

The Impact of Social Media on Vaccine-Related Legislation Following Measles Outbreaks



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Abstract

Introduction: Vaccine exemptions are on the rise in many states. Exemptions to vaccine requirements can lead to a breakdown in herd immunity, allowing viruses like measles to propagate easily through a population. In response to recent measles outbreaks, many states have passed vaccine-related legislation.

Methods: This study seeks to describe the discourse on social media related to state's vaccine-related legislation, and how it may influence the policy cycle. Specifically, social media data were retrospectively collected from four states: California, New York, Arizona and Texas to understand the interplay between public discourse on X and the outcome of each bill. Analyses were performed to determine if sentiment can be used to predict recent vaccine-related legislation and how legislators interact with the general public via X.

Results: Sentiment analysis on discussion of vaccine-related legislation during the specified policy window, and a chi-squared analysis revealed that public sentiment as measured on X was not related to the outcome of the proposed legislation.

Discussion: It seems that X is not a platform that influences the policy cycle regarding vaccine-related legislation, particularly the formulation stage where stakeholders can communicate alternative solutions

Conclusion: While public sentiment on X does not seem to influence the outcome of vaccine-related legislation, it is interesting to further explore what actions *can* be taken by the general public that will substantially influence the outcome of legislation important to stakeholders.

Keywords: vaccines; vaccine-related legislation; public health policy; sentiment analysis; X; measles

Introduction

Billions of people have turned to social media as a platform to communicate and gain information about various topics. It is therefore imperative to study how platforms like Facebook, X (formerly known as Twitter), and YouTube have altered the discourse and decisions among the health and political sectors [1, 2]. Many health-related studies have focused on the ways social media can be used to monitor public opinion [3–6], set the public agenda [7–10], improve civic engagement [11–15], and disseminate information to political actors [4, 16]. Social media are quickly becoming main avenues for U.S. citizens to voice their favor or opposition to government actions [2]. U.S. citizens rely on the government to assure healthy conditions, assess which diseases and/or adverse health-related events are affecting the population, and implement policies that will minimize health risks and maximize desirable health outcomes through public health efforts [17]. However, social media have given the public an opportunity to be more involved with health issues [18, 19]

and legislation [5, 11]. One health topic that has received increased attention is state-mandated vaccination. According to the World Health Organization (WHO), vaccine hesitancy is a leading global threat [20]. Even after decades of existence and success, skepticism continues to surround the terms “vaccine,” “vaccination,” and “immunization.” After Andrew Wakefield published a paper in *The Lancet* connecting the MMR vaccine to autism in 1998, the movement against vaccination spread rapidly all over the world [21]; the paper was later found to harbor serious flaws and was retracted, but the seeds of doubt sowed have continued to be watered. Thus, the anti-vaccination movement has continued to grow.

Along with the fear of autism, other factors such as religious beliefs, distrust of government, and fear of rare adverse side effects have also perpetuated the anti-vaccination movement. Many of the individuals in this movement take advantage of state-allowed vaccine exemptions, which allow people to opt out of obtaining recommended vaccines. However, as the movement grows

and exemptions rise, measles resurgence rates seem to surge as well [21].

Because of the rises in measles cases and vaccine exemptions, many states have proposed bills that alter government requirements for vaccines. Some state lawmakers have proposed “pro-vaccine” bills aimed to make government requirements stricter while others have proposed “anti-vaccine” bills aimed to make vaccine exemptions easier to obtain. In response, individuals and organizations have turned to social media to target lawmakers and voice their opinions and concerns about state vaccine requirements [2].

Social media offers easily accessible platforms where the public can communicate with lawmakers and vice versa [5, 11, 13–15, 22]. Lawmakers can campaign for proposed bills, and constituents can express their opinions about said bills. When both groups capitalize on this opportunity for dialogue, trust and transparency can be built between the two. The platform X has been recognized for this role, specifically in the realm of electoral campaigns [2, 11, 22]. For example, Ceron et al. [6] reported the possibility of using X discourse as a supplement to traditional polling methods. Not much research, however, has been done to study the influence of social media discourse on other arenas of politics outside of elections. Therefore, the purpose of this study was to describe the discourse on social media related to state vaccine-legislation, and how it may influence the policy cycle.

