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*Article*

# Facebook Users' Attitudes towards Human Papillomavirus Vaccination in South Africa

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**Abstract:** On February 28, 2023, the Facebook page of the United Nations Children's Fund (UNICEF) South Africa, announced the beginning of the HPV vaccination campaign for 2023. The aim of this study was to examine the attitudes of Facebook users, who commented on the UNICEF South Africa post, towards HPV vaccination to inform the development and implementation of interventions that can increase HPV vaccine acceptance and uptake. Several comments were questions regarding the eligible criteria for vaccination, side effects, consent form, and vaccination strategies. Many Facebook users were hesitant towards HPV vaccination due to various reasons including concerns around side effects, religious beliefs, vaccine stock outs, and their distrust in the institutions or systems involved in vaccination programmes. Few users accepted HPV vaccination because they believed that it was very important thing to do, beneficial for the children's health, and they have vaccinated they children before. Our findings of the current study contribute to the promotion of acceptance and uptake of HPV vaccination by developing and implementing interventions tailored to address identified barriers that are associated with hesitant to HPV vaccination.

**Keywords:** human papillomavirus; vaccination; social media; Facebook; South Africa

## 1. Introduction

Human papillomavirus (HPV) is the most common sexually transmitted infection in the world [1]. Approximately 75% of sexually active people are estimated to be infected with HPV during their lifetime [2]. While most HPV infections are transient and symptomatic, continuous infection with high-risk HPV types may results in various cancers, including cervical, anal, vulvar, vaginal, penile, and oropharyngeal cancer. Cervical cancer, the fourth most common cancer in women worldwide, is the most common cause of HPV associated morbidity and mortality, with an estimated 604,127 cases and 341,831 deaths in 2020 [3]. Low and middle-income countries (LMICs) carry the highest burdens of the disease. South Africa is no exception- each year there are an estimated 12,983 new cases of cervical and over 5595 deaths in the country [4].

Vaccination is one of the most effective public health interventions for controlling and eliminating infectious diseases **[5,6]**. Vaccines are estimated to save approximately 2 to 3 million lives, worldwide, each year **[5,7]**. They are responsible for the global eradication of smallpox and the significant reductions in disability and death from polio, measles, tetanus, rubella, and diphtheria **[8–10]**. Currently, there are six licensed HPV vaccines that are used across the world: Cervarix, Cecolin, and Walrinvax, the bivalent vaccines; Gardasil and Cervarax, the quadrivalent vaccines; and Gardasil9, the nonavalent vaccine **[11,12]**. They are all proven to be highly efficacious against persistent infection of their vaccine genotypes. However, they are most effective when administered before sexual debut and exposure to HPV [13]. Currently, HPV vaccination is recommended for adolescent males and females aged 9–14 years in a one or two-dose series and as a three-dose series

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for young men and women aged 15 years or older and immunocompromised individuals, including people living with HIV [12].

The uptake of HPV vaccination remains low when compared to other childhood and adolescent vaccines [14]. This is despite the proven safety, efficacy and recommendation of HPV vaccines, as well as the fact that programmes have been implemented by many countries to promote vaccination. A high level of vaccination uptake is needed for any vaccination programme to be successful **[9,15]**. Major barriers that contribute to lower HPV vaccination uptake include lack of awareness and knowledge about HPV vaccination, concerns about safety and side effects, and lack of health care provider recommendations.[16] Vaccine hesitancy is defined as a delay in acceptance or a refusal of vaccination despite the availability of vaccination services **[17–19]**. It stems from various factors such as complacency (the person does not see a need and value for the vaccine), individual's lack of confidence in the vaccine, and convenience (access to vaccines) **[20–22]**. Another factor that contributes to vaccine hesitancy is false information perpetuated by different communities on different social media (SM) platforms, namely, Facebook and Twitter. Vaccine misinformation on social media has therefore been called an "urgent threat to public health" [23]. Vaccine hesitancy is not a new phenomenon; people have been resistant towards vaccination since the era of smallpox vaccination programs.[24] In 2019, vaccine hesitancy was identified by the World Health Organisation as one of the top 10 threats to global health **[9,25]**.

