Dynamics of disease on social media

Chris Banks, Jess Enright, Sibylle Mohr, Rowland Kao



THE UNIVERSITY of EDINBURGH The Royal (Dick) School of Veterinary Studies









IDDconf, September 2019

- Aim: to analyse the discourse, on Twitter, relating to disease control.
- **Hypothesis**: the discourse is polarised by "factual", disease-related discussion and "rhetorical" or controversial discussion.

• Goals:

- to identify and characterise interaction networks, relating to modes of discourse on Twitter;
- identify and characterise the "influencers";
- find measures which characterise a discussion as "factual" or "rhetorical";
- determine what influence one has on the other.

- Bovine Tuberculosis (bTB)
 - discourse includes a number of areas of contention and controversy, mainly around badger culling.
- Bovine Viral Diarrhoea (BVD)
 - discourse tends to be centred around disease control, with very little controversy.
- Brexit and Agriculture
 - High controversy, high volume, very mixed topics. Just for comparison.
- Collected from Twitter public API, over a 120 day period from *September 2018* to *January 2019*.

Volumes

• bTB: 16628 tweets (82.2% retweets, 13.5% quoted, 3.2% replies)



*Government Bovine TB strategy published 13th Nov

BVD: 1342 tweets (63.9% retweets, 11.5% quoted, 6.0% replies)



• Brexit: 57501 tweets (76.3% retweets, 10.3% quoted, 5.3% replies)



- Three networks computed for each set.
- Nodes are users.
- Edges are retweets/replies/follows.

	Retweet	Reply	Follow
bTB	bTB-RT	bTB-Re	bTB-FI
BVD	BVD-RT	BVD-Re	BVD-FI

bTB Retweet Network



C.Banks, J.Enright, S.Mohr, R.Kao

BVD Retweet Network



C.Banks, J.Enright, S.Mohr, R.Kao

Community detection (Girvan-Newman): bTB-RT



C.Banks, J.Enright, S.Mohr, R.Kao

Word frequencies: BVD



Word frequencies: bTB



Sentiment analysis



- Analyses language in each tweet
- Computes a score for positive/negative sentiment
- Magnitude reflects level of emotion

- bTB: largely neutral, but with more extreme negatives.
- BVD: again largely neutral, but a skew towards positive, but less extremes.

11/17

Sentiment over time: bTB



• Above: Sum of daily polarity scores; Below: Daily volume.

Sentiment over time: BVD



• Above: Sum of daily polarity scores; Below: Daily volume.

- We see little difference between the sets based on standard network measures alone.
 - except for characterising the types of influencer by degree and betweenness.
- Analysis of the language reveals differences:
 - Word/n-gram frequencies reveal an obvious bias in the bTB set (badger culling).
 - Sentiment analysis reveals difference in the level and polarity of emotion used in each set.
 - (BVD more positive, but less extremely emotional; bTB has more extreme polarisation.)

- See how language properties interact with the network:
 - e.g. how does language/sentiment vary by community cluster?
- How does the network and language change during news events?
- Can we further classify users (i.e. official govt. sources, scientists, activists, etc.)?
- Loads more stuff! (Still open to suggestions!)



16 / 17

