

Assessing acceptability of and confidence in a potential TB vaccine in South African adults
living with HIV

Alexa Giovanatti

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Committee:

Adrienne E. Shapiro

Jennifer Ross

R. Scott McClelland

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Department of Public Health

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Alexa Giovanatti

University of Washington

Abstract

Assessing acceptability of and confidence in a potential TB vaccine in South African adults living with HIV

Alexa Giovanatti

Chair of Supervisory Committee:

Adrienne E. Shapiro

Department of Epidemiology

Objective: Although several TB vaccines are in late-stage clinical trials, there is limited understanding of TB vaccine attitudes among persons likely to be eligible for a new TB vaccine, particularly in the context of rising vaccine hesitancy following the COVID-19 pandemic. Acceptability of a potential TB vaccine and associated socio-behavioral factors were assessed among people with HIV (PWH) in South Africa to inform strategies for successful TB vaccine implementation.

Methods: A cross-sectional survey assessing vaccine acceptability and confidence was conducted in 2024 at two South African public health clinics serving PWH. Surveys were administered at follow-up visits of a study of PWH initiating ART and undergoing TB screening. Exploratory analyses were performed using Kruskal-Wallis testing to examine the relationship between vaccine acceptability and sociodemographic factors.

Results: A total of 225 PWH (57% female) were surveyed of median age 34 years (IQR 27-42), median baseline CD4 count 338 (IQR: 179-514). Of these, 64 (28%) had a personal TB history, 216 (96%) had ever lived with someone with TB, 92 (41%) were currently living with someone with TB. Acceptability of a potential TB vaccine was 112 (50%) responding “Definitely yes, as soon as available”, 86 (38%) “Definitely yes, but wait ≥ 6 months to receive it” and 27 (12%) “Unsure, leaning yes, any timeline” with nobody responding “leaning no” or “definitely no.” Acceptability was observed to be higher among participants who perceived TB as an extremely important community health issue ($P=0.003$), were extremely concerned about contracting TB ($P=0.005$), had a history of TB ($P=0.044$), were not living with someone with TB ($P=0.044$), and were unemployed ($P=0.009$). For vaccine confidence, 210 (93%) tended to or strongly agreed a TB vaccine would be safe and 218 (98%) that it would be effective. For TB information, most participants sourced government, community, and health entities, or internet ($>70\%$), and rarely sourced family or friends ($<6\%$) or social media ($<1\%$). Participants widely preferred to receive a TB vaccine in a community space (191, 85%).

Conclusions: TB vaccine acceptability and confidence among South African adult PWH was high and observed to be associated with greater risk perception for TB disease, greater perceived importance of TB in the community, and unemployment. Community spaces were widely preferred settings for TB vaccine receipt and government, health, and community entities were preferred sources for TB information. These findings may inform strategies for successful, future TB vaccine campaigns.

Keywords

Tuberculosis; vaccine; acceptability; confidence; hesitancy; South Africa

Introduction

Tuberculosis (TB) remains the leading infectious cause of death worldwide with 1.23 million deaths in 2024, disproportionately impacting people in low and middle-income countries (LMIC) (1). Despite this, the only licensed TB vaccine is the Bacillus Calmette-Guérin (BCG) which was developed in 1921 and helps prevent severe forms of TB in children but does not prevent TB in adolescents or adults (2). A TB vaccine for this older group is projected to globally prevent 4.6-8.5 million deaths by 2050 and increase gross domestic product by US\$1.6 trillion by 2080, making this a priority investment for global stakeholders (3). Galvanized by the World Health Organization's (WHO) End TB Strategy in 2014, several promising vaccine candidates to prevent TB in adults and adolescents are now in phase III clinical trials (4).

However, understanding of a potential TB vaccine's public acceptance is extremely limited. Today, vaccine hesitancy is a critical public health concern given rising vaccine hesitancy following the COVID-19 pandemic and increased politicization of vaccines worldwide (5). One study demonstrated how 25.6% of South Africans reported experiences with the COVID-19 vaccine process made them less likely to vaccinate themselves in the future (6). In a global survey of 23 countries during June-July 2022, South Africa reported the highest COVID vaccine hesitancy at 52.1% (7). In preparing for a TB vaccine campaign, vaccine acceptability studies are critical to identify drivers of uptake which in turn inform demand creation strategies, build programmatic ambition among key stakeholders, and support effective and equitable vaccine rollout (8,9). This is particularly important in high TB-burden communities like South Africa or people living with HIV (PWH).

To address this gap, ambulatory adult PWH were surveyed in South Africa to assess their acceptance and confidence in a potential TB vaccine. Sociodemographic factors associated with

acceptability, health information sources, and preferred vaccination settings were also explored. This sampled cohort represents a key recipient population for a TB vaccine given the burden of TB, multidrug-resistant (MDR) TB, HIV-associated TB, and TB mortality rates among PWH in South Africa are among the highest worldwide (2,10).

Acceptability of potential TB vaccine was hypothesized to be similar to acceptance of overall vaccines which is about 75.5% in South Africa (11). This was an exploratory analysis, but based on acceptability studies of COVID, HPV, and childhood immunizations in South Africa, vaccine acceptability was hypothesized to be inversely associated with young age (12–15), higher perceived risk of disease (16), concerns about vaccine safety or efficacy (12,14–17), and social media use for health information (12,13).

Methods

Study design: The TB vaccine acceptability survey was a cross-sectional, observational study nested within the DROP-TB study. DROP-TB was a prospective cohort study evaluating TB disease prevalence among PWH at the time of HIV care entry using a novel urine lipoarabinomannan (LAM) TB diagnostic test and followed participants for 12 months to assess incident TB (18). Eligible participants presenting for HIV care at two public health clinics were invited to participate in DROP-TB. Written consent was required for enrollment. At study enrollment, participants underwent a baseline clinical exam and provided samples for routine and investigative testing including HIV and TB labs. They answered standardized questions about demographic and clinical history including age, sex, education, region of residence, locality (rural/urban), children, employment status, COVID-19 vaccine status, personal and family TB history, and religion (see example in Appendix). Participants in DROP-TB attended quarterly

follow-up visits (either in person or by phone) for one year after the baseline visit, where they completed questions about antiretroviral therapy (ART). The vaccine acceptability survey was added to DROP-TB follow-up visits beginning in June 2024 and was administered once per participant at either the 6, 9, or 12-month follow-up visit.

Setting: The DROP-TB study and vaccine acceptability survey sub-study were conducted at two public Department of Health primary care clinics in the uMkhanyakude district of the KwaZulu-Natal province of South Africa. One was a large, peri-urban clinic and one a small, rural clinic. DROP-TB study enrollment took place between December 2021 and May 2024 and the vaccine confidence survey was conducted beginning June 2024 and ending October 2024.

Participants: Respondents for the vaccine acceptability survey included 225 DROP-TB participants presenting at their study follow-up visit as above. DROP-TB eligibility criteria included: age ≥ 18 years; presenting to the study site clinics; a positive HIV test documented in the medical chart; initiating or reinitiating ART; naïve or had not received ART within the prior 90 days; had not received TB therapy within the prior 90 days; able and willing to provide written informed consent for study procedures; and residing in the study area. In 2022, DROP-TB enrollment was augmented by co-enrolling participants in the Africa Health Research Institute Household Contact Study (AHCOS) (19). Co-enrolled AHCOS participants were adult PWH, including those already on ART, with a new positive test result for TB but not yet on TB treatment. All were eligible for DROP-TB. All DROP-TB participants in follow-up were invited to participate in the vaccine confidence survey.

TB Acceptability Survey Instrument: This survey was designed to specifically assess TB vaccine acceptability and confidence. The questions were adapted from the standardized Vaccine Confidence Project's (VCP) Vaccine Confidence Index (VCI), which explores perceptions towards the importance, safety, effectiveness, and compatibility of vaccines with beliefs (20). This was the first application of the VCI in South Africa, and the study team included members from VCP who had previously worked on HPV vaccine confidence assessments (21). The team revised successive iterations of the TB vaccine acceptability survey until arriving at the final version which covered the following themes: perception of TB as a health problem, perception of a potential TB vaccine, willingness and timing to receive a TB vaccine, concern for contracting TB relative to other infections, perception of general and TB-specific vaccine safety, effectiveness, and importance, preferred platform for a TB vaccine, willingness to participate in TB vaccine clinical trials, preferred location to receive a TB vaccine, and sources of general or TB-specific health information. For the full survey, see Appendix 1.

Vaccine confidence and acceptability were defined as follows:

Vaccine confidence: according to the WHO, the belief that vaccines are effective, safe, and part of a trustworthy medical system. Low vaccine confidence is distinct from, but may contribute to, vaccine hesitancy (22).