Sentiment toward vaccination as a whole on X is varied. Some have found the discussion on vaccines to be positive, while others have found the opposite [19, 23]. Keim-Malpass et al. [4] concluded that the discourse surrounding vaccines on X was overwhelmingly polarized. Nonetheless, the ability for both sides to be represented on this platform shows how it can be used for democratic purposes. Furthermore, because public sentiment on vaccination can strongly affect individual vaccination opinions and decisions [24], it is of utmost importance to understand what the public sentiment toward vaccines is.

The opportune time for dialogue between lawmakers and constituents typically arises after an event or uprising of public concern. This sometimes unpredictable onset is considered the opening of the “policy window,” a time in which the legislative process begins and advocates can draw attention to specific problems and offer solutions [25]. In current times, X is a major area where discourse during a policy window can occur.

Policy windows in this study will be described in a manner similar to the window that occurred in 2014 after a measles outbreak at Disneyland in California. This outbreak served as the event that opened the policy window for SB277, a policy that proposed removing personal belief exemptions from the state. The outbreak spurred discussion about vaccines and vaccine exemptions entering 2015. By February 2015, lawmakers had proposed SB 277, which was eventually signed by the California governor [26].

Events such as the above-mentioned outbreak can initiate the policy cycle: agenda setting, policy formulation, policy adoption, implementation, and evaluation.

To describe the discourse on social media related to state legislation, and how it may influence the policy cycle, retrospective X data was collected during the formulation stage of four states’ vaccination-related bills: SB 277 (CA), S2994A (NY), HB 2470-72 (AZ), and HB 1490 (TX). The formulation stage was selected to determine if public discourse and sentiment altered the policy outcomes and how lawmakers participated in dialogue on X with the public, because this stage of the policy cycle is theoretically when politicians would be weighing the different legislative options to address the issue that is the target of the proposed legislation; we postulate that input from constituents would be most impactful to the politicians’ decision regarding their stance on proposed legislation during the formulation stage. Research has determined that social media can influence the agenda setting stage; however, their influence in later stages is under explored. Seeing as how the formulation stage is when stakeholders are considered, it would seem reasonable that policy makers be mindful and active in engaging citizens at this state in policy development. Thus, the following research questions guided the study:

1. What is the sentiment toward the vaccine-related legislation during the formulation stage of the policy cycle?
2. Is there a statistically significant relationship between public sentiment on X and the proposed bill(s) outcome?

Methods

Four states including California, New York, Arizona, and Texas proposed vaccine-related legislation and were used as case studies for this study. X (formerly known as Twitter) was the preferred social media platform to collect and analyze public discourse and sentiment. It provides an easy way for people in various states to communicate with politicians and share their support or opposition for legislation. Additionally, X still allows access to posts with anti-vaxx content, unlike other social media platforms [27]. Therefore, X’s advanced search tool was used to retroactively collect posts regarding SB 277 in California, S2994A in New York, HB 2470, HB 2471, and HB 2472 in Arizona, and HB 1490 in Texas.

SB 277 in California

In December of 2014, a measles outbreak in the Disneyland amusement park in Anaheim, California extended into 2015 with an estimated 125 cases [28]. It is suspected that an imported case (i.e. someone who contracted the virus in another country and was infectious upon return to the U.S.) initiated the outbreak and that low vaccination rates in California and among other visitors in the park allowed the disease to run rampant. In response,

California passed a senate bill, SB 277, to remove ‘personal belief’ as a reason for vaccine exemption [29] with the goal of improving vaccination rates in the state. SB 277 was chosen for this study because the Disneyland outbreak was the first measles outbreak in the 21st century that led a state to change its vaccination regulations.

S2994A in New York

In October of 2018, another measles outbreak began in Brooklyn, Queens, and the virus ran rampant through some of the unvaccinated Jewish communities in the area [30]. This was the largest measles outbreak New York City had experienced in nearly three decades, and it ultimately led the U.S. to have the most cases it has had since measles was declared eradicated in 2000 [31]. On June 13, 2019, in an effort to improve vaccine uptake, New York passed S2994A and removed religious exemptions for the state [32]. S2994A was chosen for this study because the New York outbreak was ongoing at the start of this study and because it resulted in the highest case numbers of measles since eradication.

