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Zika vaccine misconceptions: A social media analysis

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Development of the Zika virus vaccine is in its early stages, but there is already cause for concern regarding the success of the eventual vaccination campaign. Evidence suggests the public is skeptical of the development and approval process for vaccines. Extreme media attention, which Zika has already received, can make people concerned about both the disease and the vaccine. We need only look back to the 2009–2010 H1N1 pandemic to find vaccine similar skepticism [1].

Uncertainty regarding the origin, transmission and health consequences of the Zika virus has created a fertile environment for conspiracy theories and pseudo-scientific claims. These theories emerged in social media, an active forum for the vaccine refusal community [2], and have made their way to the mainstream media (e.g. “Brazil State Bans Pesticide After Zika Claim” in The Wall Street Journal). In the time it takes to develop a vaccine, these claims have the potential to become entrenched, increasing the likelihood people will refuse a Zika vaccine. Physicians and public health officials must begin to address patient concerns and debunk nonscientific claims now.

We characterized these claims through an analysis of Twitter messages (tweets) using big data computational techniques [3]. We identified 138,513 Twitter messages from January 1 to April 29, 2016 that contained both vaccine keywords and a reference to Zika. Fig. 1 shows a rapid rise in the number of Zika vaccine tweets in recent weeks, coinciding with increased media attention around the outbreak.

We then identified which of these tweets mentioned pseudo-scientific claims using a supervised machine learning technique. Fig. 1 shows a rapid rise in tweets associated with pseudo-scientific claims coincides with overall interest increases, which suggests that people quickly subscribe to these theories, many months to years before a vaccine is even ready.

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Furthermore, the leading pseudo-scientific claims build on existing narratives, making them more persuasive because they appear to reinforce and confirm already-held beliefs. Consider the two most prominent theories: First, Monsanto, ranked as the “third most-hated company in America,” has been previously accused of such things as poisoning the environment and threatening farmers [4]. Thus, the story that it is not the Zika virus, but pyriproxyfen, a mosquito larvicide allegedly made by Monsanto, that led to microcephaly among infants, was readily believable to people who already view Monsanto negatively. (Monsanto does not make the larvicide in question, nor has evidence linked larvicide to the microcephaly cases). In a second prominent meme, microcephaly is attributed to side effects of existing vaccines, such as MMR or Tdap and the desire of pharmaceutical companies to profit from blaming the Zika virus, thereby creating an opportunity to sell new Zika virus vaccines. This theory conforms to existing narratives that claim vaccines have dangerous side effects and pharmaceutical companies use them to bolster profits.

In addition to fitting existing narratives, these pseudo-scientific claims are being advanced by existing vaccine skeptic communities. For users who tweeted a pseudo-scientific vaccine claim, we examined their 2015 tweets for English language anti-vaccine mentions. 86% of these users tweeted about vaccines in 2015, and at least 19% of users tweeted an anti-vaccine message. While many in the public health and medical community view these sources as lacking credibility, they have been successful in advancing such tropes in the past, contributing to lower vaccination rates, infectious disease outbreaks such as the 2014–2015 Disneyland measles outbreak [5], and widespread concerns about vaccine safety. More troubling is that mainstream media sources are sharing many of these pseudo-scientific claims without examining the evidence behind them.

Years of research in communication and psychology show that opinion change is much more challenging than opinion formation [6]. In other words, once people believe something, it is difficult to dissuade them. Public health officials must get out in front of the conspiracy theorists to educate and influence the population now. Research must assess subgroups of the population to determine their varying cognitive decision-making styles about vaccination, in order to appropriately target messages that will resonate with each group, rather than a one-size-fits-all approach [7]. As we rapidly allocate funds for vaccine development, we should ensure that we prepare the public for a successful vaccine campaign.

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Fig. 1.

The number of Zika vaccine tweets and tweets with pseudo-scientific claims coincides about the Zika vaccine for 7 day periods for the first 120 days of 2016.