Vaccine acceptability: interpreted in this paper as the opposite of vaccine hesitancy, which the WHO defines as the delay in acceptance or refusal of vaccination despite availability of vaccination services (22).

Accordingly, vaccine acceptability was represented by the composite of the questions about vaccine willingness and time of receipt:

Vaccine willingness survey prompt: *Scientists are developing new vaccines to prevent tuberculosis (TB). Several TB vaccines are being tested in clinical trials right now. If a vaccine is shown to be successful in a clinical trial...how willing would you be to accept the vaccine?*

Vaccine timing of receipt survey prompt: *How soon would you receive a tuberculosis (TB) vaccine that is approved for use in South Africa and available to you personally?*

Vaccine confidence was derived from the questions about TB vaccine safety and effectiveness. Participant's trust in the medical system was not directly assessed, but patients were asked about their preferred source of health information and location to receive a vaccine.

Data collection: Survey questions for this vaccine acceptability study were added to follow-up visit questions for DROP-TB. To maintain participant confidentiality, the acceptability data was collected using non-identifying, participant study identification numbers. Participants were reminded of the voluntary nature and confidentiality of this additional acceptability survey with the right to stop answering or decline to answer at any point. A study nurse administered the survey in the participant's preferred language (English or isiZulu) in person or by telephone. Responses were recorded electronically on a tablet in the REDCap database by the study nurse.

Data analysis: R version 2024.09.1+394 software was used to perform statistical analysis (Foundation for Statistical Computing, Vienna, Austria). Descriptive statistics were used for all variables by reporting the frequency and proportion of responses to each question. Kruskal-Wallis analyses were used given the ordinal nature of the outcome, non-normal distribution of data, and small sample size. This was an exploratory analysis but to avoid multiple comparisons test variables were selected based on existing literature on the acceptability of COVID, HPV, and childhood immunizations. These included: demographic factors (age, gender, geographic location, religion, highest level of education, employment status, COVID-19 vaccination status); personal TB history; family TB history; perceptions of safety, efficacy, and importance for overall vaccines versus a potential TB vaccine; compatibility of vaccines with participant's religion; perceptions of TB (importance in community, concern for contracting TB, concern for family contracting TB); and use of social media for health information. For several variables, response categories with small counts were combined where appropriate to ensure sufficient sample size for statistical testing. Exact combinations can be seen in the appendix. For variables with more than two categories that were significant, post-hoc Dunn's testing with Bonferroni's correction was performed to examine pairwise comparisons within that variable. An alpha-value of 0.05 was considered significant.

Results

A total of 225 participants were surveyed, 129 (57%) of whom were female and all 225 (100%) of whom were Black African. Participants had a median age of 34 years (IQR 27-42) and median baseline CD4 count of 338 (IQR: 179-514) (Table 1). Full demographic characteristics are

described in Table 1 below. Of note among this group, 64 (28%) reported a personal history of TB, 92 (41%) were living with someone with TB at the time of survey, 216 (96%) had ever lived someone with TB, and 173 (77%) had never received a COVID-19 vaccine.

Variables	n (% total)
Sex	
Female	129 (57)
Male	96 (43)
Age (Years) / Median (IQR)	34 (27-42)
Age Groups (Years)	
18-24	36 (16)
25-34	81 (36)
35-44	63 (28)
45-54	33 (15)
55+	12 (5)
CD4 (Count) / Median (IQR)	338 (179-514)
<50	9 (4)
50-199	52 (23)
>200	161 (72)
Unknown	3 (1)

Race/ethnicity

Black	225 (100)
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Geographic Residence

Urban/peri-urban	100 (44)
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Rural	125 (56)
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Marital Status

In a relationship, not living with partner, not married	154 (68)
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Living with a partner, not married	19 (8)
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Married, one spouse	15 (7)
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Single	36 (16)
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Don't know/Prefer not to say / Unanswered	1 (0)
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Children in House

Don't know/Prefer not to say	1 (0)
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No	22 (10)
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Yes	202 (90)
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Education Level

Primary (grade 1-7)	31 (14)
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Secondary (grade 8-12)	185 (82)
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Tertiary and above	1 (0)
Unknown	8 (4)

Employment

Employed, formal sector (regular wage/salary)	42 (19)
Employed, informal sector (e.g., piece work, informal trader, etc.)	30 (13)
Student or Educational bursary	12 (5)
Unemployed, receives social grants	51 (23)
Unemployed, supported on another person's social grant	90 (40)

Religion

Christian	221 (98)
Islam	1 (0)
No religion	3 (1)

COVID Vaccine Status

No vaccine	173 (77)
Yes, fully vaccinated (e.g., 2 doses Pfizer or 1 dose J&J)	3 (1)
Yes, Partial vaccination (e.g., 1 dose of Pfizer)	49 (22)

Current or Prior TB Diagnosis

No	161 (72)
Yes	64 (28)

Family/Household Member Has/Ever Had TB

No	9 (4)
Yes	216 (96)

Table 1: Clinical and demographic characteristics of respondents to the TB Vaccine

Acceptability Survey

All 225 (100%) participants felt TB is a somewhat, very, or extremely important problem in the community and it is important for scientists to find a new vaccine to prevent TB disease. All 225 (100%) reported they were somewhat, very, or extremely concerned for contracting TB compared to influenza (107, 48%), COVID-19 (61, 28%), malaria (6, 3%), or measles (50, 23%). All 225 (100%) were somewhat, very, or extremely concerned about a family member contracting TB compared to influenza (103, 57%), measles (114, 51%), COVID-19 (69, 31%), or malaria (27, 12%).

All 225 (100%) participants strongly or tended to agree it was important for people of all ages to have vaccines and for scientists to discover a new TB vaccine. Equally, 163 (72%) tended to agree and 60 (27%) strongly agreed a new TB vaccine is important. As seen in Figure 1, 181 (80%) participants tended to and 29 (13%) strongly agreed a TB vaccine would be safe while 165 (73%) tended to agree and 56 (25%) strongly agreed a TB vaccine would be effective. Similarly, 185 (82%) participants tended to agree and 24 (11%) strongly agreed vaccines overall are safe while 164 (73%) tended to agree and 54 (24%) strongly agreed vaccines overall are effective. Only small numbers of participants disagreed, were unsure, or did not answer.

Regarding vaccine platforms to prevent TB, 219 (98%) participants said “definitely” or “leaning towards yes” to being willing to receive a live attenuated vaccine like BCG; 200 (89%) to a protein subunit vaccine like hepatitis B, 90 (40%) to an mRNA vaccine like Pfizer or Moderna, and 45 (20%) to a viral vector vaccine like J&J. All (225, 100%) strongly or tended to agree to participating in a clinical trial to test a new TB vaccine and 84% to their child participating. All (225, 100%) were willing to talk to other people about getting a TB vaccine. When asked if vaccines overall were compatible with their religion, 76 (34%) agreed, 87 (39%) tended to disagree, and 62 (28%) strongly disagreed.

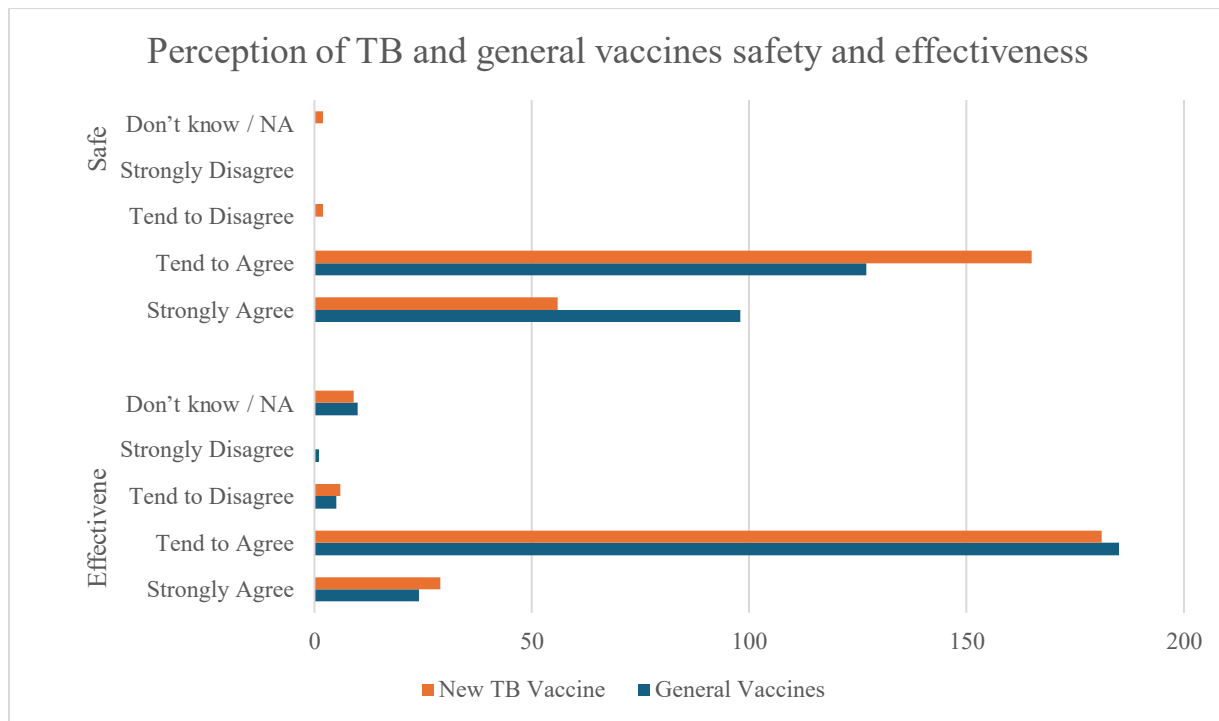


Figure 1: Confidence in general vaccines and a potential TB vaccine, as represented by participant perception of vaccine safety and effectiveness. X-axis represents count.

