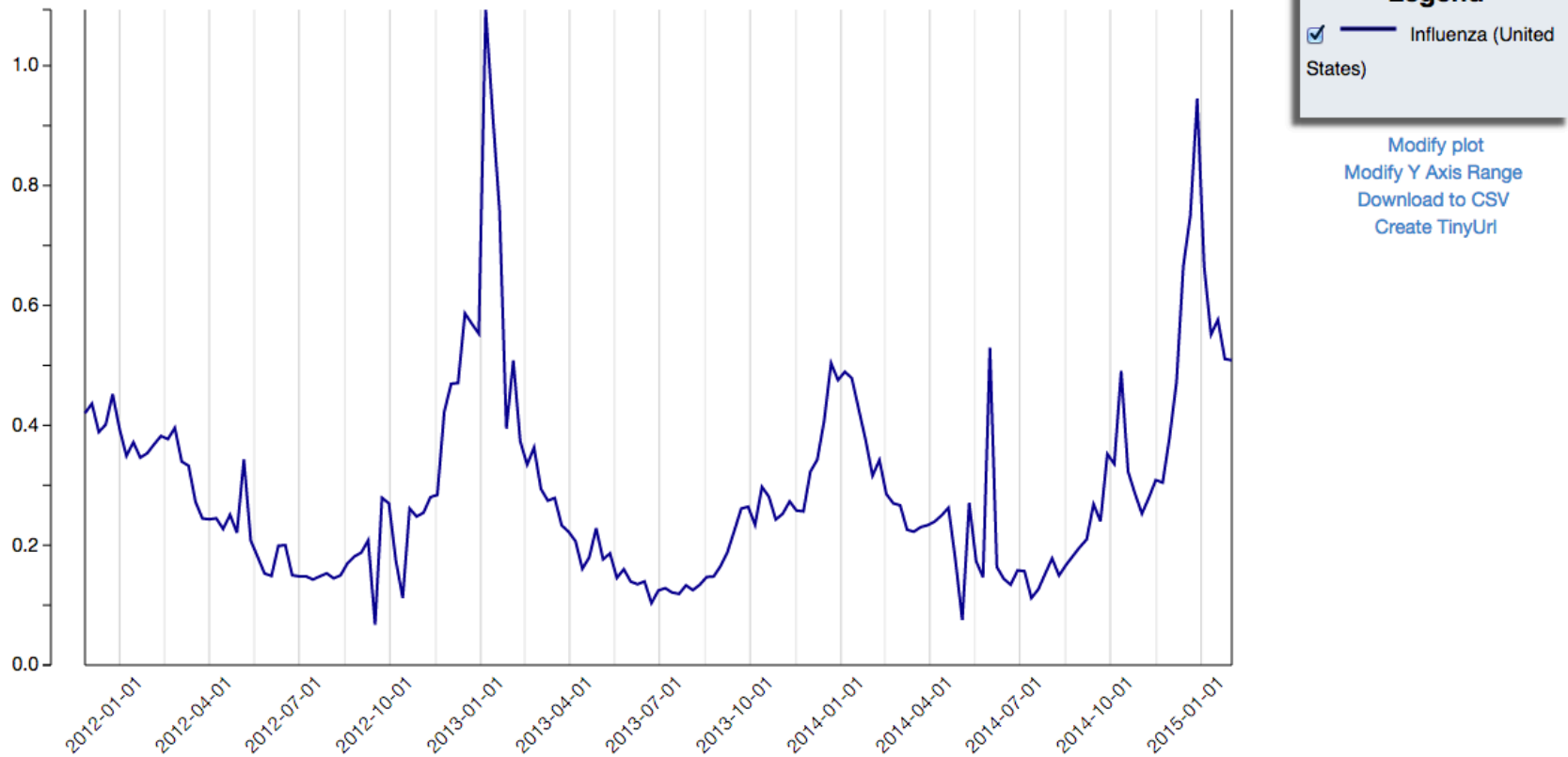Tweets can estimate influenza prevalence

HealthTweets.org

Influenza in Twitter

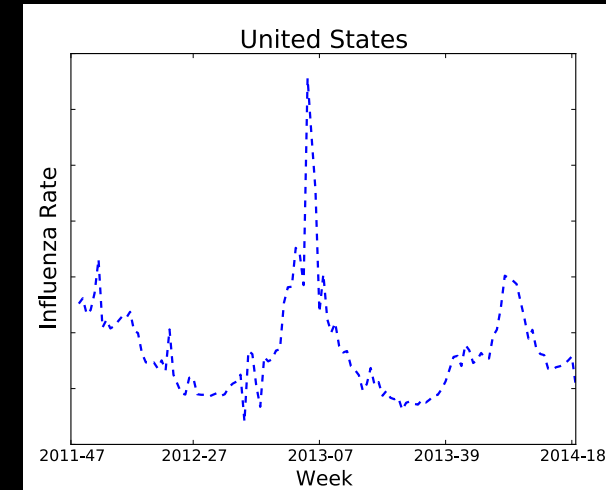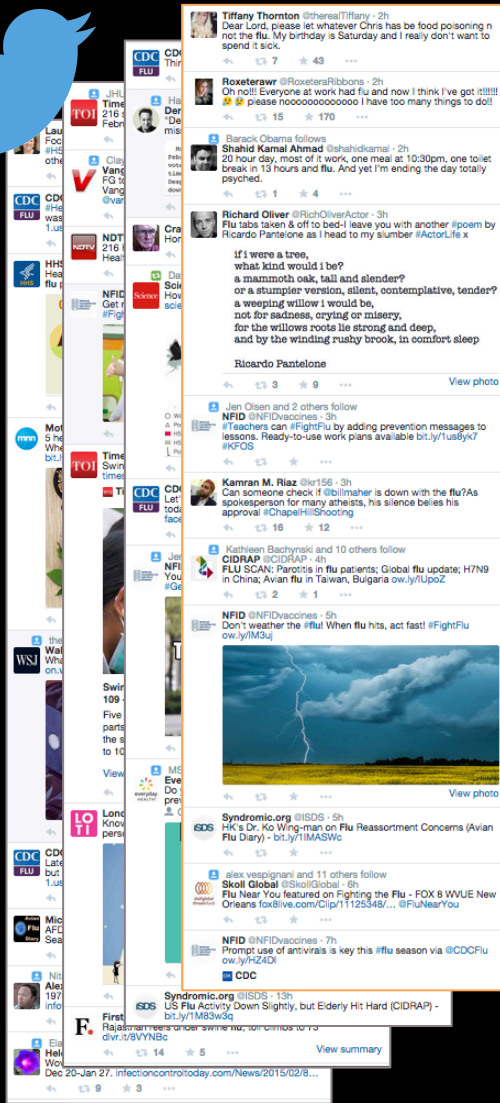