SM platforms are internet-based applications that allow individuals to interact with each other and share opinions and content in online spaces **[4,14,20,26]**. SM is considered as one of the most powerful communication tools of the 21st century [27]. As of 16 October 2023, there were over 4.8 billion active users of social media, worldwide. Facebook is currently the most popular social media platform in the world with over 2.9 billion active users [28]. SM has been a platform in which health information is generated and exchanged all over the world **[14,29]**. Healthcare professionals and organizations use social media to share health information with their patients and the general public **[14,30,31]**. They use this platform for health promotion and campaigns [29].

Vaccination campaigns are regarded as one of the most effective public health interventions and a cornerstone for prevention of communicable infectious diseases [32]. On February 28, 2023, the Facebook page of the United Nations Children's Fund (UNICEF) South Africa, originally known as the United Nations International Children's Emergency Fund announced the beginning of the HPV vaccination campaign for 2023. The announcement read: ''Protect your daughter from cervical cancer and make sure she gets her HPV vaccine at school. Contact your daughter's school for more or call 0800 029 999"( https://www.facebook.com/UNICEFSouthAfrica/posts/pfbid031dbDPVWBwp6PS7r7XKiWd6A2brkdAmH8tWSUkmF7sFg8RKmYYYtxBtLmVsMbAuekl). The announcement had a link to the UNICEF South Africa official page where information about HPV, cervical cancer, HPV vaccine, and school-based vaccination campaign was detailed. The 2023 HPV vaccination campaign was to start in February where the first dose of the HPV vaccine was to be delivered to Grade five girls who are nine years and older at government schools around South Africa. The second dose was to be administered in September. The post garnered several comments and reactions from Facebook users.

Qualitative studies using traditional platforms and on social media exploring HPV vaccination acceptance and hesitancy in South Africa are still few [33], and to the best of our knowledge no such study has been conducted during or post the Coronavirus Disease 2019 (COVID-19) pandemic in South Africa. The COVID-19 pandemic has increased the use of social media, as well as the spread of health misinformation during the periods of isolation and social distancing **[26,34,35]**. It has increased misinformation regarding COVID-19 and vaccination on social media [26]. The vaccine misinformation on social media can negatively influence vaccination decisions [36]. It has the potential to decrease public confidence or trust in the safety and effectiveness of vaccines [37]. Misinformation about the benefits and side effects of vaccination has been identified as one of the factors that contribute to vaccine hesitancy [35]. There is, therefore, an urgent need to examine the impact of COVID-19 and misinformation regarding the pandemic and vaccination on public's acceptance of other vaccines. The aim of this study was to examine the attitudes of Facebook users,

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who commented on the UNICEF South Africa post, towards HPV vaccination to inform the development and implementation of interventions that can increase HPV vaccine acceptance and uptake.

## 2. Materials and Methods

This study used secondary data which were extracted from all the comments and reactions made between 28 February 2023 and 24 March 2023 on the UNICEF South Africa Facebook post in response to the announcement of the beginning of the 2019 school-based HPV vaccination campaign. The extracted data included reactions made by Facebook users, e.g., the comments, likes and sharing. All the comments, without the names of the users who posted them, were copied, and pasted into a Microsoft Word document. Descriptive statistics related to numbers of reactions, comments and shares were calculated. We used basic thematic analysis approach to analyse the content of the comments [38]. Two authors (EM and AJ) independently coded the responses as pro-vaccination, anti-vaccination or neutral. Disagreements between the two authors were resolved by discussion and consensus. After labelling the data with the three main codes, we then used an inductive thematic analysis approach to extract emerging themes from the comments within each code. Under each theme, we reflected on the meaning given to the issue by the respondents to identify emerging subthemes. Discussions were undertaken between AW and EM to verify the 'fit' of the themes with the coded extracts and overall data set. Discrepancies were resolved through discussion and consensus. This enabled us to refine the specifics of each theme and to understand the relationships between the various vaccine hesitancy and acceptance themes. This study did not require any ethical clearance as data used was readily available and accessible to anyone on Facebook.

