

SHORT REPORT



YouTube coverage of COVID-19 vaccine development: implications for awareness and uptake

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ABSTRACT

This study examined 100 widely viewed YouTube videos on COVID-19 vaccination. Information such as length, format, upload source, content, and cumulative views was coded. As of April 6, 2020, the videos were viewed >33 million times. Almost 75% were uploaded by news sources (garnering >20 million views). While only 16% were uploaded by consumers, these videos garnered over 25% of cumulative views ($n = 8,581,186$ views). The majority of videos mentioned the vaccine manufacturing process (61.0%) and 45.0% speculated on the amount of time needed to have a vaccine ready for use, which most often was thought to be 1–2 years. Even once the biological and technical aspects of vaccine development and manufacturing are accomplished, the benefits conferred on population health will also depend on public willingness to be vaccinated. Ongoing tracking of YouTube is needed to identify what is communicated about vaccines for COVID-19. To the extent that public health officials learn how to create videos about the safety and effectiveness of a COVID-19 vaccine, which attract viewers, this could help increase awareness and interest about vaccination and help individuals make an informed decision about vaccine uptake.

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COVID-19 is a novel form of severe acute respiratory syndrome¹ that has progressed into a global pandemic.² Caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the same coronavirus family as the 2003 Severe Acute Respiratory Syndrome (SARS) and the 2012 Middle Eastern Respiratory Syndrome (MERS), COVID-19 is characterized by the crown-like spikes on its surface and its ability to evolve and become more sophisticated in a short amount of time.^{3,4} The initial outbreak is believed to be the result of viral extension from animals to humans.⁵

COVID-19 is a propagated pandemic transmitted by direct and indirect contact with SARS-CoV-2. Primary prevention of COVID-19 can only be achieved by reducing exposure to SARS-CoV-2 and by reducing susceptibility. Reducing exposure has focused on community mitigation through social distancing to avoid contact with contaminated respiratory droplets emitted, for example, by a cough or sneeze or by touching a surface contaminated with SARS-CoV-2 and then touching a portal of entry on the face. Thus, the main portals of entry include the respiratory tract and membranes of the eyes, nose, and mouth.^{3,4} Emerging research is improving understanding about how long SARS-CoV-2 can live on aerosols and surfaces, and under experimental conditions appears to be able to survive for several hours to days depending on the medium.⁶ Reducing exposure is currently the best way to achieve primary prevention, but is challenging because it relies on voluntary behavior changes of millions of people. Recommended actions for community mitigation such as closing public places and requiring people to stay home and practice social distancing

and other behaviors to reduce interpersonal contact are difficult to achieve on a population-wide basis and have very substantial economic and social-emotional costs. In contrast to reducing exposure, reducing susceptibility would be a more definitive way to end the COVID-19 pandemic. The best hope for long-term primary prevention is the development of a safe and effective vaccine.

While multiple trials to develop and test a COVID-19 vaccine are underway, at this time there are no licensed vaccinations for COVID-19.³ Vaccine development is a complex and time-consuming process involving multiple stages of development, including exploratory and pre-clinical stages, clinical development (which itself comprises three phases), regulatory review and approval, manufacturing, and quality control.⁷ A detailed description of this process and associated technical, social, economic, and moral challenges have been outlined elsewhere with respect to a COVID-19 vaccine.^{8–11} We know there has been considerable public resistance to some vaccines¹² and that there is a substantial anti-vaccine presence on widely viewed social media.^{13–15} As efforts to develop a COVID-19 vaccine emerge, there is a commensurate need to recognize the role of health literacy in mitigating community transmission of COVID-19¹⁶ and to improve understanding about information being widely accessed on social media that may influence the uptake of a prospective COVID-19 vaccine.

Access to accurate information about short- and long-term prevention of COVID-19 is paramount as the pandemic evolves.¹⁷ As such, worldwide Google searches for COVID-19 rose dramatically throughout the month of March 2020.¹⁸ A communication

channel that reaches a large proportion of the global population is YouTube, the video-sharing platform that provides information independent of reading literacy. Our prior research has focused on the extent to which behaviors to reduce exposure to SARS-CoV-2 are being conveyed on YouTube.^{19,20} We did not identify any published studies on the nature of content covered on YouTube about vaccination to reduce susceptibility to COVID-19. The aim of this study was, therefore, to describe the content on YouTube regarding COVID-19 vaccination.