HB 2470, HB 2471, and HB 2472 in Arizona

Unlike for California and New York, no measles outbreaks in Arizona were identified that prompted the proposal of vaccine-related legislation, but it likely entered a policy window in response to vaccine-related legislation being considered in other states. Contrary to the pro-vaccine bills proposed in California and New York, Arizona lawmakers proposed a package of three anti-vaccine bills in February of 2019: HB 2470, HB 2471, and HB 2472. HB 2470 would have added religious exemptions to the state because Arizona currently only allows personal belief exemptions [33]. HB 2470 also would have eliminated the requirement for parents to fill out an exemption form that informed them of potential consequences of not vaccinating their children [33]. The second bill, HB 2471, would have required medical providers to give extensive information about vaccines to parents [34], and the third, HB 2472, would have given patients the option for an antibody titer test to see whether the individual had developed antibodies to vaccine preventable diseases [35]. None of the three ever made it past the Arizona State House, nor were they signed by the Arizona governor or adopted. Nevertheless, these three Arizona bills were chosen for this study because researchers wanted to assess sentiment on social media for both pro-vaccine and anti-vaccine bills.

HB 1490 in Texas

Like Arizona, Texas did not propose vaccine-related legislation in response to measles outbreaks in the state. In February 2019, Texas legislators proposed an anti-vaccine bill, HB 1490, that sought to make obtaining exemptions easier. Currently, if Texas parents choose to exempt their children from vaccinations for personal or religious reasons, they must submit a notarized affidavit form that is valid for a two-year period [36]. HB 1490 sought to make the affidavit form more easily accessible on the Texas Department of State Health’s website and in all public schools, without the official seal [37]. If passed, HB 1490 would have potentially increased non-medical exemptions within the state of Texas by making them easier to obtain. However, HB 1490 died in the Public Health Committee, and there were no changes made to the vaccine-related legislation in Texas.

Population & Sample

The sample for this study was obtained by using the X advanced search tool to identify social media content related to each bill with specific filtered results. The search was geared towards posts that specifically contained the name of the bill and that also contained any of the following words: “measles,” “vaccine,” “vaccines,” “exemption,” “exemptions,” “anti-vaxx,” and “anti-vaccine.” Researchers also searched two variants of the names of each bill. For example, “SB277” and “SB 277” were both searched and yielded different results; some X users utilized the name of the bill with continuous letters and others with a space in between. The advanced search tool also allowed the researchers to specifically retrospectively search for posts within modified time frames. Data was not collected during the bills’ actual policy windows because policy windows include a time period before the introduction of the bills; this research wanted to look at posts specific to the bills. Therefore, at the start of the policy window, there were no posts referencing the bill(s) of interest (because bills had not yet been introduced). Instead, researchers gathered X data during modified time frames; the modified time frame for each bill started on the date when the bill was first introduced and ended when a decision was made on the bill, as shown in [Table 1](#). The search results yielded a total of 387 posts for the sample analysis. The posts selected for the California bill yielded the largest sample size ($n = 201$), followed by the New York bill ($n = 118$), then the Arizona bills ($n = 60$), and lastly, the Texas bill ($n = 8$).

Table 1. Modified Time Frames for Each Bill

	S2994A (NY)	SB 277 (CA)	HB 2470/HB 2471/HB 2472 (AZ)	HB 1490 (TX)
When bill was proposed	January 22, 2019	February 19, 2015	February 4, 2019	February 7, 2019
When bill was decided on (pass, fail, died)	June 30, 2019	June 30, 2015	February 26, 2019	February 27, 2019

Coding Procedure

To analyze the data, a code book was developed, which allowed the researchers to categorize the variables of interest (see Supplemental Materials for code book). Sentiment was coded as ‘positive,’ ‘negative,’ ‘neutral,’ or ‘uncertain’ and was coded based on the sentiment toward the proposed bill. For example, one post stated, “I hope to see you fight for your constituents rights and oppose S2994a” was coded as a ‘two’ for negative sentiment toward the New York bill. It is of note that sentiment was

coded for the sentiment towards the bill itself, not the pro-vaccine or anti-vaccine nature of the bill. Following the guidelines set by Lombard et al. [38], ten percent of the total sample was coded by two researchers to ensure the level of intercoder agreement for each variable was at least .70. Intercoder agreement was acceptable for each variable (see [Table 2](#) for agreement of each variable), and disagreements were addressed between the two researchers. Necessary changes were implemented prior to coding the remaining sample.

