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Citation: Ahmed, Wasim, Bath, Peter, Sbaffi, Laura and Demaerini, Gianluca (2018) Moral Panic through the Lens of Twitter: An Analysis of Infectious Disease Outbreaks. In: SMSociety '18 Proceedings of the 9th International Conference on Social Media and Society. Association for Computing Machinery, pp. 217-221. ISBN 978-1-4503-6334-1

Published by: Association for Computing Machinery

URL: <http://doi.org/10.1145/3217804.3217915> <<http://doi.org/10.1145/3217804.3217915>>

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Moral Panic through the Lens of Twitter: An Analysis of Infectious Disease Outbreaks

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ABSTRACT

This paper presents an in-depth qualitative analysis of $n=13,373$ tweets that relate to the peak of the Swine Flu outbreak of 2009, and the Ebola outbreak of 2014. Tweets were analysed using thematic analysis and a number of themes and sub-themes were identified. The results were brought together in an abstraction phase and the commonalities between the cases were studied. An interesting similarity which emerged was the rate at which Twitter users expressed intense fear and panic akin to that of the sociological concept of “moral panic”. Moreover, a number of discussions were found to emerge which were not reported in previous literature. Our study is the largest in-depth analysis of tweets on infectious diseases. Our results will inform public health strategies for future infectious disease outbreaks. Future work will seek to conduct further comparisons and explore relevant health theory.

CCS CONCEPTS

• Information systems → World Wide Web → Web applications → **Social networks**

KEYWORDS

Swine Flu, Ebola, Social Media, Moral Panic

ACM Reference format:

Wasim Ahmed, Peter A. Bath, Laura Sbaffi, and Gianluca Demartini. 2018. Moral Panic Through the Lens of Twitter: An Analysis of Infectious Disease Outbreaks. In *Proceedings of the International Conference on Social Media & Society*, Copenhagen, Denmark (SMSociety).¹ DOI:

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1 INTRODUCTION

Infectious disease outbreaks are a grave public health concern with high fatality rates, and account for 29 out of 96 causes of major human mortality [1, 2]. The Black Death, which occurred from 1346 to 1353, is estimated to have taken the lives of between one-fourth and three-fourths of the world’s population across Europe and Asia and, in Europe only, at least 25 million people died from it, including half of the London population at the time (around 100,000 people) [3]. The Spanish influenza pandemic (the medical name given to this strain of virus is A/H1N1), which occurred from 1918 to 1920, infected 500 million people and claimed 50-100 million lives (equivalent to 3% to 5% of the world’s population) [4].

Infectious disease outbreaks are likely to lead to public views and opinions which may be expressed in the online world, as a space where people share their thoughts. Sharing of health information online began towards the latter part of the 20th century, for instance, via personal websites, discussion forums and online communities. The last few years have seen a shift towards sharing information via social media, and have changed the ways in which people communicate about health issues [5]. Previous deadly outbreaks, such as that of the Spanish influenza virus, occurred without modern communication devices such as personal computers and mobile phones, whereas the 2009 swine flu pandemic and the 2014 Ebola epidemic occurred in the age of social media platforms such as

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SMSociety, July 2018, Copenhagen, Denmark

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Twitter. This makes it possible to examine unfiltered public views and opinions shared during these outbreaks and, importantly, to study what aspects of health online communities choose to converse about. Furthermore, certain discussions related to infectious diseases emerge on Twitter which may not be revealed in traditional interviews or surveys.

Although previous empirical research has examined Twitter content surrounding swine flu [6, 7], and Ebola [8, 9, 10], we were unable to find any research that conducted an in-depth thematic analysis of how Twitter users respond during these infectious disease outbreaks.

1.1 H1N1

The H1N1 Swine Influenza (Flu) Pandemic of 2009 began in April and originated in Mexico [11], spreading across the world because it was a new strain of flu and members of the public had no immunity to it [12, 13]. The United States Centres for Disease Control and Prevention (CDC) announced on the 21st of April 2009 that two patients from California had been infected by the swine flu virus, and that preparations for a swine flu pandemic were underway. Four weeks after the initial two reports in California, 41 countries reported diagnosed cases of the virus [14]. There were an estimated 123,000 to 203,000 deaths due to swine flu from April 1 to December 31, 2009 [15].