## 3. Results

Between 28 February 2023 and 24 March 2023, the Facebook post received 1800 reactions, 154 comments, and was shared 40 times. Regarding the reactions made on the post, there were 1500 "likes", 277 "love", 20 "cares", 14 "laughs", 3 "sad faces" and 3 "cries". Of these 154 comments, 143 (93%) were made by the Facebook users while the remaining 11 (7%) were responses to some users' comments. Out of the 143 comments made by the users, 125 (87%) were around HPV vaccination, 15 (10%) were on the people appearing in the advert, and 1 was mentioning their friends to notify them about the post, 1 was asking for the contact details, and the remaining 1 was greeting. Among the 125 comments on HPV vaccine, 2 of them were only emojis.

### *3.1. Questions*

Several users raised various questions around HPV vaccination, including eligibility for vaccination, male vaccination, side effects, vaccination process, and other vaccines.

#### 3.1.1. Eligibility for vaccination

Four users wanted to know the age at which HPV vaccination is given.

- *"Is it important also for a lady at the age of 32 to get the vaccine as well??"*
- *"My daughter is 20, can she still get the vaccine?"*
- *"At which age she must get the vaccine?"*
- *"At what age she must get the vaccine?"*

Another user enquired about the vaccination of breast-feeding mothers.

- *"It is right for a breastfeeding mother to vaccinate?"*

One user raised a question about the vaccination of boys and the other user supplemented the question by wanting to know if it was not a priority to protect all children irrespective of gender.

- *"When are you gon start giving our boys?"*
- *"I want to know too. It's really unfair that they're being excluded... Should it not be a priority to protect ALL children?"*

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Another user replied to these questions about vaccination of boys by pointing out that boys didn't not have cervix which vaccines was taken to protect in girls. The other user also replied to the question by indicating that boys were HPV vaccination should also be given to boys. However, the user mentioned the wrong diseases that the vaccination was protecting against.

*"this injection protects people/children from getting Hepatitis B so it should be given to boys too"*

The last user to comment to the question pointed out that HPV vaccination protected boys from genital cancers.

*"boys can get genital cancers if they're not vaccinated against hpv"*

#### 3.1.2. Side effects

One user wanted to know what to do about the side effects that occurred after vacci nation and was comforted by another user.

*"My child get this vaccines yesterday namhlanje ingalo yakhe idumbile,ndingenza njan xa kunjalo?"*
*"she will be fine don't worry."*

#### 3.1.3. Consent form

One parent what to know what to do with the consent form that was given to the child at school.

*"My child was given a form from school for to sign and fill but I am confused about this what should I do she is in grade 5"*

#### 3.1.4. Vaccination strategy

One user enquired about the vaccination against measles at schools, while the other one wanted to know if HPV and Tuberculosis was the same.

*"When are the nurses going to the schools for the measles injection"*

One user wanted to know the reasons private schools were not vaccinating their children and the other user enquired about the place or location to take his or her children for vaccination since they were home schooled.

*"But private school don't offer this.i wonder why."*
*"my girls are Homeschooled, so we're could I get the HPV vaccine for them?"*

### *3.2. Determinants of vaccine hesitancy*

Several users were hesitant towards HPV vaccination due to various reasons such as the occurrence of side effects, religious beliefs, vaccine stockouts, distrust in the institutions or systems involved in vaccination, and agendas and interests behind vaccination programmes.

#### 3.2.1. Side effects

Four users were concerned about the side effects their children previously suffered after vaccination.

*I understand about Hpv my concern is that after they get their measles vaccination many childrens now have mum's"*

*"My child was given from school but she is sick"*

*"My son was given HPV shot last week Thursday from school, he got fever Sunday night and Monday"*

*"My Daughter's Arm Is Swollen After This Vaccine 😢"*

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3.2.2. Religious beliefs

Two users were hesitant to vaccinate their children due to their religious beliefs. They believed that their children will be protected by a prayer, Jesus Christ and scripture.

*"We just really need to pray for our children i wrote on my form that I don't need my child to get it but they give Hime without my permission"*

*"Jesus Christ is our vaccine"*

*"we trust Jesus Christ he is the one who created everything so our kids ore protected by the blood of Jesus"*

*"We walk by faith Hebrews 11"*

3.2.3. Vaccine Stockouts

Two users complained about the lack of vaccine at their local health centres as the reason they failed to vaccinate their children.