Table 2 demonstrates vaccine acceptability. For willingness to get a potential TB vaccine, 198 (88%) responded “Definitely yes” and (27)12% “Unsure, leaning yes” with nobody responding,

“leaning no” or “definitely no.” For timing of vaccination, 118 (52%) would take a potential TB vaccine immediately, 107 (48%) would wait ≥ 6 months. Taken together, vaccine acceptability was reflected as 112 (50%) participants responding definitely yes, as soon as available to a potential TB vaccine, 86 (38%) responding definitely yes, but wait at least six months, and 27 (12%) responding unsure, leaning towards yes, any timeline.

Survey Prompt	Response	All n (% total)
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TB Vaccine Perceptions: Scientists are developing new vaccines to prevent tuberculosis (TB).

Several new TB vaccines are being tested in clinical trials right now.

<u>Willingness:</u> If a new TB vaccine is shown to be successful, would you be willing to take it?	Definitely yes	198 (88)
	Unsure, leaning towards yes	27 (12)
	Definitely no or unsure, leaning towards no	0 (0)

<u>Timing:</u> How soon would you receive a tuberculosis (TB) vaccine that is approved for use in South Africa and available to you personally?	As soon as it is available to me	118 (52)
	I would wait < 6 months	88 (39)
	I would wait between 6-12 months	17 (8)
	I would wait more than a year	2 (1)

Vaccine Acceptability:

Definitely yes, as soon as available	112 (50)
Definitely yes, but wait at least 6 months	86 (38)
Unsure, leaning yes, any timeline	27 (12)

Table 2: Willingness to receive a potential TB vaccine, timeline of receipt, and acceptability as a composite variable of both.

As seen in Figure 2, participants were asked about people they would turn to and sources of information they would access for TB and general health information with multiple answers permitted. The most common sources of TB information were NGOs or community support organizations (202, 92%), a family doctor or personal health provider (201, 92%), government websites (190, 87%), or international health authorities (Africa CDC, WHO) (191, 87%). The most common sources of general health information were NGOs or community support organizations (215, 98%), family members (213, 97%), a family doctor or personal healthcare provider (213, 97%), government websites (208, 95%), traditional news like television and radio (207, 95%), international health authorities (203, 93%), other government communications online like social media (201, 92%), and online or paper newspapers (199, 91%). Of note, for both questions, few people selected social media influencers or social media (<5%).

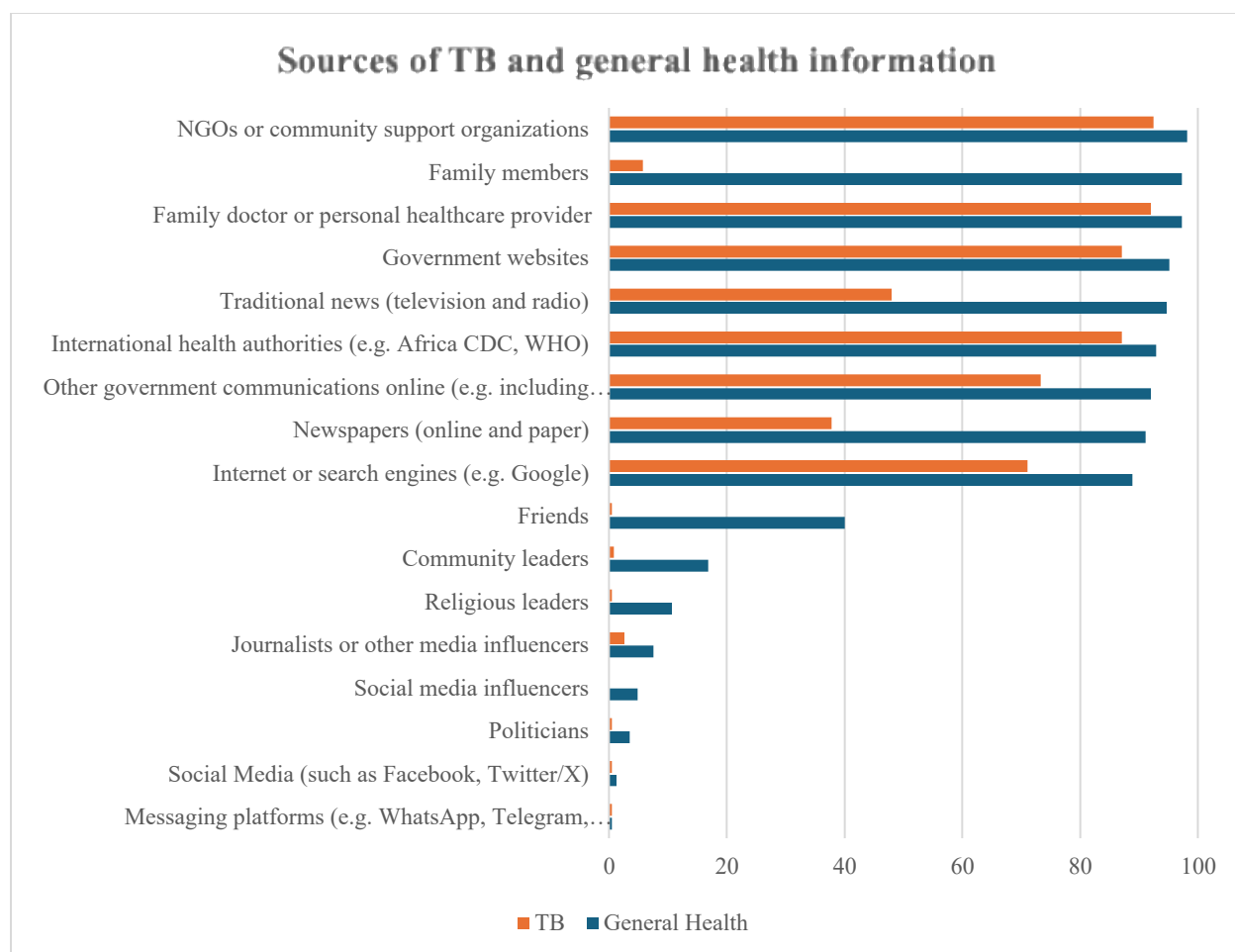


Figure 2: Information sources for general health and TB, shown as % participants responding yes per category. Sources were asked independently and multiple answers were permitted.

Participants were asked, “Which of the following would you use to access news or information about: 1) Your general health and 2) Tuberculosis (TB)” and “Which of the following people / types of people would you turn to for information about: 1) Your general health and 2) Tuberculosis.”

As seen in Figure 3, most participants reported a preference to receive a TB vaccine in a community-based setting, such as a community center, meeting hall, local shop, or school (186, 85%). Following this, 41 (18%) would receive the vaccine at a mobile vaccination center. Few

preferred to obtain the vaccine at a health center / clinic (16, 7%), hospital (5, 2%), pharmacy (17, 8%), work (11, 5%), dedicated vaccination center (1, <1%), or place of worship (0, 0%).