1.2 Ebola

The source of the 2014 outbreak of Ebola virus was traced to Guinea in December 2013, from which point spread across West Africa. As of January 2016, there were 28,637 cases of Ebola across and 11,315 deaths [16]. The 2014 Ebola epidemic was the largest epidemic of Ebola ever recorded, and the number of cases outnumbered all of the previous cases combined [17]. In June 2014, Médecins Sans Frontières (MSF) declared that the outbreak was out of control, and in August 2014 the United Nations (UN) declared Ebola to be an international public health emergency [18].

1.3 Moral Panic

The concept of moral panic is a well-established sociological notion first developed in 1972 [19]. It is well summarized in the passage below:

“Societies appear to be subject, every now and then, to periods of moral panic. A condition, episode, person or group of persons emerges to become defined as a threat to societal values and interests; its nature is presented in a stylized and stereotypical fashion by the mass media; the moral barricades are manned by editors, bishops, politicians and other right-thinking people; socially accredited experts pronounce their diagnoses and solutions; ways of coping are evolved or (more often) resorted to; the condition then disappears, submerges or

deteriorates and becomes more visible. Sometimes the object of the panic is quite novel and at other times it is something which has been in existence long enough, but suddenly appears in the limelight. Sometimes the panic passes over and is forgotten, except in folklore and collective memory; at other times it has more serious and long-lasting repercussions and might produce such changes . . . in legal and social policy or even in the way the society conceives itself.” [Cohen, 2002].

Garland [20] outlined a number of examples of potential moral panics which include: the witch hunts that took place in the 16th and 17th centuries, the war on drugs, and threats from terrorism. Moral panics may turn out to be insignificant later on, but at the time they occur they generate a real sense of panic. A typical feature of moral panic is an overblown reaction from different parts of society. This concept is relevant to this study because infectious disease outbreaks are further examples of moral panics.

1.4 Study Purpose and Research Questions

Different disciplines may design and conduct research differently. For example, studies conducted using Twitter data from the field of computer science may lack a sociological basis and describe the results without relating them to theory. Other disciplines, for instance, studies in Philosophy, may be purely theoretical. This is not to say either of these approaches are improper; studies from these fields still contribute to knowledge. A novel aspect of the sociological study described in this paper is that it utilised in-depth qualitative methods and related the results to the sociological theory of the moral panic. Previous work in this area has tended to focus on utilising computational methods for data analysis. The study proposes to address the following research questions:

- What were the key discussions on Twitter during the peak of the swine flu and Ebola outbreaks?
- What similarities and differences emerged by contrasting the thematic findings of each of the outbreaks to one another?
- Does the response of users on Twitter mimic that of a moral panic? A case study approach was utilized and the study operated under the pragmatic research paradigm.

2 METHODS

2.1 Identifying Peaks

Data were retrieved from the Firehose Application Programming Interface (API) (i.e., a complete set of tweets using a licensed reseller of Twitter data). More specifically, the tool Visibrain [21] was utilised and data were filtered using DiscoverText [22]. The 2009 swine flu and 2014

Ebola outbreaks are the two health-related events with the highest proportion of media coverage in the 21st century [23]. Google ranked “swine flu” as the fastest growing Web search query in Google News [24], and “Ebola” was among the most searched terms in 2014 [24]. In this study, the data retrieved were purposively sampled according to when Google Trends data showed a heightened interest in the respective outbreaks, and a case study approach was utilised. Ethical approval for this study was gained from the University of Sheffield.

2.2 Data Retrieval and Filtering for swine flu

The entire dataset retrieved related to swine flu consisted of 214,784 tweets posted during the two-day period of April 28th and April 29th 2009 and identified using the keyword terms “swine flu”, “#SwineFlu”, and “H1N1”. As stated above, this time interval was selected because it falls where Google Trends data shows an increased interest in the outbreak. The approach for filtering data on swine flu is summarised in **Table 1** below.

Table 1: Research approach for filtering swine flu data

Stage	Total
Pre-data Cleaning	214,784
Removing Exact Duplicates	102,852
Removing Duplicates at a 60% threshold	76,783
10% sample removed for analysis	7,678

2.3 Data Retrieval and Filtering for Ebola

The entire dataset that was retrieved relating to Ebola consisted of 181,110 tweets produced during the period of 29th and 30th September 2014 identified using the keyword “Ebola”. Once again, Google Trends data showed an increase in interest around Ebola web-search queries during that time. The approach that was taken for filtering data on Ebola is summarised in Table 2 below.