On April 6, 2020, using the keywords “COVID-19 vaccine” and a cleared browser, videos were identified and sorted for view count, and the 100 videos with the highest number of views in the English language were recorded. For each video, the following information was documented: upload date, duration (in minutes), format (live presenter or animation), number of views, and source. The sources of upload were defined as consumer, professional, or television or internet-based news, which were mutually exclusive and exhaustive categories. In addition, content categories, based on a US Centers for Disease Control and Prevention fact sheet as well as a prior YouTube study on vaccinations,^{7,13,14} were used to summarize the information covered in the videos. The content categories included: 1) vaccination development process (discussed development of the vaccine, steps underway to develop a vaccine or any elements of the process); 2) vaccination development being fast-tracked (discussed fast-tracking efforts, prioritizing and steps to expedite the process of making a vaccine available as soon as possible); 3) time required to develop a vaccine (coded as <6 months, 6 to 12 months, or >12 months); 4) description of clinical trial with animals (vaccines being tested on animals or plans to conduct animal testing in the near future); 5) description of clinical trial with humans (vaccines are being tested on humans or plans for human testing); 6) volunteers (cases of humans volunteering to test vaccines or readiness of human subjects for trials); 7) adverse reactions (predictions or discussion of any potential adverse reactions related to vaccination); 8) vaccine manufacturing process (including any step of the manufacturing process); 9) specific manufacturer named (including an institution or commercial entity working on the COVID-19 vaccine such as pharmaceutical companies, universities, or research institutions (NIH, etc.); 10) universal vaccine (vaccine to cover any and all strains of the virus); 11) hoax (was coded for a video suggesting that COVID-19 is not real, but rather a deception); and 12) existence of a vaccine to protect against COVID-19.

For each of the 100 videos, coverage of content in each category was coded dichotomously (present or absent). The videos were analyzed by one researcher (EAZ) and a random sample of 10 videos was coded by a second researcher (CHB) to establish inter-rater reliability and was found to be acceptable (Cohen’s kappa = .93). Descriptive analyses included calculations of frequencies, percentages, and, where appropriate, means, standard deviations, and ranges. Using a chi-square test for categorical variables and ANOVA for continuous variables, we assessed if there were differences (*p* value of < .05) in the content covered between the different sources of upload. All analyses were performed using SPSS version 26 (IBM SPSS, Armonk, NY). The Institutional Review Board (IRB) at

William Paterson University does not review protocols that do not involve human subjects, while the IRB at Teachers College, Columbia University deemed the study exempt.

As of April 6, 2020, the top 100 COVID-19 vaccine videos were viewed 33,410,789 times; 10 days later, these videos were viewed an additional 2.3 million times. The mean number of views of was 334,108 (range = 55,751–2,484,051) and the mean video length was 6.4 minutes (range = 37 seconds to 57 minutes). Almost all of the videos (90%) featured a live presenter, while 10% featured an animated presentation. Almost 75% of the most widely viewed videos were uploaded by news sources (*n* = 73 videos garnering 20,883,012 views, 62.5% of total cumulative views), while 16% were uploaded by consumers (garnering 8,581,186 views, 25.7% of total cumulative views), and 11% were uploaded by professionals (garnering 3,889,981 views, 11.6% of total cumulative views). There were no statistically significant differences between the content covered in the three sources so we describe the results for the total sample of 100 videos.

The majority of videos (61.0%) mentioned the vaccine manufacturing process and 45.0% speculated on the amount of time needed to have a vaccine ready for use, which most often was thought to be 1–2 years (Table 1). While 42.0% discussed human clinical trials, only 20.0% talked about the need for volunteers to participate in these trials and only 3% (garnering 2,684,921 views, 8% of all views) mentioned possible adverse reactions to the vaccine (one of which noted that there were no possibilities of adverse effects). None of the videos mentioned that a vaccine for COVID-19 already exists and only 2% of videos suggested that COVID-19 was a hoax; however, these two videos garnered 674,746 views.

To our knowledge, this is the first published paper on COVID-19 vaccination and YouTube. More than 33 million views were documented for the 100 most widely viewed videos addressing COVID-19 vaccination, even before any vaccine is

Table 1. Content about COVID-19 vaccination covered by number of videos, total views and proportion of cumulative views.