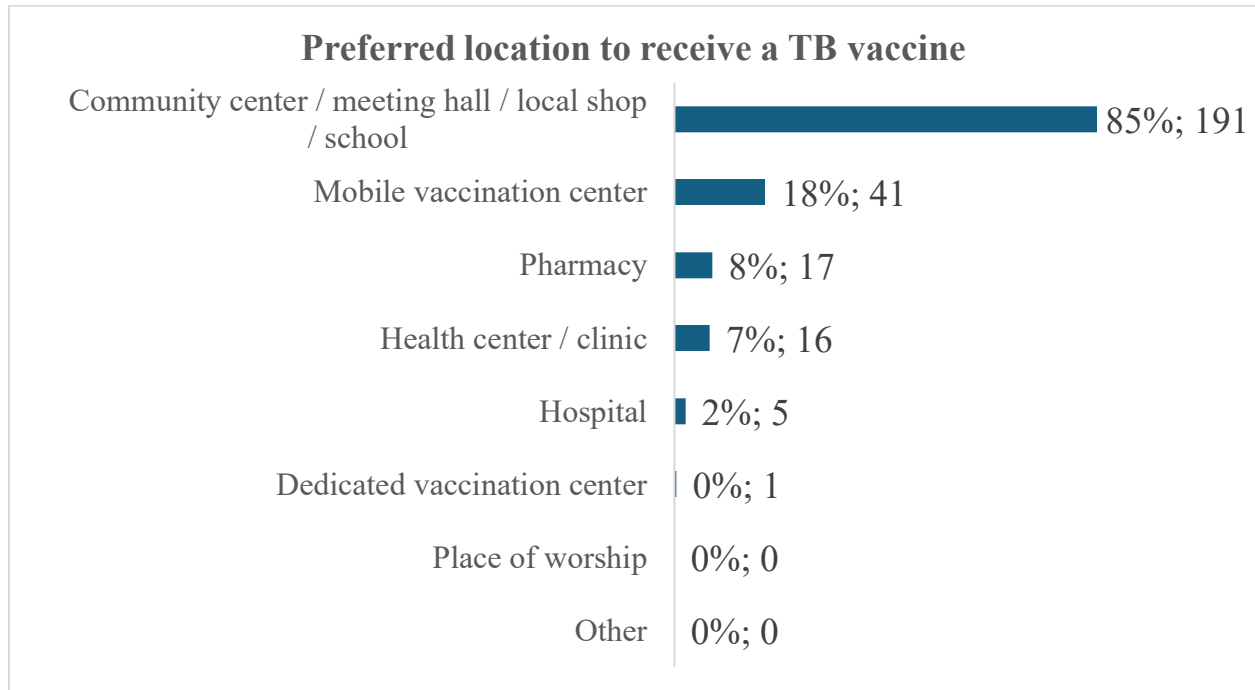


Figure 3: Preferred location to receive a TB vaccine. Participants were asked, “If a new tuberculosis (TB) were available, WHERE would you prefer to get one? Please list as many locations as apply (%;N)”

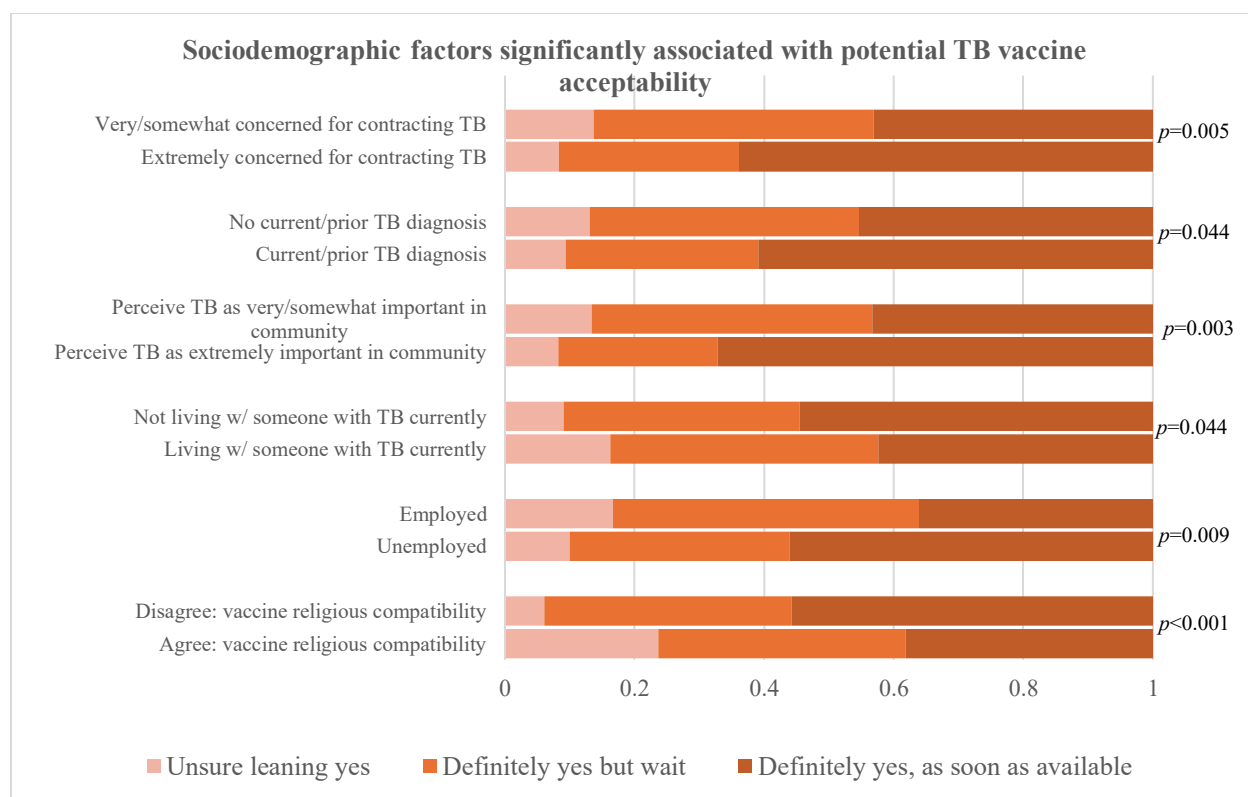


Figure 4: Sociodemographic factors significantly associated with acceptability of a potential TB vaccine. Unless otherwise noted, all other variables tested were not significantly associated with vaccine acceptability in this sample.

As seen in Figure 4, vaccine acceptability was observed to be significantly greater in participants who were extremely concerned about contracting TB ($p=0.017$), had a history of TB ($p=0.044$), perceived TB as an extremely important community health issue ($p = 0.002$), were unemployed ($p=0.009$), or disagreed vaccines were compatible with their religion ($p<0.001$). As 96% of participants had ever lived with someone with TB, focus was placed on the time of survey administration; vaccine acceptability was significantly lower in participants who currently lived with someone with TB ($p=0.044$). Age, sex, employment status, education level, geographic location, and COVID-19 vaccine status use were not significantly associated with TB vaccine

acceptability. Perception of vaccine importance and effectiveness were skewed towards participants tending to agree, and comparison of those strongly agreeing versus tending to agree within these categories was not significant. High skew in religion (98% Christian), social media use for TB information (1%), and perception of vaccine safety (>85% tending to agree) precluded meaningful analysis of these variables with vaccine acceptability.

Discussion

Acceptability and confidence in a potential TB vaccine were high among the respondents surveyed. Acceptability was observed to be greater in those who perceived TB to be an important community issue, had higher concern about contracting TB, had a history of TB, or were unemployed. Respondents widely preferred to receive a TB vaccine in a community space and preferred to receive general health or TB-specific information from health, government, and community authorities.

Comparison data for TB vaccine acceptability is extremely limited, though in a survey of 350 high-school students in Khayelitsha, South Africa, 84.1% would say yes to receiving a TB vaccine (23). In a small sample of Mozambican adults and adolescents, 77% reported willingness to receive a TB vaccine (24). In a Zambian sample of 499 adults, the adjusted probability that community members would definitely get a new TB vaccine was 76.9% among the general community and 82.6% for HCW (25). Lastly, in a survey of 449 pregnant, Kenyan women, 55% reported they would definitely intend to receive a TB vaccine (26). Acceptability of COVID-19, HPV, and childhood immunizations in South Africa has been lower (13,14,27). When the COVID-19 vaccine was first introduced in late 2020, only 76% of South Africans reported willingness to accept it (12).

Confidence in overall and TB-specific vaccine safety and effectiveness was notably high in the study. Most participants tended to agree that vaccines were safe and effective, with few disagreeing, precluding sufficient power to assess the relationship between vaccine acceptability and confidence. Nevertheless, a negative association has been previously demonstrated between vaccine acceptability and concerns about vaccine safety, efficacy, or side effects with COVID-19, HPV, and childhood immunizations (12,14–17).

Social desirability bias could have contributed to the high vaccine acceptability, confidence, and perception of importance seen in our study. However, the willingness of participants to report high levels (77%) of non-vaccination against COVID-19 vaccine seems protective against this. Additionally, while 28% of participants reported concern for contracting COVID-19, all 100% reported concern for contracting TB. Taken together, it seems the high vaccine acceptability could be driven more by high perceived risk of disease acquisition. This has also been demonstrated in Sub-Saharan African studies on HPV (16), COVID-19 (12,28), and TB (23,25). Indeed, South Africa has one of the highest burdens of TB globally (1), and 96% of our participants reported ever living with someone with TB. Additionally, in 2023, roughly 54% of TB cases in South Africa occurred in individuals living with HIV (10), so in our study population of exclusively PWH the perceived risk and consequent vaccine desirability may be even greater.