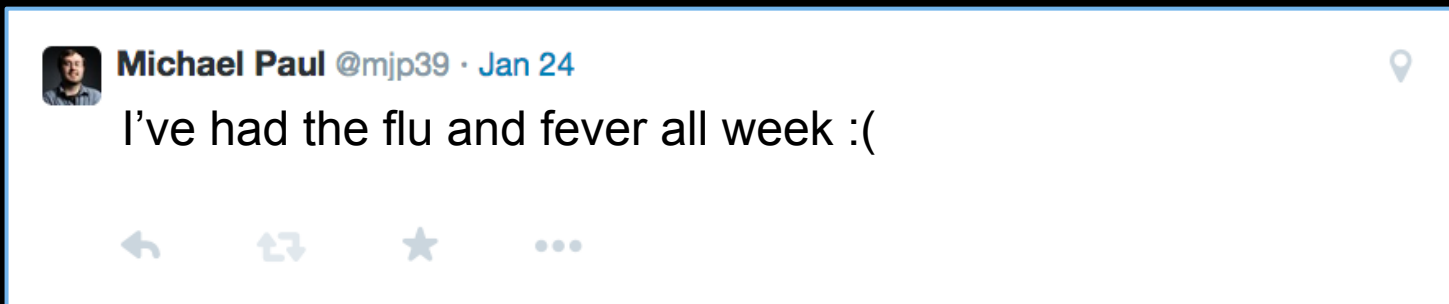# Influenza in Twitter

Look for tweets that indicate infection:

Infection vs Awareness

"think I'm coming down with the flu"
vs
"tired of hearing about the flu"