Content covered	Total videos N = 100	Total views 33,410,789	Proportion of cumulative views
Vaccination development process	61	18,922,304	56.6%
Fast-tracking of vaccine development	29	8,790,379	26.3%
Time needed to develop a vaccine	45	14,169,166	42.4%
<6 months	11	3,489,150	10.4%
6 to <12 months	4	871,565	2.6%
1–2 years	24	9,105,359	27.3%
Other	6	703,092	2.1%
Animal clinical trials	19	6,060,335	18.1%
Human clinical trials	42	10,554,073	31.6%
Need for volunteers	20	6,602,181	19.8%
Adverse reactions to a vaccine	3	2,684,921	8.0%
Manufacturing process	12	1,788,877	5.4%
Specific vaccine manufacturer	35	9,661,365	28.9%
Universal vaccine	10	3,582,607	10.7%
Claim that COVID-19 is a hoax	2	674,746	2.0%
A vaccine for COVID-19 already exists	0	0	0%

available. This demonstrates that people are seeking information about this topic from YouTube. To the extent that public health officials learn how to create videos about the safety and effectiveness of a COVID-19 vaccine, which attract viewers, this could help increase awareness and interest about vaccination and help individuals make an informed decision about vaccine uptake.

Several findings, while preliminary, are noteworthy. The majority of videos and cumulative views (73 of 100 videos garnering 20,883,012 views) were uploaded by news sources. In contrast, only 11% were uploaded by professionals (attracting a commensurate proportion of cumulative views). Public health and biomedical professionals would benefit from learning ways to communicate through videos that attract more views. Perhaps most importantly, while only 16% of videos were uploaded by consumers, these videos garnered over 25% of cumulative views ($n = 8,581,186$ views). Vaccination is a polarizing topic among Americans, and widely viewed YouTube videos uploaded by consumers about vaccines sometimes communicate misinformation and some degree of anti-vaccination sentiment.^{13,14} Public health agencies should be prepared to address this as a COVID-19 vaccination campaign evolves.

Fortunately, we did not identify a disproportionate amount of misinformation or negative information about a vaccine for COVID-19. But while only 3 of the 100 most widely viewed videos addressed the topic of adverse reactions, these videos garnered 8% of the cumulative views ($n = 2,684,921$ views). We believe this indicates interest in vaccine safety and the need to address safety in a clear and reassuring way once a vaccine is licensed.

There are many challenges of reducing population-wide susceptibility to COVID-19 by means of a vaccination, including rapidly developing and scaling up the production of a safe and effective vaccine that will confer lasting immunity for all segments of the population.^{11,21,22} When a vaccine does become available, another factor that will determine its effectiveness is the extent to which there is widespread acceptance and rapid uptake. Information that is widely disseminated about one or more COVID-19 vaccines will, in turn, influence beliefs about safety and effectiveness, and willingness to be vaccinated. Ideally, accurate information will be widely disseminated from credible scientific sources. But numerous studies about emerging infectious diseases²³⁻²⁵ and endemic chronic diseases^{26,27} as well as other vaccines^{13,14} demonstrate that one of the main sources of the most widely viewed YouTube videos was by consumers or other sources of questionable veracity.

There are several limitations of this study that necessitate mention. This study was cross-sectional and indicates only a snapshot in time. This is especially important as YouTube postings and their respective view counts change on a daily basis. We documented total views for each video and cumulative views garnered by videos uploaded by different sources and addressing various content. These data do not, however, necessarily represent unique viewers. The study was conducted at a time before vaccine development received extensive attention. The coding form included a delimited scope of information and increased understanding about the biology and pathogenesis of COVID-19 has been continually changing. Finally, the sample size was relatively small ($n = 100$) and

does not necessarily represent all content on this topic on YouTube. Despite these limitations, this study contributes to current knowledge about information sources relevant to COVID-19 vaccination.

Policymakers must recognize that even once the biological and technical aspects of vaccine development and manufacturing are accomplished, the benefits conferred on population health will also depend on public willingness to be vaccinated. Levels of vaccine uptake may be influenced by various factors, including public opinion about vaccine efficacy and safety. Given the widespread use of social media in general and YouTube in particular, it would behoove public health officials to learn how to produce accurate videos that are appealing (i.e., widely viewed) to help people make informed decisions about vaccination.

It is clear that scientific findings of COVID-19 vaccine development are evolving rapidly. This highlights the need for ongoing communication and recognition that widely viewed videos may not include the most current science. Ongoing tracking of YouTube is, therefore, needed to identify what is and is not being communicated about vaccination for COVID-19. Discovering ways to communicate accurate information should be a central part of a COVID-19 vaccination campaign.

Disclosure of potential conflicts of interest

No potential conflicts of interest were disclosed.

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