Regarding demographic factors, our study was similar to others on COVID, HPV, and childhood immunizations in finding no consistent association between vaccine acceptability and gender (12,13,15,17), rurality (15,29), or education level (6,12,13,15,30). As 100% of the study population identified as Black, an association with race/ethnicity was unable to be assessed. In contrast to other studies, an association between vaccine acceptability and older age was not

observed (12–15,29,31). This may be attributed to the more limited age range of our study participants, with only 12 participants being over 55 years old and no participants over 67 years old. A significant association was also found between vaccine acceptability and unemployment for which prior data is not consistent or even suggests the opposite (12,29). It is possible that these findings are unique to the small study sample but not generalizable to the entire population.

Some of our findings were unexpected. For instance, it was observed that participants who currently lived with someone with TB expressed less acceptability of a TB vaccine. In contrast, a study found that not knowing anyone who tested positive for COVID was associated with being more hesitant of the COVID vaccine (12). Qualitative analysis would be needed to contextualize this finding. Next, participants who felt vaccines were incompatible with their religion reported greater vaccine acceptability. This finding should be interpreted with caution given small counts of individuals in the ‘Unsure, leaning toward yes’ categories. By contrast, it has been previously described that compatibility of vaccines with religious beliefs is associated with greater COVID vaccine acceptability (6,13,15). Nevertheless, outreach to local Christian leaders could be an important strategy for TB vaccine campaigns as 67% of participants did not feel vaccines are compatible with their religion. Lastly, in today’s digital age, it was surprising that so few people reported receiving health information from social media, precluding meaningful analysis. In the literature, receiving vaccine information from social media was strongly associated with COVID vaccine hesitancy (12,13). It is reasonable to query if our findings are limited by small sample size or interacting factors that are not evaluated within the limits of an exploratory analysis.

In terms of platform, participants were more interested in a future TB vaccine that is like the BCG or hepatitis B than mRNA or viral vector vaccines used during COVID. As both

vaccines have been established in the South African childhood vaccination schedule since 1974 and 1995 respectively (32), perhaps this stems from participants' comfort with an older vaccine. Indeed, there was public concern during the COVID-19 pandemic that testing and development of the COVID vaccines was too rushed (13).

While this study did not directly assess participant's trust in health and government authorities, most respondents reported a preference to receive information on general health and TB specifically from community, health, and governmental authorities which supports some level of confidence in these entities. Of note, participants sought TB information much less from family members, friends, newspapers, or traditional news than they did for general health information. And in general, participants did not seek general or TB-specific health information from social media, journalists, media influencers, politicians, or religious leaders. These findings may importantly inform communication platforms in advance of a TB vaccine's introduction in countries like South Africa. As previous literature has demonstrated a significant association between vaccine acceptability and trust in government (6,15,17) or health care providers (15,27), future acceptability studies could also directly inquire about this subject.

Finally, this study importantly identified participants' strong preference to receive a TB vaccine in a community space such as a center, meeting hall, local shop, or school. Apart from mobile health clinics, participants generally did not choose to receive vaccines in dedicated health spaces like a hospital, health clinic, pharmacy, or vaccine center. Qualitative interviews would need to contextualize if this is related to health care accessibility, stigma, or another reason. Regardless, this result has major implications for selecting settings to administer the TB vaccine in future TB vaccine campaigns.

Strengths and Limitations

This was an exploratory analysis with multiple comparisons, therefore observed associations must be interpreted with caution as they are not designed for prediction nor account for interacting variables. Equally, the small sample size may limit interpretation of associations found. The quantitative nature of the study did not capture context behind unexpected findings, such as the association between vaccine acceptability and incompatibility of vaccines with religion or living with someone with TB. The study cohort was defined by the DROP-TB study protocol criteria which only included clinic-attending adults living with HIV so findings may not be generalizable to the entire population of potentially vaccine-eligible persons including adolescents, people without HIV, or people not in clinical care. Of note this survey included participants who were ART-naïve or off ART at baseline who are not representative of those PWH eligible for the recent M72/AS01E-4 phase III clinical trial that included South Africa (8); notably, all survey participants were taking ART at the time they completed the survey. Data was collected in one province of South Africa which may limit generalizability to other vaccine-eligible settings like Asia and Latin America where the TB epidemic is less HIV-driven. Asking participants about their confidence in the effectiveness of a potential TB vaccine has limitations as some vaccines like M72/AS01E are only ~50% effective (33). Future studies could also ask about trust in government and health authorities, misinformation or lack of information, stigma, or collective responsibility of vaccination which were noted to be associated with acceptability in prior studies on COVID, HPV, and childhood immunizations.

Strengths of the study include the highly relevant sample population for a TB vaccine. PWH in South Africa represent a likely priority recipient population for a TB vaccine given the high prevalence and mortality rate of TB among PWH and high burden of TB in South Africa

(2,10). The sample populations captured two geographic settings, rural and urban, which improves the generalizability of findings in South Africa. The study fills a critical gap in TB vaccine acceptability studies to date, which are time-sensitive given WHO's goal of introducing a TB vaccine by 2030.

Conclusions and Next Steps

A TB vaccine for adolescents and adults is projected to prevent 4.6-8.5 million deaths by 2050 and increase global gross domestic product by US\$1.6 trillion by 2080, making this a priority investment for global stakeholders (3). This exploratory analysis found that acceptability of and confidence in a potential TB vaccine were high among a sample of South African adults living with HIV. Acceptability was observed to be associated with greater perceived risk of TB disease, greater perceived importance of TB as a health problem in the community, and unemployment. Participants predominantly preferred community spaces (community center, hall, schools) as places to receive a TB vaccine followed by mobile health clinics. Participants preferred to receive TB information from government, health, and community entities and did not prefer traditional news (TV, radio, newspaper), friends, family, or social media as sources. These findings may inform public communication strategies, information platforms, and settings for administration for TB vaccine campaigns. There is an urgent need for further acceptability studies to understand drivers of vaccination across more high TB burden communities to increase vaccine demand and uptake.

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Ethical Approval

The study was approved by the University of Washington Institutional Review Board (Study 00006518), the University of KwaZulu-Natal Biomedical Research Ethics Committee (BREC/00001174/2020), and the London School of Hygiene and Tropical Medicine Ethics Committee (Ref. 21624). The study was also approved by the Health Research Committee of the KwaZulu-Natal Department of Health (NHRD KZ_202010_029).

Conflicts of Interest

Adrienne E. Shapiro, MD, PhD reports receiving grants to her institution from Merck and Gilead as a clinical trial investigator and is a consultant to Merck; Alexa Giovanatti, DO reports no conflicts of interest.

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Appendix

Survey:

Confidential

DROP TB
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Followup Questionnaire Tb Vacc

TB Vaccine & Clinic Change Questionnaire - Follow-up

Thank you for answering the follow-up questions. I would like to ask you a few more questions around issues which may be affecting the community in your area. Taking part in this survey is voluntary and you have the right to end the interview at any point, as well as refuse to answer any questions you feel uncomfortable with.

Your responses will help in improving understanding about the issues. The survey should take between 5-10 minutes to complete. Like all questions we ask in this study, it will be completely anonymous, and your name will not be attached to any of the information.

At which follow-up visit is this questionnaire being asked?

- ☐ Month 3
- ☐ Month 6
- ☐ Month 9
- ☐ Month 12
- ☐ Not at a follow-up visit

Date of visit/questionnaire completed:

Clinic Changes for ART

Have you changed the clinic where you collect ART since you joined this study?

- ☐ No
- ☐ Yes
- ☐ Refused

What was the reason you changed your clinic where you collect ART?

- ☐ Relocated
- ☐ Found employment
- ☐ Previous clinic was overcrowded
- ☐ Attitudes of nurses at the clinic
- ☐ Missed the clinic appointment date
- ☐ Other (specify)
- ☐ Refused

Other reason for changing ART clinic, specify:

Did you get a transfer letter from your previous clinic where you collected ART?

- ☐ No
- ☐ Yes
- ☐ Refused

What was the reason you did not get a transfer letter from the clinic?

- ☐ Have not had time to collect the transfer letter
- ☐ Did not have money to go back to the previous clinic to collect the transfer letter
- ☐ Scared to ask for a transfer letter from nurses
- ☐ Other (specify)
- ☐ Refused

Other reason for not getting a transfer letter, specify:

Additional Demographics

Do you have any children in your household under the age of 18?

