

Vaccine Information and Sentiment Over Space and Time

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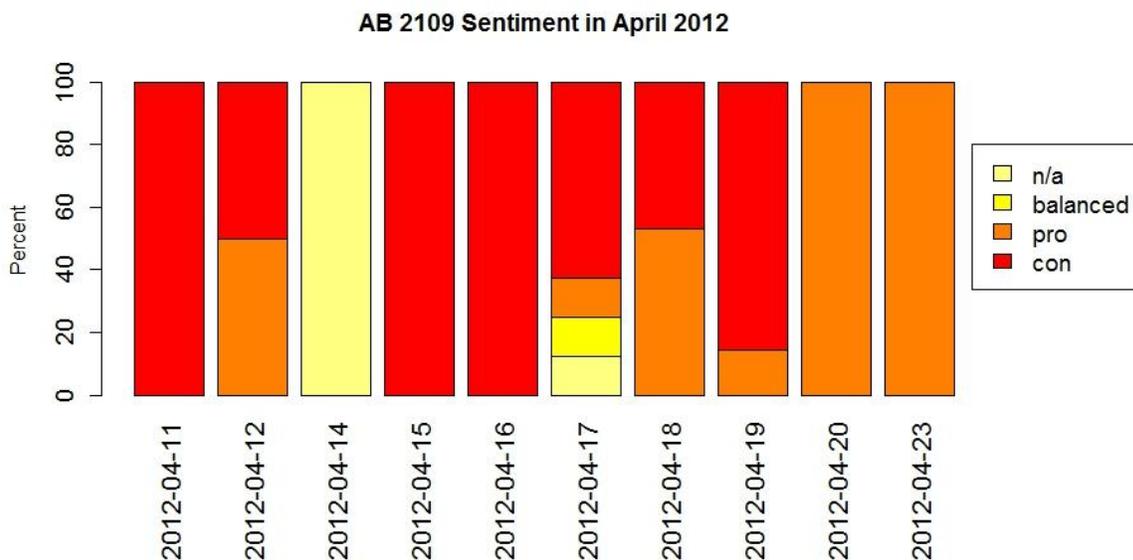
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In the early 20th century, infectious diseases were responsible for a large portion of morbidity and mortality experienced in the United States. Since the early 1900's, over 20 vaccines have been developed and the number of cases and deaths associated with vaccine preventable diseases has decreased substantially (Centers for Disease Control and Prevention). However, in recent decades some vaccine preventable diseases have reemerged, largely due to decreasing immunization rates. One notable example is the San Diego measles outbreak in early 2008, where an unvaccinated seven year old became infected with measles in Switzerland and upon returning to San Diego spread the disease to 11 other unvaccinated children (Centers for Disease Control and Prevention).

Radical ideas and misinformation on vaccines have deterred some people from becoming immunized and immunizing their children leading to the reemergence of vaccine preventable diseases. Understanding the spread of vaccine related information in space and time can be useful in guiding prevention and intervention efforts based on the public's perception of vaccines, the publication of vaccine related information, and outbreaks of vaccine preventable diseases.

We employ several methods for tracking the distribution of vaccine related information geographically and temporally. One such method maps the IP addresses of websites found by searching vaccine related keywords in a search engine. In this sense we can determine where the most influential (most visited) website contents are created. We are interested in where information is being created as well as how the flow of information changes in relation to real world events. For instance, in June the Advisory Committee on Immunization Practices (ACIP) will meet to discuss new vaccine recommendations. Among other topics, a discussion will be held on the use of pneumococcal vaccines in immunocompromised adults. The vaccine, PCV13 in particular, was previously only used in children. We expect content published on this topic to increase after the issue is voted on, especially if the decision is to recommend the vaccine in this population.

Another important component of our research is the public's sentiment in regards to the chosen keywords. One method that incorporates the user's sentiment is analyzing Twitter results. A controversial issue currently in California legislature is a bill that, if passed, will alter the requirements for a parent to claim a personal belief exemption and thus exclude their children from adhering to school entry immunization requirements. AB 2109 would require parents to first meet with a physician to discuss the risks and benefits of vaccines. Using Twitter results we can determine overall sentiment towards the bill in the Twitter community and how sentiment changes overtime, more specifically in relation to the bill's status in California legislature. The figure below indicates how sentiment on Twitter changed from mostly anti-AB 2109 (red bars) to mostly pro-AB 2109 (orange bars) as the bill was passed to various committees. A vote took place on April 17th and then the bill was referred on April 19th, the figure illustrates how the transition in sentiment occurs during these dates.



Real world events affect the distribution of vaccine related information and sentiment over space and time. In addition to immunization related legislature and ACIP meetings, real world events of interest include outbreaks and seasonal occurrences of vaccine preventable diseases. We expect vaccine related information and Twitter traffic to increase around some of these real world events. In terms of outbreaks, whooping cough is at epidemic proportions in Washington state with more than ten times as many cases compared to last year as of June 2012 (Washington Department of Health). Investigation is in progress to determine if more information on whooping cough is being produced in the US and specifically in Washington state. We will also analyze tweets to determine attitudes associated with this vaccine preventable disease and if the sentiment has changed since the epidemic.