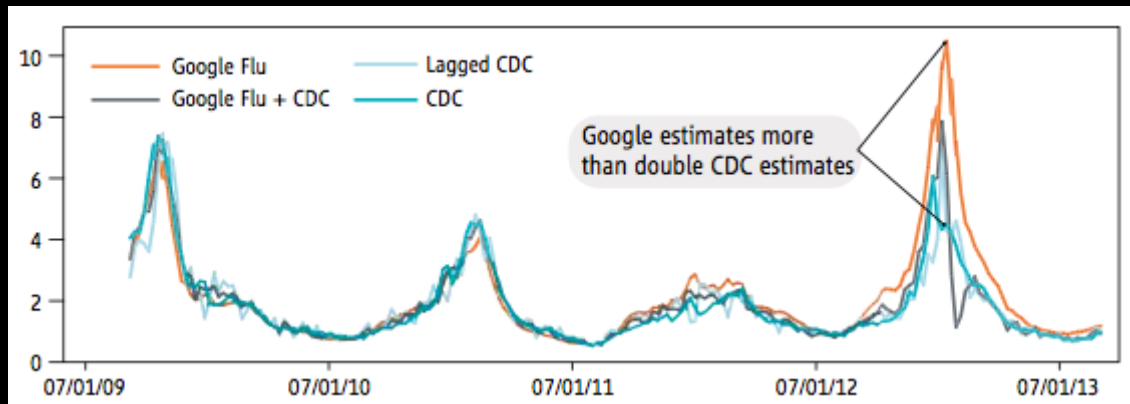# Infection vs Awareness

"think I'm coming down with the flu"

VS

"tired of hearing about the flu"

The user probably has the flu.
- These are the tweets we want to count for surveillance!

Infection vs Awareness

This distinction matters!

From Lazer et al., *Science*, 2014

Google concluded that media attention contributed to their overestimate in 2012-2013

Tweet Classification

Cascade of 3 logistic regression classifiers:

- about health vs not about health

- about flu vs not about flu

- flu infection vs flu awareness

Tweet Classification

Estimated weekly flu rate:

$$\frac{\text{\# tweets about flu infection that week}}{\text{\# of all tweets that week}}$$

This yields estimates of infection

Infection vs Awareness

"think I'm coming down with the flu"

vs

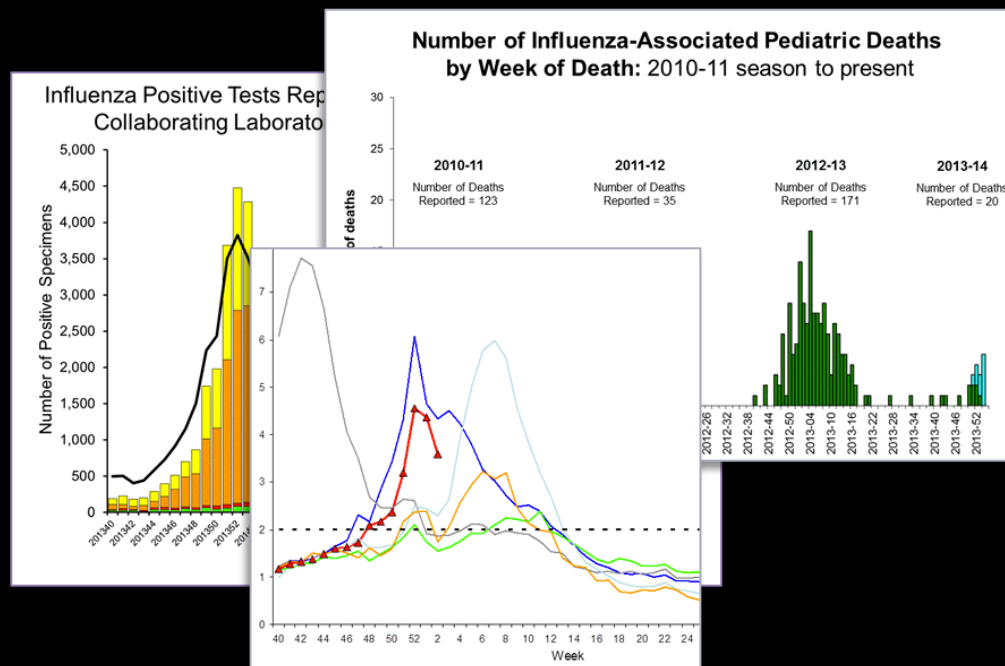"tired of hearing about the flu"

The user is aware of the flu.
- New question: what can we learn from tweets like this?