- ☐ No
☐ Yes
☐ Don't know/Prefer not to say

Which religion, if any, do you practice?

- ☐ Islam
☐ Christian - Nazareth Baptist Church
☐ Christian - Zion Christian Church (ZCC)
☐ Christian - Zionist (Isiyoni)
☐ Christian - Roman Catholic
☐ Christian - Anglican
☐ Christian - Seventh Day Adventist
☐ Christian, Other (specify)
☐ Other (specify)
☐ No religion
☐ Don't know/prefer not to say

Religion, Other (specify):

Perceptions of TB Importance as a Health Problem

Have you ever had tuberculosis (TB)?

- ☐ No
☐ Yes
☐ Don't know
☐ Refused

Has a person in your household ever had tuberculosis (TB)?

- ☐ No
☐ Yes
☐ Don't know
☐ Refused

How important do you think tuberculosis is as a health problem for people in your community?

- ☐ Extremely important
☐ Very important
☐ Somewhat important
☐ Not very important
☐ Not at all important
☐ Don't know
☐ Refused

How concerned are you that YOU might contract the following diseases:

	Extremely concerned	Very concerned	Somewhat concerned	Not very concerned	Not at all concerned	Don't know	Refused
Malaria	☐	☐	☐	☐	☐	☐	☐
Tuberculosis (TB)	☐	☐	☐	☐	☐	☐	☐
COVID-19	☐	☐	☐	☐	☐	☐	☐
Measles	☐	☐	☐	☐	☐	☐	☐
Influenza	☐	☐	☐	☐	☐	☐	☐

How concerned are you that someone in your family or household might contract the following diseases:

	Extremely concerned	Very concerned	Somewhat concerned	Not very concerned	Not at all concerned	Don't know	Refused
Malaria	☐	☐	☐	☐	☐	☐	☐
Tuberculosis (TB)	☐	☐	☐	☐	☐	☐	☐
COVID-19	☐	☐	☐	☐	☐	☐	☐
Measles	☐	☐	☐	☐	☐	☐	☐
Influenza	☐	☐	☐	☐	☐	☐	☐

TB Vaccine Perceptions

Scientists are developing new vaccines to prevent tuberculosis (TB). Several new TB vaccines are being tested in clinical trials right now.

If a new TB vaccine is shown to be successful in a clinical trial, would you be willing to take the new vaccine?

- ☐ Definitely yes
☐ Unsure, leaning towards yes
☐ Unsure, leaning towards no
☐ Definitely no
☐ Don't know
☐ Refused

How soon would you receive a tuberculosis (TB) vaccine that is approved for use in South Africa and available to you personally?

- ☐ As soon as it is available to me
☐ I would wait at least 6 months
☐ I would wait between 6-12 months
☐ I would wait more than a year
☐ Don't know
☐ Refused

And how important do you think it is for scientists to find a new vaccine to prevent tuberculosis (TB) disease?

- ☐ Extremely important
☐ Very important
☐ Somewhat important
☐ Not very important
☐ Not at all important
☐ Don't know
☐ Refused

Agree or Disagree

If there is a TB vaccine developed in the next 6-12 months, how strongly would you agree or disagree with the following statements?

	Strongly agree (1)	Tend to agree (2)	Tend to disagree (3)	Strongly disagree (4)	Don't know	Refused
I think a new TB vaccine would be safe	☐	☐	☐	☐	☐	☐

I think a new TB vaccine would be important	☐	☐	☐	☐	☐	☐
I think a new TB vaccine would be effective	☐	☐	☐	☐	☐	☐

How strongly do you agree or disagree with each of the following statements about vaccines in general?

	Strongly agree (1)	Tend to agree (2)	Tend to disagree (3)	Strongly disagree (4)	Don't know	Refused
Vaccines are important for people of all ages to have	☐	☐	☐	☐	☐	☐
Vaccines are important for children to have	☐	☐	☐	☐	☐	☐
Overall, I think vaccines are safe	☐	☐	☐	☐	☐	☐
Overall, I think vaccines are effective	☐	☐	☐	☐	☐	☐
Vaccines are compatible with my religious beliefs	☐	☐	☐	☐	☐	☐

There are several different types of vaccines currently being tested to prevent tuberculosis (TB) disease.

How willing would you be to take the following type of vaccine:

	Definitely yes (1)	Unsure, leaning towards yes (2)	Unsure, leaning towards no (3)	Definitely no (4)	Don't know	Refused
An mRNA vaccine to prevent TB (similar to mRNA vaccines to prevent COVID - like Moderna or Pfizer)	☐	☐	☐	☐	☐	☐
A protein subunit vaccine to prevent TB (similar to the hepatitis B vaccine)	☐	☐	☐	☐	☐	☐
A viral vector vaccine to prevent TB (similar to the J&J vaccine to prevent COVID)	☐	☐	☐	☐	☐	☐
A live attenuated vaccine to prevent TB (a weakened form of the TB bacteria is used - similar to the BCG vaccine currently given to babies to prevent severe TB)	☐	☐	☐	☐	☐	☐

TB Vaccine Clinical Trial Participation

How willing would YOU be to participate in a clinical trial testing a new tuberculosis (TB) vaccine to prevent TB?

- ☐ Extremely willing
☐ Very willing
☐ Somewhat willing
☐ Not very willing
☐ Not at all willing
☐ Don't know
☐ Refused

How willing would you be to allow YOUR CHILD to participate in a clinical trial testing a new tuberculosis (TB) vaccine to prevent TB?

- ☐ N/A - don't have children
☐ Extremely willing
☐ Very willing
☐ Somewhat willing
☐ Not very willing
☐ Not at all willing
☐ Don't know
☐ Refused

If you were to receive a new tuberculosis (TB) vaccine, would you be willing to talk to others (become a TB vaccine champion) about getting a TB vaccine?

- ☐ No
☐ Yes
☐ Don't know
☐ Refused

If a new tuberculosis (TB) vaccine were available, WHERE would you prefer to get one? Please list as many locations as apply.

[Prompt after the participant gives an answer:]

Anyplace else?

- ☐ Hospital
☐ Health centres/Clinic
☐ Community centre / meeting hall / local shop / hall / school
☐ Workplace
☐ Pharmacy
☐ Mobile vaccination centre
☐ Dedicated vaccination centre
☐ Place of worship
☐ Other (please specify)
☐ Don't know
☐ Refused

Other preferred TB vaccine location:

Sources of Information

Which of the following would you use to access news or information about:

1) Your general health

2) Tuberculosis (TB)

	About your general health	About tuberculosis (TB)
Traditional news (television and radio)	☐	☐
Newspapers (online and paper)	☐	☐
Social Media (such as Facebook, Twitter/X)	☐	☐

Government websites	☐	☐
Other government communications online (e.g. including on social media)	☐	☐
The internet or search engines (e.g. Google)	☐	☐
Messaging platforms (e.g. WhatsApp, Telegram, Messenger, etc)	☐	☐
Other (please specify)	☐	☐
None of the above	☐	☐
Don't know	☐	☐
Refused	☐	☐

Other information source (general health):

Other information source (TB):

Which of the following people / types of people would you turn to for information about:

1) Your general health

2) Tuberculosis (TB)

	About your general health	About tuberculosis (TB)
Family members	☐	☐
Your family doctor or personal healthcare provider	☐	☐
Religious leaders	☐	☐
Community leaders	☐	☐
Friends	☐	☐
Social media influencers	☐	☐
Politicians	☐	☐
Journalists or other media influencers	☐	☐
NGOs or community support organisations	☐	☐
International health authorities (e.g. Africa CDC, WHO)	☐	☐
None of the above	☐	☐
Don't know	☐	☐
Refused	☐	☐

In your family or community, WHO would have the final say about whether or not you would take a new tuberculosis (TB) vaccine?

- ☐ Me
- ☐ My spouse/partner
- ☐ My mother
- ☐ My father
- ☐ My mother-in-law
- ☐ My father-in-law
- ☐ My daughter(s)
- ☐ My son(s)
- ☐ My community leader
- ☐ My religious leader
- ☐ My employer
- ☐ Someone else
- ☐ Don't know
- ☐ Refused

That was the last question. Thank you for your answers and for participating in this study.