*"They don't have in clinics"*

*"Even in Butterwòrth they don't stock them in clinics, they claim that they r expensive"*

3.2.4. Distrust in the institutions or systems involved in vaccination

Many users were hesitant towards HPV vaccination due to their distrust of the institutions or systems involved in vaccination, which was caused by several reasons. Two users were concerned about the high number of vaccines they were subjected to.

*"We are getting vaccines left, right & center of late"*

*"Vaccine after vaccine nowadays."*

Some users were hesitant to vaccination due to their general distrust of the HPV vaccines.

"I don't trust this vaccine 💉..."

Another user did not trust HPV vaccination after they were vaccinated with COVID-19 vaccine.

"I dont trust this since they force us on covid"

Due to the distrust that they had of HPV vaccine, some use users even urged parents not to trust it and to do some investigation before they can vaccinate their children.

*"Do investigations about these things do not fold your arms and trust someone whom you don't know, to temper with your child's DNA."*

*"Don't ever trust a stranger when it comes to your children life. Do investigations about these things"*

Some users believed that there were agendas or motive behind HPV vaccination programme.

*"There is something fishy."*

*"there is and very denger."*

*"something is fishy about this vaccine why they fos them"*

Another user believed that that the agenda behind HPV vaccination was of reducing the population rather than preventing disease.

*"depopulation through vaccination"*

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A user believed that financial interests were motive behind HPV vaccination programme.

*"Vaccine production is a business 🤔"*

One user believed that HPV vaccines contained causing agents of cervical cancer.

*"Possibly the vaccine have a cervical cancer"*

Other users even complained that these vaccines were only developed for 'others' because those who were behind the development were not vaccinating themselves.

*"The unfortunate part is that, those who produce these things, they do not use them but they give to you"*

*"Same as the one for covid that they still trying to figure out what is it where it is coming from. If we're wise we should have asked ourselves why the Pfizer manager said he will never take the vaccine because he is healthy."*

3.2.5. Vaccination strategy

One user was concerned about the use of schools rather than hospitals and clinics for vaccination purposes.

*"Schools supposed to be a place to learn, Sadly they slowly turning schools into hospitals and clinics"*

3.2.6. Vaccination process (Consent)

Another user refused or declined to vaccinate his or her children by not signing a consent form to give a permission to vaccinate.

*"My child didn't get it I didn't sign for it"*

3.2.7. Natural immunity

One user believed that there was no need for women to vaccinate because they were protected naturally. This user believed that what protected them without vaccines is still going to offer that protection.

- *"What protected women in the past?"*
- *"yet they survived and gave birth to us without any form of witchcraft okay bye"*

*3.3. Determinants of HPV vaccine acceptance*

Several Facebook users accepted HPV vaccination because they believed it was very important, beneficial for the health of their children, and they are used to the vaccine. Three users were accepting HPV vaccine because they general believed that it was an important thing to do.

*"It's an important vaccine"*

*"its very important"*

*"it is very important for them to take it"*

The other users were more accepting of HPV vaccine because it was preventing cervical cancer.

*"this vaccine it prevent cancer"*

*"It's extremely important that girls are protected against cervical cancer"*

Four users accepted HPV vaccination because it was something they are used to be doing.

*"My daughter got her HPV vaccine and measles one at school"*

*"my daughter is also in grade 5 n she was vaccinated on Wednesday t school"*

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*"Mine also get that at school and nothing happend to her she is fine she was also in grade 4 she is in grade 8 now"*

*"Yes but this vaccine was there even before covid I remember my daughter also got it when she was in grade 4"*

*"Yes she get it on Wednesday thanks"*

## 4. Discussion

In this study, we evaluated the attitude towards HPV vaccination of Facebook users who commented on the UNICEF's post announcing the beginning of HPV school-based vaccination campaign for 2023. Researchers are using social media to network with others, recruiting study participants, disseminating new knowledge, and as well as collecting data. Public health researchers use data from social media to explore the public's opinions on HPV vaccination [39]. Few studies have considered the surveillance of opinions about vaccination on social media as a precursor to vaccination decision making [40].

