Mapping the Anti-Vaccination Debate in Italy

Alessandro Cossard, Gianmarco De Francisci Morales, Yelena Mejova, Daniela Paolotti

ISI Foundation, Turin, Italy

Keywords: misinformation, vaccination, polarization, social media, Twitter

According to the WHO, in the span between November 2017 and October 2018, Italy experienced 2552 cases of measles [1], after which Italy's Health Ministry announced a measles prevention plan that would keep obligatory vaccinations in place for children between the ages of up to 16 [4]. Anti-vaccination sentiment has been pointed to as an important driver behind the epidemic, with prominent political figures openly expressing scepticism over the need and efficacy of vaccinations [2]. Social media is an important gateway for Italian population to receive such messaging, as well as a way to participate in the debate. In this study, we map the Twitter discourse around vaccinations in Italy in order to (i) discover the structure of the conversation, (ii) find most central figures setting the agenda, (iii) determine the properties of the most successful content, and (iv), detect people as yet undecided about the matter, in order to target them for a possible intervention.

The data was collected using Twitter Streaming API beginning in August 2018 using the following Italian keywords: *vaccini, vaccinazioni, vaccinazioni obbligatorie, vaccinazioni scuola, vaccinazioni legge lorenzin, immunodepressi scuola vaccini*. The results presented here span the period of August 2018 to December 2018, but the collection is ongoing. Following network-based controversy analysis developed in [3], we compose a 2-threshold retweet network between the users. Note that retweets are often assumed to be in agreement with original content, unlike replies which can comment and potentially disagree with it. The network was then passed to METIS, a graph partitioning package [5]. We partition the graph repeatedly for N=100 times with different random seeds to get an ensemble of partition assignments for each node, and use the average partition assignment for each node across the N repetitions as a polarity score. By optimizing the number of users with a score within a 95% confidence interval from either extreme (0 and 1), we find the optimal proportion of two sides to be 1.00:1.54 (that is, one side is 54% larger than the other). Colored using METIS scores, the network can be seen in Figure 1, consisting of 12,786 nodes and 39,202 edges. Upon manual examination of a selection of nodes, we find the red to be anti-vaccination stance and green pro-vaccination.

The network (displayed using force-directed Yifan Hu layout) is clearly separated into two factions, with pro-vaccination side about twice as large (at 62% of all nodes in GCC) as anti-vaccination (34%). The most prominent accounts on the pro-vaccination are RobertoBurioni, an Italian scientist, Professor at the San Raffaele University in Milan, who has 80k followers (tweeting about 4.7 times a day), as well as matteorenzi (Matteo Renzi), ex prime minister of Italy who supports mandatory vaccination (with 2.3 tweets per day). Interestingly, not all central figures are scientists and politicians: catirafaella is a 17 year old vocal in her support of Matteo Renzi. On the anti-vaccination side, central accounts include EuroMasochismo, PaoloZenga, and Mr_Ozymandias who are prolific content producers, posting 12.7, 30.3, and 55.2 tweets per day, respectively. EuroMasochismo is a satirical page, and together with PaoloZenga they claim to have no medical credentials, whereas Mr_Ozymandias claims to be "disobedient chemist for love" (a reference to a common anti-vax slogan).

Figure 1: Retweet network, colored by side as determined using METIS: green is pro-vaccination, red is vaccination-skeptic.

Preliminary content analysis reveals a large portion of most retweeted content being of satirical or cynical nature, promising to be difficult for standard Natural Language Processing. We are thus focusing on hashtag analytics, URL citations, and content propagation properties.

The study is ongoing to determine the best technique for identifying undecided but interested users, and most effective communication strategies for reaching them.

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