Survey Response Data

Metric	n (%)
Total sample size	225
Sex	
Female count	129 (57.3)
Male	96 (42.7)
Age Group	
18-24	36 (16.0)
25-34	81 (36.0)
35-44	63 (28.0)
45-54	33 (14.7)
55+	12 (5.3)
Race/ethnicity	
Black	225 (100)
White	0 (0.0)
Coloured	0 (0.0)
Indian	0 (0.0)
Other (specify)	0 (0.0)
Marital Status	
In a relationship, not married	154 (68.4)
Living with a partner, not married	19 (8.4)
Married, one spouse	15 (6.7)
Single	36 (16.0)
<NA>	1 (0.4)
Kids in House	
Don't know/Prefer not to say	1 (0.4)
No	22 (9.8)
Yes	202 (89.8)
Urbanicity/Rurality	
Urban/peri-urban	100 (44.4)
Rural	125 (55.6)
Education Level	
Primary (grade 1-7)	31 (13.8)
Secondary (grade 8-12)	185 (82.2)
Tertiary and above	1 (0.4)
Unknown / No answer	8 (3.6)
Employment	
Employed, formal sector (regular wage/salary)	42 (18.7)

Employed, informal sector (e.g., piece work, informal trader, etc.)	30 (13.3)
Student or Educational bursary	12 (5.3)
Unemployed, receives social grants	51 (22.7)
Unemployed, supported on another person's social grant	90 (40.0)
Religion	
Christian - Anglican	13 (5.8)
Christian - Nazareth Baptist Church	50 (22.2)
Christian - Roman Catholic	52 (23.1)
Christian - Seventh Day Adventist	3 (1.3)
Christian - Zion Christian Church (ZCC)	35 (15.6)
Christian - Zionist (isiyoni)	68 (30.2)
Islam	1 (0.4)
No religion	3 (1.3)
History of TB Diagnosis	
No	161 (71.6)
Yes	64 (28.4)
Family/Household Member Has/Ever Had TB	
No	9 (4.0)
Yes	216 (96.0)
Perception/Importance of TB as Health Problem	
Extremely important	61 (27.1)
Very important	156 (69.3)
Somewhat important	8 (3.6)
Concern of Contracting Malaria	
Don't know	5 (2.2)
Not at all concerned	156 (69.3)
Not very concerned	57 (25.3)
Somewhat concerned	3 (1.3)
Very concerned	4 (1.8)
Concern of Contracting TB	
Extremely concerned	72 (32.0)
Very concerned	149 (66.2)
Somewhat concerned	4 (1.8)
Concern of Contracting COVID-19	
Extremely concerned	2 (0.9)
Very concerned	11 (4.9)
Somewhat concerned	49 (21.8)
Not very concerned	94 (41.8)
Not at all concerned	67 (29.8)
Don't know	1 (0.4)
<NA>	1 (0.4)

Concern of Contracting Measles	
Extremely concerned	1 (0.4)
Very concerned	8 (3.6)
Somewhat concerned	42 (18.7)
Not very concerned	92 (40.9)
Not at all concerned	79 (35.1)
Don't know	3 (1.3)
Concern of Contracting Influenza	
Very concerned	11 (4.9)
Somewhat concerned	96 (42.7)
Not very concerned	84 (37.3)
Not at all concerned	34 (15.1)
Concern Family/Household Member Will Contract Malaria	
Very concerned	4 (1.8)
Somewhat concerned	23 (10.2)
Not very concerned	69 (30.7)
Not at all concerned	127 (56.4)
Don't know	2 (0.9)
Concern Family/Household Member Will Contract TB	
Extremely concerned	79 (35.1)
Somewhat concerned	1 (0.4)
Very concerned	145 (64.4)
Concern Family/Household Member Will Contract COVID-19	
Extremely concerned	1 (0.4)
Very concerned	11 (4.9)
Somewhat concerned	57 (25.3)
Not very concerned	100 (44.4)
Not at all concerned	50 (22.2)
Don't know	2 (0.9)
<NA>	4 (1.8)
Concern Family/Household Member Will Contract Measles	
Very concerned	9 (4.0)
Somewhat concerned	105 (46.7)
Not very concerned	82 (36.4)
Not at all concerned	29 (12.9)
Concern Family/Household Member Will Contract Influenza	
Very concerned	11 (4.9)
Somewhat concerned	118 (52.4)
Not very concerned	78 (34.7)
Not at all concerned	18 (8.0)
COVID Vaccine Status	

No vaccine	173 (76.9)
Yes, fully vaccinated (e.g., 2 doses Pfizer or 1 dose J&J)	3 (1.3)
Yes, Partial vaccination (e.g., 1 dose of Pfizer)	49 (21.8)
If a New TB Vaccine is Shown to Be Successful, Would You Be Willing to Take It?	
Definitely yes	198 (88.0)
Unsure, leaning towards yes	27 (12.0)
TB Vaccine Timeline	
As soon as it is available to me	118 (52.4)
I would wait at least 6 months	88 (39.1)
I would wait between 6-12 months	17 (7.6)
I would wait more than a year	2 (0.9)
Importance of Scientists to Discover New TB Vaccine	
Extremely important	62 (27.6)
Very important	147 (65.3)
Somewhat important	16 (7.1)
Belief New TB Vaccine Would Be Safe	
Strongly agree	29 (12.9)
Tend to agree	181 (80.4)
Tend to disagree	6 (2.7)
Don't know	9 (4.0)
I Think a New TB Vaccine Would Be Important	
Strongly agree	60 (26.7)
Tend to agree	163 (72.4)
Tend to disagree	2 (0.9)
I Think a New TB Vaccine Would Be Effective	
Strongly agree	56 (24.9)
Tend to agree	165 (73.3)
Tend to disagree	2 (0.9)
Don't know	2 (0.9)
Vaccines Are Important for People of All Ages to Have	
Strongly agree	98 (43.6)
Tend to agree	127 (56.4)
Vaccines Are Important for Children to Have	
Strongly agree	82 (36.4)
Tend to agree	142 (63.1)
Don't know	1 (0.4)
Overall, I Think Vaccines Are Safe	
Strongly agree	24 (10.7)
Tend to agree	185 (82.2)
Tend to disagree	5 (2.2)

Strongly disagree	1 (0.4)
Don't know	10 (4.4)
Overall, I think vaccines are effective	
Strongly agree	54 (24.0)
Tend to agree	164 (72.9)
Tend to disagree	3 (1.3)
Don't know	3 (1.3)
<NA>	1 (0.44)
Vaccines are compatible with my religious beliefs	
Strongly agree	4 (1.8)
Tend to agree	72 (32.0)
Tend to disagree	87 (38.7)
Strongly disagree	62 (27.6)
An mRNA vaccine to prevent TB (similar to mRNA vaccines to prevent COVID - like Moderna or Pfizer)	
Definitely yes	10 (4.4)
Unsure, leaning towards yes	80 (35.6)
Unsure, leaning towards no	28 (12.4)
Definitely no	107 (47.6)
A protein subunit vaccine to prevent TB (similar to the hepatitis B vaccine)	
Definitely yes	7 (3.1)
Unsure, leaning towards yes	193 (85.8)
Unsure, leaning towards no	7 (3.1)
Definitely no	18 (8.0)
A viral vector vaccine to prevent TB (similar to the J&J vaccine to prevent COVID)	
Unsure, leaning towards yes	45 (20.0)
Unsure, leaning towards no	41 (18.2)
Definitely no	138 (61.3)
Don't know	1 (0.4)
A live attenuated vaccine to prevent TB (a weakened form of the TB bacteria is used - similar to the BCG vaccine)	
Definitely yes	58 (25.8)
Unsure, leaning towards yes	161 (71.6)
Unsure, leaning towards no	2 (0.9)
Definitely no	3 (1.3)
Don't know	1 (0.4)
How willing would YOU be to participate in a clinical trial testing a new tuberculosis (TB) vaccine to prevent TB?	
Extremely willing	56 (24.9)
Very willing	140 (62.2)

Somewhat willing	28 (12.4)
<NA>	1 (0.4)
How willing would you be to allow YOUR CHILD to participate in a clinical trial testing a new tuberculosis (TB) vaccine to prevent TB?	
Extremely willing	1 (0.4)
Very willing	70 (31.1)
Somewhat willing	119 (52.9)
Not very willing	31 (13.8)
Not at all willing	3 (1.3)
N/A - don't have children	1 (0.4)
If you were to receive a new tuberculosis (TB) vaccine, would you be willing to talk to others (become a TB vaccine champion) about getting a TB vaccine?	
Yes	224 (99.6)
<NA>	1 (0.4)
If a new tuberculosis (TB) vaccine were available, WHERE would you prefer to get one? Please list as many locations as apply:	
Hospital	
Checked	5 (2.2)
Unchecked	220 (97.8)
Health centres/clinic	
Checked	16 (7.1)
Unchecked	209 (92.9)
Community centre / meeting hall / local shop / hall / school	
Checked	191 (84.9)
Unchecked	34 (15.1)
Workplace	
Checked	11 (4.9)
Unchecked	214 (95.1)
Pharmacy	
Checked	17 (7.6)
Unchecked	208 (92.4)
Mobile vaccination centre	
Checked	41 (18.2)
Unchecked	184 (81.8)
Dedicated vaccination centre	
Checked	1 (0.4)
Unchecked	224 (99.6)
Place of worship	
Unchecked	225 (100)
Sources of Information Which of the following	