Table 2. Intercoder Reliability of All Variables, as Described by Lombard et al. [38]

Variable	Precent agreement (%)	Krippendorff's alpha
Content	95%	.92
Source	95%	.92
Post Type	100%	1.00
Sentiment	87%	.79

Results

The purpose of this study was to describe the discourse on social media related to SB 277 (CA), S2994A (NY), HB 2470/HB 2471/HB 2472 (AZ), and HB 1490 (TX), and how it may influence the policy cycle. To accomplish this purpose, descriptive statistics were used to analyze the data related to research questions one, and a chi square test was performed to assess research question two.

To answer research question one, which sought to determine the sentiment toward the proposed bill(s) on X, descriptive analyses were performed. The sentiment analysis for each bill is described below ([Table 3](#)). For California SB 277, 201 posts were sampled. Of these, 31 (15.4%) were in favor of SB 277, 99 (49.3%) were against, 46 (22.9%) were neutral, and 25 (12.4%) were unclear ([Table 3A](#)).

For the New York bill S2994A, 118 posts and replies were collected. Majority ($n = 71, 60.2\%$) of the posts and replies were against the bill, 28 (23.7%) were in favor of S2994A, 0 (0%) were neutral, and 19 (16.1%) were unclear ([Table 3B](#)).

In Arizona, three bills, HB 2470, HB 2471, and HB 2472 were collected and analyzed together because it was not uncommon for people to post about them together. Out of 60 posts sampled, 11 (18.3%) were in favor of the three bills, 29 (48.3%) were against, 11 (18.3%) were neutral, and 9 (15%) were unclear ([Table 3C](#)).

In Texas, only eight posts and replies were included in the sample. A majority ($n = 6, 75\%$) of them were against the bill, 0 (0%) were in favor of HB 1490, 2 (25%) were neutral, and 0 (0%) were unclear ([Table 3D](#)).

Table 3. Sentiment Analysis for SB277 (CA) (3A), S2994A (NY) (3B), HB 2470, HB 2471, and HB 2472 (AZ) (3C), and HB 1490 (TX) (3D)

Table 3A. Description of Posts According to Sentiment for SB277 (CA) (n = 201)

Sentiment	Frequency	Percent (%)
For SB 277	31	15.4
Against SB 277	99	49.3
Neutral	46	22.9
Not Clear	25	12.4
Total	201	100

Table 3B. Description of Posts According to Sentiment for S2994A (NY) (n = 118)

Sentiment	Frequency	Percent (%)
For S2994A	28	23.7
Against SB 277	71	60.2
Neutral	0	0
Not Clear	19	16.1
Total	118	100

Table 3C. Description of Posts According to Sentiment for HB 2470, HB 2471, HB 2472 (AZ) (n = 60)

Sentiment	Frequency	Percent (%)
For the bills	11	18.3
Against the bills	29	48.3
Neutral	11	18.3
Not Clear	9	15
Total	60	100

Table 3D. Description of Posts According to Sentiment for HB 1490 (TX) (n = 8)

Sentiment	Frequency	Percent (%)
For HB 1490	0	0
Against HB 1490	6	75
Neutral	2	25
Not Clear	0	0
Total	8	100

To answer research question two and determine whether there was a significant relationship between public sentiment on X and the proposed bill(s) outcome, a chi-square analysis was conducted. The results for sentiment predicting the outcome of vaccine-related legislation did not reveal a significant test statistic, ($\chi^2(2) = 1.007, p = 0.60, \Phi = .06$). Therefore, sentiment via the social media platform X was not related to the outcome of vaccine-related legislation. Statistically, the results reveal that the decisions made regarding SB 277 (CA), S2994A (NY), HB 2470/ HB 2471/ HB 2472 (AZ), and HB 1490 (TX) were not made in response to, or in accordance with, the X discussion during the modified time frames for the bills.

Discussion

Research question one sought to assess the sentiment of the posts towards the bills of interest. Through our data collection, we were able to identify posts about proposed legislation during the policy window for four proposed bills in Texas (HB 1490), California (SB 277), Arizona (HB 2470/HB 2471/HB 2472), and New York (S2994A). In our dataset, we had highly variable numbers of posts identified and evaluated through our methodology, ranging from 8 posts for Texas (HB 1490) to 201 posts for California (SB277). This may be due to numerous factors, including differences in the time allotted for each investigated policy window and general interest and engagements about these proposed bills on social media or otherwise. For bills with fewer posts to evaluate (chiefly Texas and Arizona), there are questions about representativeness of our dataset, and therefore the results of our study should be widely generalized with caution.