Table 2: Research approach for filtering Ebola data

Stage	Total
Pre-data cleaning	181,110
Removing duplicates	102,852
Removing near duplicates at a 60% threshold	76,782
10% sample removed for analysis	5,695

2.4 Analysis Technique and Reliability Measures

After the filtering stage, data were entered into Nvivo and the six stages of thematic analysis [25] were utilised in order to analyse the data. For data on swine flu, inter-coder reliability was 99.96%, and for Ebola it was 99.93%. This was calculated by sourcing a coder who coded 300 tweets

for each dataset. In regards to test-retest reliability for tweets on swine flu the agreement rate was 99.94%. and for Ebola it was 99.94%.

3 RESULTS AND DISCUSSION

3.1 Thematic Findings for swine flu

Overall, it was found that the information which was shared on Twitter during this time period revolved around eight key themes and a number of sub-themes as described in Table 3 below.

Table 3: Thematic Findings for swine flu

Theme (N%)	Sub-themes (N%)
Emotion and feeling (253/4.4%)	General fear (174/3.0%) Fear of travel (54/0.9%) Anger (17/0.3%) Worry (8/0.1%)
Health information (609/10.6%)	Transmission (22/0.4%) Prevalence monitoring (158/2.8%) Prevention techniques (134/2.3%) Prevention products (126/2.2%) Symptoms (80/1.4%) Speculative diagnosis (18/0.3%) Medication (14/0.2%) References to other infection or disease (57/1.0%)
General commentary & resources (2467/43.0%)	General discussions (1826/31.8%) Information seeking (145/2.5%) Economic impact of swine flu (62/1.1%) Voice of reason (109/1.9%) Frightening scenarios (13/0.2%) Name discussion (26/0.5%) Resources (42/0.7%) Images used in Tweets (36/0.6%) Unfollowing users (2/0.03) Other discussions (206/3.6%)
Media and health organisations (675/11.80%)	Health organisations (general) (136/2.4%) Health organisations (critical) (7/0.1%) Media organisations (general) (444/7.7%) Media organisations (critical) (88/1.5%)
Politics (124/2.2%)	Political reference (81/1.4%) Obama (43/0.75%)
Country of origin (Mexico/Travel) (211/3.7%)	Reference to Mexico and/or Mexico City (162/2.8%) Reference to Mexicans (43/0.8%) Reference to borders (6/0.10%)
Food (428/7.5%)	Pork Consumption (336/5.9%) Food Humor (92/1.6%)
Humor or sarcasm (975/17.0%)	Humor Related to Pigs (100/1.8%) Nervous Humor (18/0.3%) Popular Culture/Understanding (221/3.9%) Miscellaneous Humor (378/6.6%) Sarcasm (258/4.5%)

3.2 Thematic Findings for Ebola

Overall, the main finding was that discussions on Twitter involving Ebola revolved around eight key themes, and a number of sub-themes as highlighted in Table 4 below.

Table 4 below provides an overview of themes that were identified from the analysis of tweets on Ebola.

Table 4: Thematic Findings for Ebola

Theme (N/%)	Sub-themes (N/%)
Emotion and feeling (113/2.60%)	Anger (12/0.3%) Fear (55/1.3%) Fear of travel (5/0.11%) Praying, prayer or call to God (26/0.60%) Dead rising generates fear (15/0.35%)
Health information (192/4.5%)	Transmission reporting (41/1.00%) Transmission of Ebola (26/0.60%) Symptoms (37/0.90%) Vaccines (36/0.80%) Prevention (22/0.51%) Speculative diagnosis (7/0.16%) Quarantine (25/0.60%)
Significant news stories (282/6.60%)	Ebola Patients rise from dead (107/2.5%) Australia will not send volunteers (64/1.5%) US to send troops to fight Ebola (18/0.42%) News story uses terrorism analogy (6/0.14%) Doctor exposed to Ebola (87/2.03%) FDA warning over fake drugs (30/0.70%)
General commentary (2311/54.0 %)	General discussions (2025/47.26%) Information seeking (28/0.65%) Economic impact of Ebola (11/0.25%) Death count (32/0.74%) Western privilege (11/0.25%) Link to Instagram (24/0.56%) Twitter users linking to YouTube (56/1.30%) Refers to iPhone (9/0.21%) Twitter users linking to other tweets (55/1.30%) Downplaying Ebola risk (9/0.21%) Conspiracy theories (51/1.20%)
Refers to official organisations (75/1.80%)	WHO (17/0.40 %) CDC (37/0.90%) MSF (12/0.30 %) UNICEF (9/0.21%)
Refers to West African city and or region (181/4.2)	Sierra Leone (104/2.42%) Liberia (36/0.84%) Nigeria (33/0.80%) Guinea (8/0.2%)
Political references (88/2.05%)	Obama (68/1.58%) Julie Bishop (7/0.16%) Critical of governments (13/0.30%)
Humor or Sarcasm (1046/24.41%)	Sarcasm (425/9.9%) Humor (418/9.8%) Zombies (77/1.8%) Zombie apocalypse (18/0.42%) Ebola used as an insult (108/2.52%)

3.3 Comparison of Cases

Fig. 1 provides an overview of the similarities and differences of the outbreak.