We classified our findings under three main themes: inquiries (questions), hesitancy and acceptance of HPV vaccination. Several Facebook users reflected a number of uncertainties about HPV vaccination, including about eligibility criteria, male vaccination, side effects, vaccination process and other vaccines. According to Mavundza and colleagues, parents' views and practices on childhood vaccination may be influenced by their level of knowledge around childhood vaccination [41]. They reported that some parents were less accepting of childhood vaccination because they did not have enough information to understand the benefits of vaccination or to know the process of getting their children vaccinated. The findings from this current study suggest that HPV vaccination hesitancy may also relate, in some cases, to inadequate information about the HPV vaccine and HPV vaccination.

Several other reasons for HPV vaccine hesitancy, besides knowledge, were identified in our study. Specifically, several users were hesitant to HPV vaccination because of their experience with side effects after vaccination, religious beliefs they had, vaccine stockout, vaccine strategy and process that was being used, and their belief in natural immunity. Distrust towards the institutions or systems involved in vaccination was an addition factor contributing to vaccine hesitancy, with a number of reasons for this distrust emerging, including various agendas and interests they thought were behind vaccination programmes. With regards to the determinants of HPV vaccination acceptance, we found that several Facebook users were influenced by their beliefs that it was an important thing to do, prevention of cervical cancer, and they have already vaccinated their children.

In this study, our findings have both similarities and differences with the findings of the similar study by Wiyeh and colleagues [4], where they explored the determinants of vaccine hesitancy from the comments made by Facebook users to the Western Cape Department of Health's post announcing the implementation of school-based HPV vaccination campaign for 2019. Different to our findings, Wiyeh and colleagues [4] found that their post had 659 reactions, 157 comments and was shared 156 times compared to our study with 1800 reactions, 154 comments and being shared 40 times. Our study generated similar findings regarding the factors that influenced vaccine hesitancy among the Facebook users, with the exception of religious beliefs and belief in natural immunity which was identified in our study and not theirs. Religious beliefs have been previously identified as a determinant of vaccine hesitancy by other studies [9,41,42]. The belief in natural immunity has been found as a factor that influenced vaccine hesitancy by Cooper and colleagues [9]. Like the findings of the similar study by Wiyeh and colleagues [4], we also found that the prevention of cervical cancer was one of the reasons some Facebook users were accepting HPV vaccine. Several Facebook users accepted HPV vaccination because they believed it was very important, beneficial for the health of their children, and they are used to the vaccine.

To our best knowledge, this is the first study to examine the views and attitudes of Facebook users towards HPV vaccination after COVID-19 pandemic in South Africa. The findings of the current study contribute to the promotion of acceptance and uptake of HPV vaccination by developing and

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implementing interventions tailored to address barriers identified such as lack of information or knowledge about HPV vaccines and vaccination process, the occurrence of side effects after vaccination, vaccine stock outs, and distrust in the institution or systems involved in vaccination. Despite these contributions, as with many other studies, ours has its own important limitations that should be considered when interpreting the findings. Firstly, this study evaluated the views and attitudes of only Facebook users. Therefore, its findings cannot be applied to the general population particularly parents, who are responsible for making decisions for their children. For this reason, future studies should focus on the views and attitudes of parents. Secondly, although Facebook is currently the most popular social media network in the world, it does not represent the whole population of social media network. Therefore, there is a need for future studies to collect data from other social media platforms such as Twitter, Instagram, YouTube, and LinkedIn.

## 5. Conclusions

We found that the attitudes of the Facebook users towards HPV vaccination were influenced by different factors. We also found that the users lacked or had minimal information about the HPV vaccines and the HPV vaccination process. Our findings will help policy and decision markers, programme managers, and other stakeholders in South Africa and other parts of the world with similar settings to develop and implement tailored interventions that can help increase acceptance and uptake of HPV vaccination.