Influenza Awareness

- Public awareness of a disease is a major factor that can influence its spread

- Officials must often manage public perceptions to manage outbreaks

Influenza Awareness

- We currently lack systems for up-to-date monitoring of influenza awareness

Awareness in Twitter

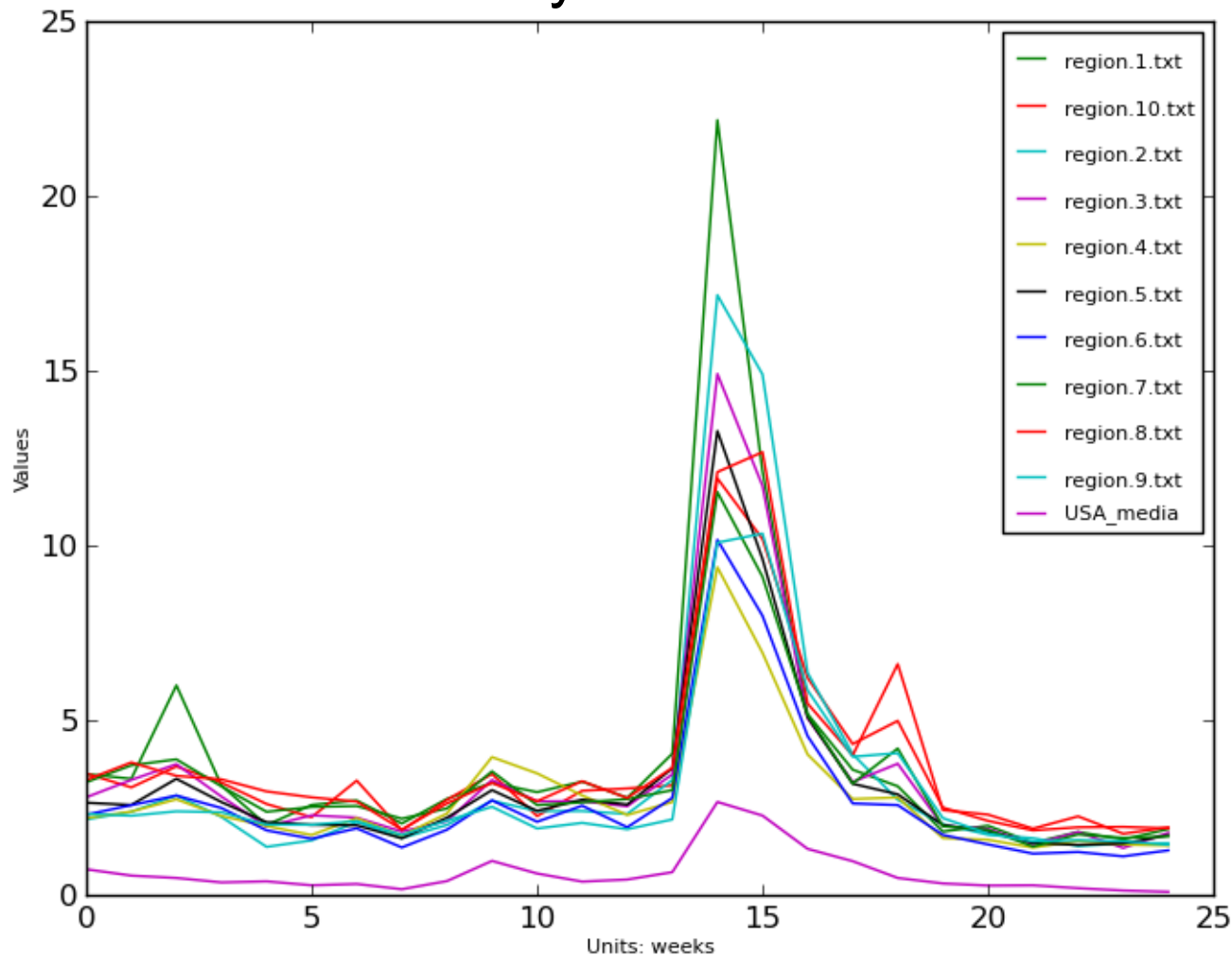We can estimate levels of awareness using our tweet classifiers:

- about health vs not about health

- about flu vs not about flu

- flu infection vs flu awareness

Comparing Trends

- Twitter trends for infection and awareness
  - 9/30/2012 – 5/31/2013

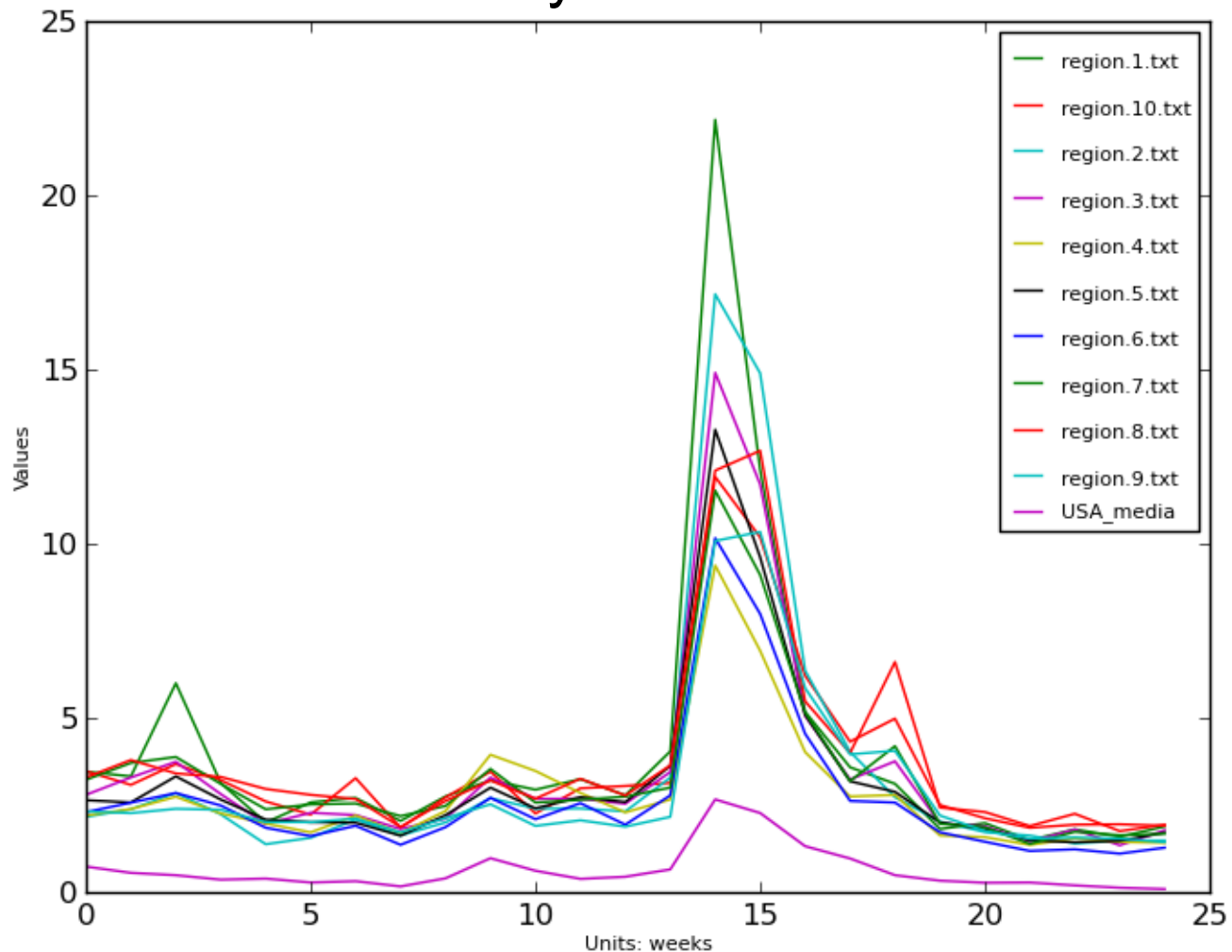- 10 HHS regions in United States

