

Mapping South African Covid-19 Vaccine Opinions

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Keywords: Covid-19, vaccines, opinion mining, South Africa, sentiment analysis

Abstract:

Vaccine hesitancy is one of the 10 greatest threats to global health according to the World Health Organisation(2019). Increasing uncertainty around vaccines could disrupt efforts to minimise Covid-19 and future pandemics' impacts. The South African Government (2021a) planned to have 67% of the population vaccinated by the end of 2021. According to the Department of Health (2022), 51% of the adult population in South Africa has been vaccinated as of 27 November 2022. This aligns with the increasing trend of vaccine hesitancy globally and in South Africa.

In Saudi Arabia, researchers found that more negative opinions regarding vaccines within the community and that the results were used then by government to create of policies for change (Alliheibi, Omar and Al-Horais, 2021). The reasons for vaccine hesitancies vary across the world, reasons include cost, level of education as well as religious beliefs. Dzinamarira et al. (2021) state that many communities in Africa have always resisted vaccination regardless of the type and or form of the vaccine. In the case of the Zimbabwe, vaccine hesitancy is linked closely to one religious group that implies that the reason for disease or virus is spiritual. In South Africa, limited research on Covid-19 vaccine opinions have been conducted. The aim of our research was to investigate and visualise the spatial distribution of vaccine opinions in South Africa using opinion mining. Gaining a better understanding of South Africans opinion on Covid-19 vaccinations and the spatial distribution of it can be used to inform focused interventions which will help to educate and reduce vaccine hesitancies.

The first phase of the research was to determine the potential of only using a social media platform, such as Twitter, for determining the spatial distribution of Covid-19 vaccine opinions. Liu and Liu (2021) used a similar approach of collecting tweets and geolocating users in the United States. However, this was found not to be a viable option, as users' locations were generally not captured, or the predefined locations could be used. Thus, we were unable to identify tweets from only South African users. Based on this, we decided to conduct a survey for the second phase. The National Income Dynamics Study – Coronavirus Rapid Mobile Survey (NIDS-CRAM) (Köhler *et al.*, 2021) is a similar study that was conducted in South Africa by means of a telephonic survey to determine willingness to accept a vaccine from participants, however, the study did not only focus on vaccines, but also other social issues linked to Covid-19. Our survey was aimed at online opinions, the survey asked the following questions: basic demography questions; current city and where they grew up; vaccination history; the respondent's opinion on vaccinations in general, Covid-19 vaccinations, and vaccination mandates; and trusted news and information sources.

The survey was distributed on various social media platforms, such as Twitter, Instagram, Facebook, and the online survey platform, Prolific. We were able to collect 742, of which 694 were found to be usable after the data was cleaned. Most of the other response removed was due to the respondents not currently living in South Africa. We received responses from individuals from all 9 provinces with the majority of responses being from Gauteng. The opinions collected in the survey were analysed using sentiment analysis and mapped to determine the spatial distribution of these opinions.

The sentiment analysis was conducted using both a rule-based and feature based approach. The rule-based models included using TextBlob and Vader, the feature-based approach used roBerta based deep leaning models from the hugging face library. Majority (56%) of the respondents have taken the vaccine though some still conveyed negative sentiments about the vaccine, inferring a reduced likelihood of them receiving the booster shot. There was an overall negative sentiment regarding the Covid-19 vaccines in South Africa. It can be seen in Figure 1 that Mpumalanga had the highest percentage of negative opinions with 71% of the responses being classified as negative. The reasons for the hesitancy ranged from religious and medical reasons to mistrust in the process of creating the vaccine. Positive sentiments included trust in science and the need to protect family members as well as themselves. It is important to understand where there is hesitancy to help create focused interventions to mitigate the potential spread of mutations of the virus.

There were more females (30%) that had chosen to be vaccinated as opposed to males (24%). This is supported by data from the Covid-19 Perceptions Study (2021b) conducted by Africa Centre for Disease Control which showed that males were 66% more doubtful than females regarding the effectiveness of the Covid-19 vaccines.

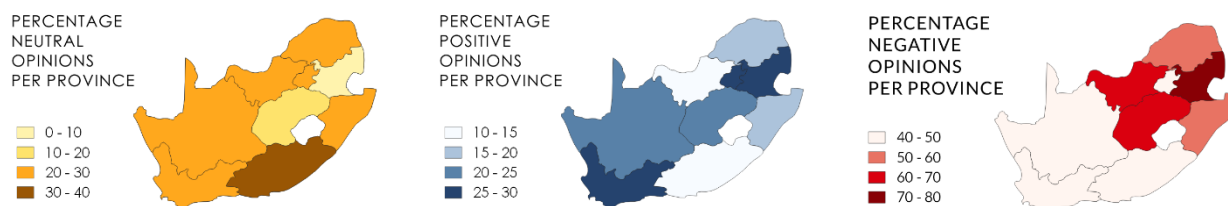


Figure 1 Maps showing the distribution of sentiment of Covid-19 vaccines across South Africa.

Most respondents (56%) receive their news or information about Covid-19 and vaccinations from news channels, such as eNCA. This is followed by scientific journal papers (40%), social media (26%), YouTube (20%), government (19%), and then newspapers (16%). It was interesting that scientific journal papers ranked so high as they are not often behind a paywall and not written in an accessible manner. Participants who receive their information about Covid-19 through YouTube were more likely to not be vaccinated than those who received their information through other means.

Respondents with a tertiary qualification such as bachelor's degree, honours degree, master's degree, or PhD were 59% more likely to be vaccinated as opposed to those with a qualification such as a higher certificate or diploma which has a 47% likelihood of being vaccinated. The reasons for this should be further investigated to determine if the reasons for difference were vaccine mandates applied by universities or something else.

The results from our survey provide an overview of the spatial distribution of South African's opinion on Covid-19 vaccinations that could potentially help determine where there are vaccine hesitations in South Africa. This information can be used to create targeted interventions to encourage more people to get vaccinated. The sentiment analysis also showed that natural language processing model for South African English is needed to better classify the responses and would be useful for other applications in South Africa as well.

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