For each of the four bills, the majority of the discussion on X was in opposition of the bill; our analysis suggests that people who actively post on X about vaccines and vaccine-related legislation are those that are against them. This is counter to the findings from previous research [19,

23] that found more positive vaccine-related discourse on X. However, given the nature of our study, we rated sentiment based on the proposed legislation, thus the results cannot be directly compared without further interpretation. Negative sentiment toward the bills in California and New York would translate into negative vaccine-related discourse ($n = 170, 53.3\%$), whereas positive sentiment toward the bills in Texas and Arizona would be negative vaccine-related discourse ($n = 11, 12.2\%$). Taken together, there was more negative general sentiment toward vaccines ($n = 181, 46.8\%$) than positive ($n = 59, 15.2\%$). Additionally, there was more negative sentiment toward legislation in general ($n = 205, 53.0\%$) than positive ($n = 70, 18.1\%$). Given that public sentiment can strongly affect individual vaccination opinions [24], the results imply that for individuals obtaining information on X, discourse could lead to negative opinions toward vaccines. Perhaps there are more people and organizations who are in favor of vaccines, but such individuals did not appear as active or outspoken in our analysis. One study has found that negative posts elicit more attention than positive ones [39]. Another study stated that aggression towards actors of public interest, including lawmakers, is an increasing phenomenon [40]. Considering those two claims, it is not surprising that the majority of the posts we collected were negative (i.e. in opposition of the bill of interest, regardless of the nature of the legislation proposed).

It's interesting to note that the two pro-vaccine bills, SB 277(CA) and S2994A (NY), were proposed in politically blue (democratic) states and both passed. However, the two anti-vaccine bills, HB 2470/HB 2471/HB 2472 (AZ) and HB 1490 (TX), were proposed in politically red (republican) states and neither passed. This suggests that state governments, regardless of political party affiliation and regardless of public sentiment on social media, tend to support pro-vaccine legislation.

According to the chi-square analysis conducted on our data set (evaluating research question 2), sentiment on

social media does not appear to be associated with the outcome of vaccine-related legislation in our dataset. The posts do not align with the decisions that were eventually made with the four bills, regardless of the pro- or anti-vaccine nature of the bill. Although two were pro-vaccine and two were anti-vaccine, the majority of the discussion for all of them, as previously mentioned, was negative and in opposition, supporting the conclusion that no matter what's being proposed or in what context (position of the bill, political leanings of the state, etc.), people prefer to voice negative opinions more often rather than positive ones on X. Other studies, previously cited, indicate this as well [39, 40]. It seems that X is not a platform that influences the policy cycle regarding vaccine-related legislation, particularly the formulation stage where stakeholders can communicate alternative solutions [25, 41]. Despite Cernon and Negri's [5] claim that social media can influence the formulation stage, our results align with results from Stier et al. [41] where legislators seem to be the primary influence in policy debates and implementation. To further elucidate the impact of social media related discourse on the outcomes of vaccine related legislation, additional studies with larger datasets should be conducted.

Despite the fact that our results refute our initial hypothesis, it is still useful to know that sentiment on X does not appear to be influencing the outcome of vaccine-related legislation. One study noted that publication of negative data helps enhance progress in academia by stopping further investment in scientifically barren topics and focuses research in more fruitful areas [42]. Knowing that sentiment is not influencing the lawmaking process when it comes to vaccine-related legislation can be of value to politicians, interest groups, and researchers alike.

If it is true that individual engagement with politicians and proposed legislation on social media platforms like X does not seem to correlate the outcomes of the legislation (at least in this dataset), general engagement about policy on social media could still play a part in sentiment and attitudes about general topics from both individuals and politicians, even if the discourse does not seem to change the outcomes of specific proposed bills directly. Studies suggest that individuals engage with social media around shared ideas, organize and convey information about activism. These activities could have cascading, downstream affects on legislative outcomes, even if discourse about a proposed bill is not directly impacted by social media discourse and engagement [43].