2012-2013 Flu Season

Weekly awareness:
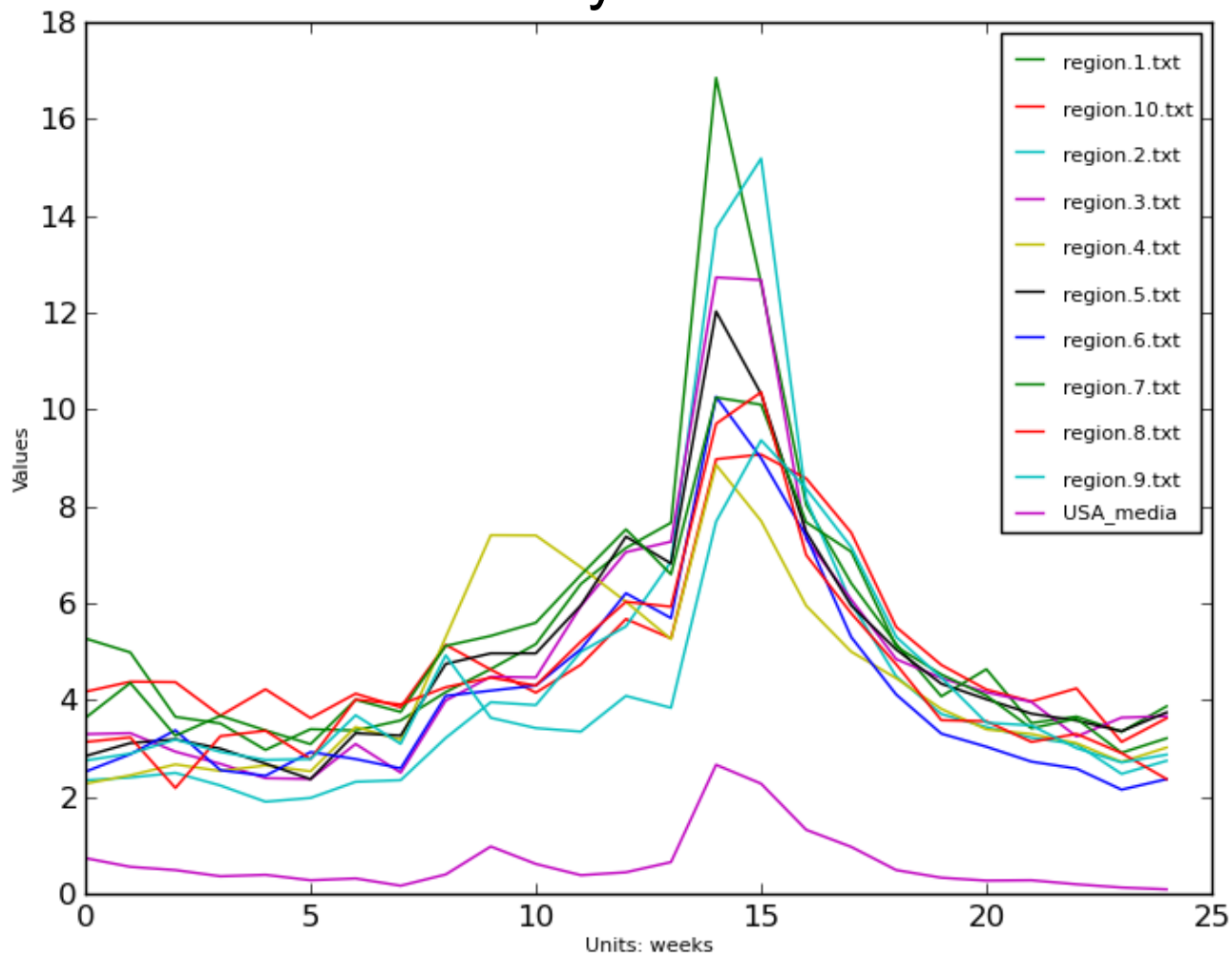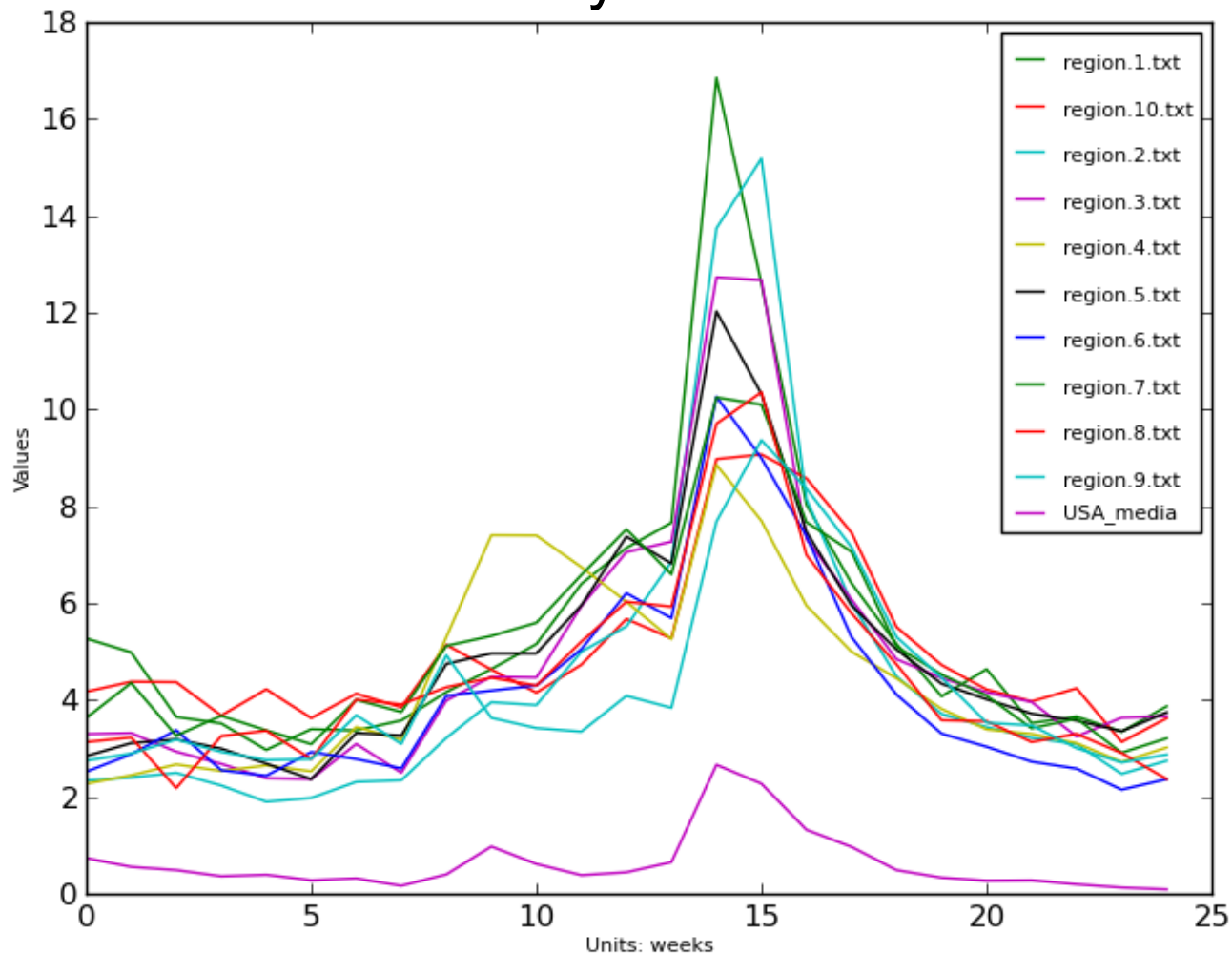
2012-2013 Flu Season