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## References

1. Loke, A.Y., et al., *The Uptake of Human Papillomavirus Vaccination and Its Associated Factors Among Adolescents: A Systematic Review.* J Prim Care Community Health, 2017. **8**(4): p. 349-362.
2. Ashrafi, G.H. and N.A. Salman, *Pathogenesis of Human Papillomavirus – Immunological Responses to HPV Infection*. 2016.
3. Mavundza, E.J., et al., *A Systematic Review of Interventions to Improve HPV Vaccination Coverage.* Vaccines (Basel), 2021. **9**(7).
4. Wiyeh, A.B., et al., *Social media and HPV vaccination: Unsolicited public comments on a Facebook post by the Western Cape Department of Health provide insights into determinants of vaccine hesitancy in South Africa.* Vaccine, 2019. **37**(43): p. 6317-6323.
5. Singh, S., et al., *Ensuring childhood vaccination among slums dwellers under the National Immunization Program in India - Challenges and opportunities.* Prev Med, 2018. **112**: p. 54-60.
6. Perlman, S., et al., *Knowledge and awareness of HPV vaccine and acceptability to vaccinate in sub-Saharan Africa: a systematic review.* PLoS One, 2014. **9**(3): p. e90912.
7. Dlamini, S.K., et al., *Guidelines for the vaccination of HIV-infected adolescents and adults in South Africa.* Southern African Journal of HIV Medicine, 2018. **19**(1).
8. Callaghan, T., et al., *Parent psychology and the decision to delay childhood vaccination.* Soc Sci Med, 2019. **238**: p. 112407.
9. Cooper, S., et al., *Factors that influence parents' and informal caregivers' views and practices regarding routine childhood vaccination: a qualitative evidence synthesis.* Cochrane Database Syst Rev, 2021. **10**(10): p. CD013265.
10. Saeterdal, I., et al., *Interventions aimed at communities to inform and/or educate about early childhood vaccination.* Cochrane Database Syst Rev, 2014(11): p. CD010232.
11. Okolie, E.A. and B.I. Nwadike, *Spotlight on Human Papillomavirus Vaccination Coverage: Is Nigeria Making Any Progress?* JCO Global Oncology, 2023. **9**.