Conclusions

If public sentiment on social media is not influencing the types of legislation considered by state governments, then what is? Citizens of the U.S. rely on lawmakers to make decisions that are in the best interest of the people and to listen to their voices, but our research suggests that those concerns, when expressed on social media platforms such

as X, are not of utmost priority to state politicians. An interesting future study would be to determine what actually *is* influencing legislation. Potential avenues to explore that might impact more effectively impact legislation outcomes could be rallies, phone calls, or emails directly to the politicians' offices. It is also a possibility that lawmakers are not taking the interests of the people into consideration at all and that their incentives to propose bills are fed by other outlets. If lawmakers do not use social media to assess public sentiment about vaccines, then the outcome intended from the vaccine misinformation limitation policies that were adopted by Facebook, YouTube, and Pinterest may not be to influence policy, but might serve another purpose?

List of Abbreviations

WHO: World Health Organization

Conflicts of Interest

The authors declare that they have no conflict of interests.

Ethics Approval and/or Participant Consent

Not applicable.

Authors' Contributions

CG: made substantial contributions to the design of the study, the collection of data as well as interpretation and analysis of the data, revised the manuscript critically, and gave final approval of the version to be published.

EB: made substantial contributions to the analysis of the data, revised the manuscript critically, and gave final approval of the version to be published.

AM: made substantial contributions to the design of the study, the collection of data as well as interpretation and analysis of the data, revised the manuscript critically, and gave final approval of the version to be published.

ACS: made substantial contributions to the design of the study, revised the manuscript critically, and gave final approval of the version to be published.

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References

- [1] Kata A. Anti-vaccine activists, Web 2.0, and the postmodern paradigm—an overview of tactics and tropes used online by the anti-vaccination movement. *Vaccine*. 2012;30(25):3778–89. <https://doi.org/10.1016/j.vaccine.2011.11.112>
- [2] Wang H, Can D, Kazemzadeh A, Bar F, Narayanan S, editors. A system for real-time Twitter sentiment analysis