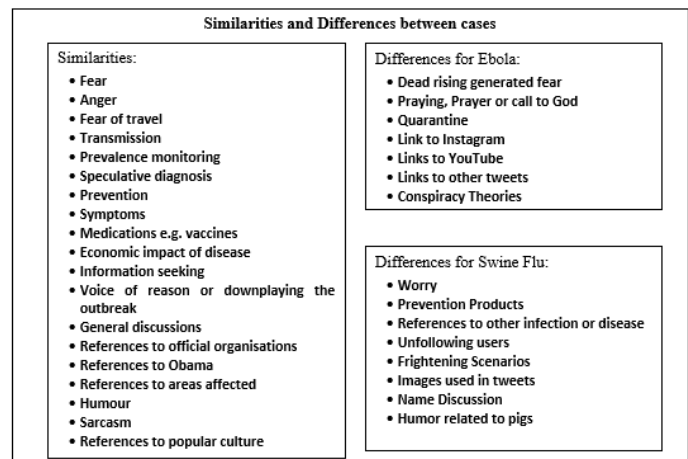


Figure 1: Similarities and Differences of Cases

There was overlap across the cases for the theme of emotion and feeling. For instance, it can be seen that all cases resulted in Twitter users expressing intense fear towards each of the outbreaks. Moreover, the comparison highlights how both cases of swine flu and Ebola had a specific sub-theme entitled “fear of travel”. There were similarities in both cases where Twitter users were unsure of whether they should travel internationally. In both cases, it was also found that there were a small number of Twitter users who were speculatively diagnosing themselves. For swine flu, Twitter users would talk about diagnosis in general terms. In the case of Ebola, many tweets surrounded the concept of quarantine. For swine flu, Twitter users drew parallels with previous outbreaks, whereas with Ebola these comparisons were not observed. Users might have been more familiar with the swine flu outbreak, since it had occurred previously in the West.

3.5 Moral Panic

Based on the empirical and theoretical exposition above, it could be argued that during the peak of the Ebola and swine flu, outbreaks a moral panic was underway, and Twitter users were caught up in this. The tweets from the fear theme can be used in support of this argument. In fact, there appeared to be an exaggerated fear from Twitter users across all of the themes, particularly in the discussions surrounding the possibility of patients rising from the dead, and of the potential of a zombie apocalypse. This reaction on Twitter coupled with increased media attention surrounding the outbreak could be argued to express a moral panic. Another defining factor of moral panic is the exaggeration of an episode by mass media, and in the outbreaks of swine flu and Ebola, there were articles shared on Twitter that appeared to sensationalise the outbreaks. Looking back now at the outbreaks, sometime after they have occurred, it is easy to say that Twitter users, the

general public, and the media might have over-reacted, but at the time, reactions were seen as appropriate in order to make people aware, and as they became aware, of a potential global threat. Moreover, it must be noted that social media as a platform in general may work to inflame fears on any range of events.

3.5 Limitations and Suggestions for Further Research

The study examined two-day time intervals from when there was heightened interest surrounding swine flu, and Ebola, therefore, there could be limitations in the conclusions that were drawn from the data. This study concentrated on examining tweets in English, and therefore it is not a complete record of all users that were tweeting about the outbreaks as other languages were not considered. It may appear that the number of tweets in the fear category were low, however, tweets across a number of themes appeared to contain an element of fear to support our assertion that a moral panic was underway. Another related limitation is that the study may not have retrieved all data from Twitter related to the outbreaks because certain users may have been talking about the outbreaks without mentioning them. The study analysed tweet content and did not categorize and/or analyse images or videos in tweets. Previous work has discussed ethics in relation to Twitter, and analysed tweets on health awareness days as well as the Ebola virus, which could provide further comparison avenues [26, 27, 28].

4 CONCLUSIONS

Social media platforms can be argued to be just as influential as conventional media [29]. Our study developed new insight into how users respond during infectious disease outbreaks reflects on users' response in association with the sociological concept of the moral panic.

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