Weekly awareness:

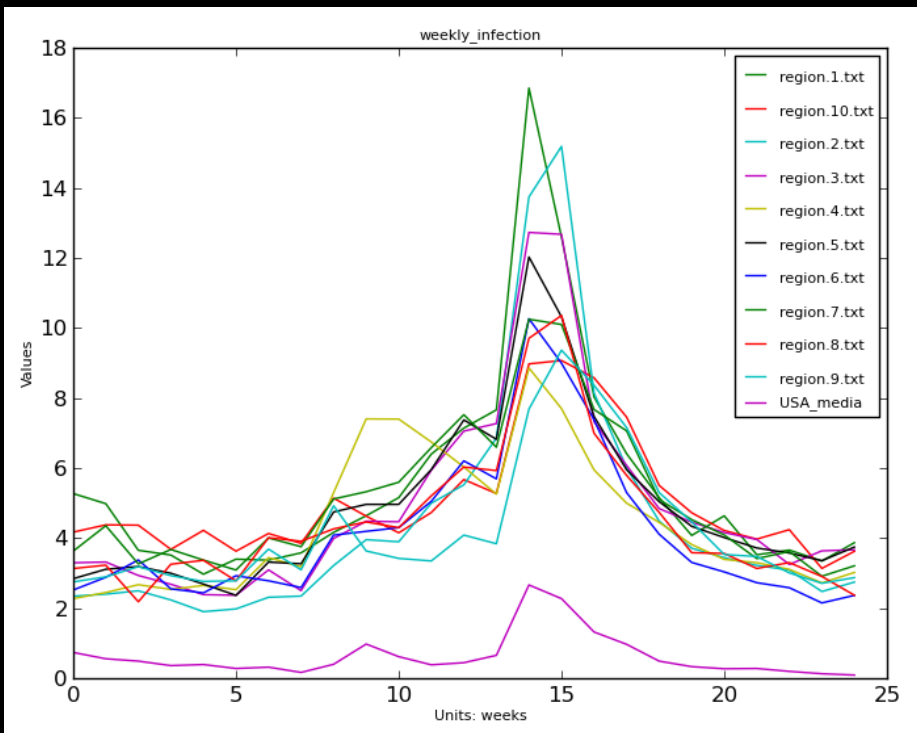# 2012-2013 Flu Season

Weekly infection:

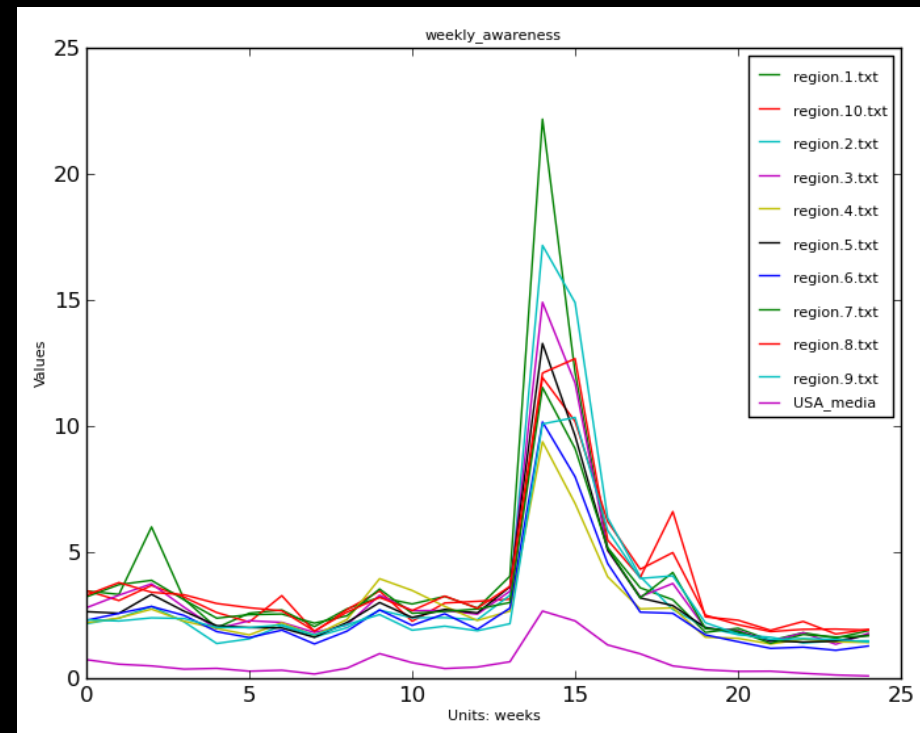# 2012-2013 Flu Season

Weekly infection:

2012-2013 Flu Season

Infection:

Awareness:

Conclusion

- Public awareness of disease is important
- Tweet volume can measure awareness
- Awareness, infection have different trends