- of 2012 U.S. Presidential Election Cycle. In: Proceedings of the 2012 Conference; 2012 Jul; Jeju Island, Korea. Association for Computational Linguistics; 2012. Available from: <https://aclanthology.org/P12-3020.pdf>
- [3] Himelboim I, Xiao X, Lee DKL, Wang MY, Borah P. A social networks approach to understanding vaccine conversations on Twitter: network clusters, sentiment, and certainty in HPV social networks. *Health Commun.* 2020;35(5):607–15. <https://doi.org/10.1080/10410236.2019.1573446>
- [4] Keim-Malpass J, Mitchell EM, Sun E, Kennedy C. Using Twitter to understand public perceptions regarding the #HPV vaccine: opportunities for public health nurses to engage in social marketing. *Public Health Nurs.* 2017;34(4):316–23. <https://doi.org/10.1111/phn.12318>
- [5] Ceron A, Negri F. The “social side” of public policy: monitoring online public opinion and its mobilization during the policy cycle. *Policy Internet.* 2016;8(1):1–21. <https://doi.org/10.1002/poi3.117>
- [6] Ceron A, Curini L, Iacus SM, Porro G. Every tweet counts? How sentiment analysis of social media can improve our knowledge of citizens’ political preferences with an application to Italy and France. *New Media Soc.* 2014;16(2):340–58. <https://doi.org/10.1177/1461444813480466>
- [7] Jang SM, McKeever BW, McKeever R, Kim JK. From social media to mainstream news: the information flow of the vaccine-autism controversy in the US, Canada, and the UK. *Health Commun.* 2019;34(1):110–7. <https://doi.org/10.1080/10410236.2017.1384433>
- [8] Deschamps BRD. Policy agenda setting and Twitter: three cases from Canada [thesis]. Regina (SK): University of Regina; 2017. Available from: <https://uregina.scholaris.ca/server/api/core/bitstreams/0887b2f7-4468-4f17-b414-a372b64b3077/content>
- [9] Rogstad I. Is Twitter just rehashing? Intermedia agenda setting between Twitter and mainstream media. *J Inf Technol Polit.* 2016;13(2):142–58. <https://doi.org/10.1080/19331681.2016.1160263>
- [10] McNeill A, Harris PR, Briggs P. Twitter influence on UK vaccination and antiviral uptake during the 2009 H1N1 pandemic. *Front Public Health.* 2016;4:26. <https://doi.org/10.3389/fpubh.2016.00026>
- [11] Bonsón E, Perea-Khalifi D, Bednarova M. Twitter as a tool for citizen engagement: An empirical study of the Andalusian municipalities. *Gov Inf Q.* 2019;36(3):480–89. <https://doi.org/10.1016/j.giq.2019.03.001>
- [12] Santoso AD, Hidayah N, Rinjani DK, editors. Does the Government Hear Us? A Picture of Interaction between Netizen and Indonesian Local Government in Twitter. Atlantis Press; 2017 Nov. <https://doi.org/10.2991/icas-17.2017.4>
- [13] Reddick C, Chatfield A, Brajawidagda U. Increasing policy success through the use of social media cross-channels for citizen political engagement. 2017. <https://doi.org/10.24251/HICSS.2017.344>
- [14] Ferro E, Loukis E, Charalabidis Y, Osella M. Evaluating complex forms of social media use in government. Proceedings of the Nineteenth Americas Conference on Information Systems, Chicago, Illinois, August 15-17, 2013. Available from: https://www.icsd.aegean.gr/publication_files/650765956.pdf
- [15] Linders, D. (2012). From E-Government to We-Government: Defining a Typology for Citizen Coproduction in the Age of Social Media. *Government Information Quarterly*, 29, 446-454. <https://doi.org/10.1016/j.giq.2012.06.003>
- [16] Kapp JM, Hensel B, Schnoring KT. Is Twitter a forum for disseminating research to health policy makers? *Ann Epidemiol.* 2015;25(12):883–87. <https://doi.org/10.1016/j.annepidem.2015.09.002>
- [17] Friis RH. *Epidemiology* 101. 2nd ed. Burlington (MA): Jones & Bartlett Learning; 2018. ISBN-13: 978-1284107852
- [18] Blankenship EB, Goff ME, Yin J, Tse ZTH, Fu KW, Liang H, et al. Sentiment, contents, and retweets: A study of two vaccine-related Twitter datasets. *Perm J.* 2018;22:17-138. <https://doi.org/10.7812/tpp/17-138>
- [19] Puri N, Coomes EA, Haghbayan H, Gunaratne K. Social media and vaccine hesitancy: new updates for the era of COVID-19 and globalized infectious diseases. *Hum Vaccin Immunother.* 2020;16(11):2586–93. <https://doi.org/10.1080/21645515.2020.1780846>
- [20] World Health Organization. [Internet] Ten threats to global health in 2019. Geneva: WHO; 2019. [cited 2019 September 1] Available from: <https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019>
- [21] Hussain A, Ali S, Ahmed M, Hussain S. The anti-vaccination movement: a regression in modern medicine. *Cureus.* 2018;10(7):e2919. <https://doi.org/10.7759/cureus.2919>
- [22] Grover P, Kar AK, Dwivedi YK, Janssen M. Polarization and acculturation in US Election 2016 outcomes – Can twitter analytics predict changes in voting preferences. *Technol Forecast Soc Change.* 2019;145:438–60. <https://doi.org/10.1016/j.techfore.2019.05.021>
- [23] Massey PM, Leader A, Yom-Tov E, Budenz A, Fisher K, Klassen AC. Applying multiple data collection tools to quantify human papillomavirus vaccine communication on Twitter. *J Med Internet Res.* 2016;18(12):e318. <https://doi.org/10.2196/jmir.6547>
- [24] Salathé M, Khandelwal S. Assessing vaccination sentiments with online social media: implications for infectious disease dynamics and control. *PLoS Comput Biol.* 2011;7(10):e1002199. <https://doi.org/10.1371/journal.pcbi.1002199>