12. mondiale de la Santé, O. and W.H. Organization, *Human papillomavirus vaccines: WHO position paper (2022 update)–Vaccins contre les papillomavirus humains: note de synthèse de l'OMS (mise à jour de 2022).* Weekly Epidemiological Record= Relevé épidémiologique hebdomadaire, 2022. **97**(50): p. 645-672.
13. Gallagher, K.E., et al., *Human papillomavirus (HPV) vaccine coverage achievements in low and middle-income countries 2007-2016.* Papillomavirus Res, 2017. **4**: p. 72-78.
14. Ortiz, R.R., A. Smith, and T. Coyne-Beasley, *A systematic literature review to examine the potential for social media to impact HPV vaccine uptake and awareness, knowledge, and attitudes about HPV and HPV vaccination.* Hum Vaccin Immunother, 2019. **15**(7-8): p. 1465-1475.
15. Forster, A.S., et al., *A qualitative systematic review of factors influencing parents' vaccination decision-making in the United Kingdom.* SSM Popul Health, 2016. **2**: p. 603-612.
16. Brandt, H.M., J.Y. Pierce, and A. Crary, *Increasing HPV vaccination through policy for public health benefit.* Hum Vaccin Immunother, 2016. **12**(6): p. 1623-5.
17. Kateeb, E., et al., *Predictors of Willingness to Receive COVID-19 Vaccine: Cross-Sectional Study of Palestinian Dental Students.* Vaccines (Basel), 2021. **9**(9).
18. Galle, F., et al., *Acceptance of COVID-19 Vaccination in the Elderly: A Cross-Sectional Study in Southern Italy.* Vaccines (Basel), 2021. **9**(11).
19. El-Elimat, T., et al., *Acceptance and attitudes toward COVID-19 vaccines: A cross-sectional study from Jordan.* PLoS One, 2021. **16**(4): p. e0250555.
20. Al-Regaiey, K.A., et al., *Influence of social media on parents' attitudes towards vaccine administration.* Hum Vaccin Immunother, 2022. **18**(1): p. 1872340.
21. Wirsiy, F.S., et al., *Acceptability of COVID-19 Vaccine in Africa.* Int J MCH AIDS, 2021. **10**(1): p. 134-138.
22. Jafflin, K., et al., *Parental and provider vaccine hesitancy and non-timely childhood vaccination in Switzerland.* Vaccine, 2022. **40**(23): p. 3193-3202.
23. Rathje, S., et al., *Social media behavior is associated with vaccine hesitancy.* PNAS nexus, 2022. **1**(4): p. pgac207.
24. Dubé, È., et al., *Vaccine hesitancy, acceptance, and anti-vaccination: trends and future prospects for public health.* Annu Rev Public Health, 2021. **42**(1): p. 175-91.
25. Barello, S., et al., *'Vaccine hesitancy' among university students in Italy during the COVID-19 pandemic.* Eur J Epidemiol, 2020. **35**(8): p. 781-783.
26. Puri, N., et al., *Social media and vaccine hesitancy: new updates for the era of COVID-19 and globalized infectious diseases.* Hum Vaccin Immunother, 2020. **16**(11): p. 2586-2593.
27. Farsi, D., *Social Media and Health Care, Part I: Literature Review of Social Media Use by Health Care Providers.* J Med Internet Res, 2021. **23**(4): p. e23205.
28. Statista. *Number of internet and social media users worldwide as of July 2023*. 2023 [cited 2023 16 October 2023]; Available from: https://www.statista.com/statistics/617136/digital-population-worldwide/.
29. Chen, L., X. Yang, and X. Huang, *Promoting HPV vaccination on social media: interactive effects of threat, efficacy and social cues.* Hum Vaccin Immunother, 2021. **17**(11): p. 4442-4456.
30. Suarez-Lledo, V. and J. Alvarez-Galvez, *Prevalence of Health Misinformation on Social Media: Systematic Review.* J Med Internet Res, 2021. **23**(1): p. e17187.
31. Limaye, R.J., et al., *Social media strategies to affect vaccine acceptance: a systematic literature review.* Expert Rev Vaccines, 2021. **20**(8): p. 959-973.
32. Tang, L., et al., *Social media and outbreaks of emerging infectious diseases: A systematic review of literature.* Am J Infect Control, 2018. **46**(9): p. 962-972.
33. Ngcobo, N., et al., *Human papillomavirus vaccination acceptance and hesitancy in South Africa: Research and policy agenda.* South African Medical Journal, 2019. **109**(1): p. 13-15.
34. Boucher, J.C., et al., *HPV vaccine narratives on Twitter during the COVID-19 pandemic: a social network, thematic, and sentiment analysis.* BMC Public Health, 2023. **23**(1): p. 694.
35. Cascini, F., et al., *Social media and attitudes towards a COVID-19 vaccination: A systematic review of the literature.* EClinicalMedicine, 2022. **48**: p. 101454.
36. Zhang, J., et al., *Effects of fact-checking social media vaccine misinformation on attitudes toward vaccines.* Prev Med, 2021. **145**: p. 106408.
37. Steffens, M.S., et al., *Using social media for vaccination promotion: Practices and challenges.* Digit Health, 2020. **6**: p. 2055207620970785.
38. Braun, V. and V. Clarke, *Using thematic analysis in psychology.* Qualitative research in psychology, 2006. **3**(2): p. 77-101.
39. Gustafson, D.L. and C.F. Woodworth, *Methodological and ethical issues in research using social media: a metamethod of Human Papillomavirus vaccine studies.* BMC medical research methodology, 2014. **14**(1): p. 1-11.
40. Dunn, A.G., et al., *Associations between exposure to and expression of negative opinions about human papillomavirus vaccines on social media: an observational study.* Journal of medical Internet research, 2015. **17**(6): p. e4343.

 doi:10.20944/preprints202312.0071.v1



41. Mavundza, E.J., S. Cooper, and C.S. Wiysonge, *A Systematic Review of Factors That Influence Parents' Views and Practices around Routine Childhood Vaccination in Africa: A Qualitative Evidence Synthesis.* Vaccines, 2023. **11**(3): p. 563.
42. Khosa, L.A., et al., *Vaccine hesitancy drives low human papillomavirus vaccination coverage in girls attending public schools in South Africa.* Frontiers in Public Health, 2022. **10**: p. 860809.