- [25] Anderson JE. Public policymaking. 8th ed. Boston (MA): Cengage Learning; 2018. ISBN-13: 9781305190115
- [26] California Legislative Information. [Internet] SB-277 Public health: vaccinations. Sacramento (CA): California State Senate; 2015. [cited 2019 September 1] Available from: https://leginfo.legislature.ca.gov/faces/billStatusClient.xhtml?bill_id=201520160SB277
- [27] Wong JC. [Internet] Facebook to ban anti-vaxx ads in new push against 'vaccine hoaxes'. The Guardian. 2019. [cited 2019 September 1] Available from: <https://www.theguardian.com>
- [28] Zipprich J, Winter K, Hacker JK, Xia D, Watt JP, Harriman KH. Measles outbreak — California, December 2014–February 2015. MMWR Morb Mortal Wkly Rep. 2015;64:153–4. <https://doi.org/10.15585/mmwr.mm6406a5>
- [29] Watts MM. California governor signs vaccine bill that bans personal, religious exemptions. [Internet] CNN. 2015. [cited 2019 September 1] Available from: <https://www.cnn.com/2015/06/30/health/california-vaccine-bill/index.html>
- [30] McDonald R, Ruppert P, Souto M, Johns D, McKay K, Bessette N, et al. Notes from the field: Measles outbreaks from imported cases in Orthodox Jewish communities — New York and New Jersey, 2018–2019. Am J Transplant. 2019;19(11):2131–3. <https://doi.org/10.1111/ajt.15414>
- [31] Centers for Disease Control and Prevention. [Internet] Measles cases and outbreaks. Atlanta (GA): CDC; 2020 [updated 2021 Nov 19]. [cited 2019 September 1] Available from: <https://www.cdc.gov/measles/cases-outbreaks.html>
- [32] New York State Senate. [Internet] S2994A. Albany (NY): NYS Senate; 2019. [cited 2019 September 1] Available from: <https://www.nysenate.gov/legislation/bills/2019/s2994>
- [33] Arizona Legislature. [Internet] Arizona House Bill 2470. Phoenix (AZ): Arizona Legislature; 2019. [cited 2019 September 1] Available from: <https://www.azleg.gov/legtext/54leg/1R/bills/HB2470P.pdf>
- [34] Arizona Legislature. [Internet] Arizona House Bill 2471. Phoenix (AZ): Arizona Legislature; 2019. [cited 2019 September 1] Available from: <https://www.azleg.gov/legtext/54leg/1R/bills/HB2471P.pdf>
- [35] Arizona Legislature. [Internet] Arizona House Bill 2472. Phoenix (AZ): Arizona Legislature; 2019. [cited 2019 September 1] Available from: <https://www.azleg.gov/legtext/54leg/1R/bills/HB2472P.pdf>
- [36] Cheng EB, S. [Internet] Some lawmakers want Texas to release vaccine opt-out rates for each school, not just for districts. The Texas Tribune. 2019. [cited 2019 April 29] Available from: <https://marshallnewsmessenger.com/2019/04/30/some-lawmakers-want-texas-to-release-vaccine-opt-out-rates-for-each-school-not-just-for-districts/>
- [37] Texas Legislature Online. [Internet] HB 1490. Austin (TX): Texas Legislature; 2019. [cited 2019 September 1] Available from: <https://capitol.texas.gov/BillLookup/History.aspx?LegSess=86R&Bill=HB1490>
- [38] Lombard M, Snyder-Duch J, Bracken CC. Content analysis in mass communication: assessment and reporting of intercoder reliability. Hum Commun Res. 2002;28(4):587–604. <https://doi.org/10.1111/j.1468-2958.2002.tb00826.x>
- [39] Kätsyri J, Kinnunen T, Kusumoto K, Oittinen P, Ravaja N. Negativity bias in media multitasking: the effects of negative social media messages on attention to television news broadcasts. PLoS One. 2016;11(5):e0153712. <https://doi.org/10.1371/journal.pone.0153712>
- [40] Rost K, Stahel L, Frey BS. Digital social norm enforcement: online firestorms in social media. PLoS One. 2016;11(6):e0155923. <https://doi.org/10.1371/journal.pone.0155923>
- [41] Stier S, Schünemann WJ, Steiger S. Of activists and gatekeepers: temporal and structural properties of policy networks on Twitter. New Media Soc. 2018;20(5):1910–30. <https://doi.org/10.1177/1461444817703166>
- [42] Boorman GA, Foster JR, Laast VA, Francke S. Regulatory forum opinion piece: the value of publishing negative scientific study data.* Toxicol Pathol. 2015;43(7):901–6. <https://doi.org/10.1177/0192623315575680>
- [43] Anderson M, Toor S, Olmstead K, Rainie L, Smith A. [Internet] Activism in the social media age: public attitudes toward political engagement on social media. Pew Research Center. 2018 Jul 11. [cited 2019 September 1] Available from: <https://www.pewresearch.org/internet/2018/07/11/activism-in-the-social-media-age/>

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