would you use to access news or information about 1) Your general health 2) Tuberculosis (TB)	
Traditional news (television and radio) (choice=About your general health)	
Checked	213 (94.7)
Unchecked	12 (5.3)
Traditional news (television and radio) (choice=About tuberculosis (TB))	
Checked	108 (48)
Unchecked	117 (52)
Newspapers (online and paper) (choice=About your general health)	
Checked	205 (91.1)
Unchecked	20 (8.9)
Newspapers (online and paper) (choice=About tuberculosis (TB))	
Checked	85 (37.8)
Unchecked	140 (62.2)
Social Media (such as Facebook. Twitter/X) (choice=About your general health)	
Checked	3 (1.3)
Unchecked	222 (98.7)
Social Media (such as Facebook. Twitter/X) (choice=About tuberculosis (TB))	
Checked	1 (0.4)
Unchecked	224 (99.6)
Government websites (choice=About your general health)	
Checked	214 (95.1)
Unchecked	11 (4.9)
Government websites (choice=About tuberculosis (TB))	
Checked	196 (87.1)
Unchecked	29 (12.9)
Other government communications online (e.g. including on social media) (choice=About your general health)	
Checked	207 (92)
Unchecked	18 (8)
Other government communications online (e.g. including on social media) (choice=About tuberculosis (TB))	
Checked	165 (73.3)
Unchecked	60 (26.7)
The internet or search engines (e.g. Google) (choice=About your general health)	
Checked	200 (88.9)
Unchecked	25 (11.1)

The internet or search engines (e.g. Google) (choice=About tuberculosis (TB))	
Checked	160 (71.1)
Unchecked	65 (28.9)
Messaging platforms (e.g. WhatsApp. Telegram. Messenger. etc.) (choice=About your general health)	
Checked	1 (0.4)
Unchecked	224 (99.6)
Messaging platforms (e.g. WhatsApp. Telegram. Messenger. etc.) (choice=About tuberculosis (TB))	
Checked	1 (0.4)
Unchecked	224 (99.6)
Other (please specify) (choice=About your general health)	
Unchecked	225 (100)
Other (please specify) (choice=About tuberculosis (TB))	
Unchecked	225 (100)
None of the above (choice=About your general health)	
Unchecked	225 (100)
None of the above (choice=About tuberculosis (TB))	
Unchecked	225 (100)
Don't know (choice=About your general health)	
Unchecked	225 (100)
Don't know (choice=About tuberculosis (TB))	
Unchecked	225 (100)
Which of the following people / types of people would you turn to for information about 1) Your general health 2) Tuberculosis (TB); family members (choice=About your general health)	
Checked	219 (97.3)
Unchecked	6 (2.7)
Family members (choice=About tuberculosis (TB))	
Checked	13 (5.8)
Unchecked	212 (94.2)
Your family doctor or personal healthcare provider (choice=About your general health)	
Checked	219 (97.3)
Unchecked	6 (2.7)
Your family doctor or personal healthcare provider (choice=About tuberculosis (TB))	
Checked	207 (92)
Unchecked	18 (8)
Religious leaders (choice=About your general health)	
Checked	24 (10.7)

Unchecked	201 (89.3)
Religious leaders (choice=About tuberculosis (TB))	
Checked	1 (0.4)
Unchecked	224 (99.6)
Community leaders (choice=About your general health)	
Checked	38 (16.9)
Unchecked	187 (83.1)
Community leaders (choice=About tuberculosis (TB))	
Checked	2 (0.89)
Unchecked	223 (99.1)
Friends (choice=About your general health)	
Checked	90 (40)
Unchecked	135 (60)
Friends (choice=About tuberculosis (TB))	
Checked	1 (0.4)
Unchecked	224 (99.6)
Social media influencers (choice=About your general health)	
Checked	11 (4.9)
Unchecked	214 (95.1)
Social media influencers (choice=About tuberculosis (TB))	
Unchecked	225 (100)
Politicians (choice=About your general health)	
Checked	8 (3.6)
Unchecked	217 (96.4)
Politicians (choice=About tuberculosis (TB))	
Checked	1 (0.4)
Unchecked	224 (99.6)
Journalists or other media influencers (choice=About tuberculosis (TB))	
Checked	17 (7.6)
Unchecked	208 (92.4)
Journalists or other media influencers (choice=About tuberculosis (TB))	
Checked	6 (2.7)
Unchecked	219 (97.3)
NGOs or community support organisations (choice=About your general health)	
Checked	221 (98.2)
Unchecked	4 (1.8)
NGOs or community support organisations (choice=About tuberculosis (TB))	

Checked	208 (92.4)
Unchecked	17 (7.6)
International health authorities (e.g. Africa CDC. WHO) (choice=About your general health)	
Checked	209 (92.9)
Unchecked	16 (7.1)
International health authorities (choice=About tuberculosis (TB))	
Checked	196 (87.1)
Unchecked	29 (12.9)

Statistical analyses

<i>Clinical / demographic factors</i>	Response	N (%)	Unsure, Leaning Yes	Definitely yes but wait to receive it	Definitely Yes, as soon as available	Kruskal Wallis or post- hoc Dunn's test p-value
Age	>35 (vs. ≤35)	103 (46)	11 (41)	41 (47)	51 (46)	$p=0.91$
Gender	Female (vs. Male)	129 (57)	16 (59)	53 (62)	60 (54)	$p=0.15$
Geography	Urban/ periurban (vs. rural)	100 (44)	11 (41)	32 (37)	57 (51)	$p=0.079$
Religion	Christian (vs. Islam/other)	221 (98)	-	-	-	<i>N/A results not meaningful due to skew</i>
Education Level	Primary (vs. above grade 7)	31 (14)	4 (15)	10 (12)	17 (15)	$p=0.36$
Employment Status	Employed (vs. unemployed or student)	72 (32)	12 (44)	34 (65)	26 (23)	$p=0.002$
COVID-19 Vaccine Status	Received ≥ 1 vaccine (vs. unvaccinated)	52 (23)	7 (26)	16 (19)	29 (26)	$p=0.24$

Current or prior diagnosis of TB	Yes (vs. No)	64 (28)	6 (22)	19 (22)	39 (35)	$p=0.044$
Family/household member with TB at any time	Yes (vs. No)	216 (96%)	-	-	-	<i>N/A results not meaningful due to skew</i>
COVID-19 Vaccine Status	Received ≥ 1 vaccine (vs. unvaccinated)	52 (23)	7 (26)	16 (19)	29 (26)	$p=0.238$
Living with a household member who has TB currently	Yes (vs. No)	92 (41)	15 (56)	38 (44)	39 (35)	$p=0.044$
<i>Survey Prompt</i>						
I believe a new TB vaccine would be safe	Tend to agree (vs. strongly agree)^	181 (86)	-	-	-	<i>N/A; results not meaningful due to skew</i>
I believe a new TB vaccine would be effective	Tend to agree (vs. strongly agree)^	165 (75)	16 (62)	68 (82)	81 (72)	$p=0.85$
I believe a new TB vaccine would be important	Tend to agree (vs. strongly agree)^	163 (73)	17 (65)	68 (79)	78 (70)	$p=0.61$
Overall, I think vaccines are safe	Tend to agree (vs. strongly agree)^	185 (89)	-	-	-	<i>N/A; results not meaningful due to skew*</i>
Overall, I think vaccines are effective	Tend to agree (vs. strongly agree)^	164 (75)	17 (65)	65 (80)	82 (74)	$p=0.69$
Vaccines are important for all people to have	Tend to agree (vs. strongly agree)	127 (56)	11 (41)	50 (58)	66 (59)	$p=0.24$
Vaccines are compatible with my religious beliefs	Agree (vs. disagree)	76 (34)	18 (67)	29 (34)	29 (26)	$p<0.001$
How important do you think tuberculosis is as a health problem for people in your community?	Extremely important (vs. Somewhat / very important)	61 (27)	5 (19)	15 (17)	41 (37)	$p=0.0013$

Personal Concern of Contracting TB	Extremely concerned (vs. Very/somewhat concerned)	72 (32)	6 (22)	20 (23)	46 (41)	<i>p=0.0025</i>
Concern family / household member will contract TB	Extremely concerned (vs. very/somewhat concerned)	79 (35)	6 (22)	29 (34)	44 (39)	<i>p=0.12</i>
<i>Which of the following would you use to access news or turn to for information about: Tuberculosis</i>						
Social Media	Yes (vs. No)	3 (1.3)	-	-	-	<i>N/A; results not meaningful due to skew</i>
Social Media influencers	Yes (vs. No)	1 (0)	-	-	-	<i>N/A; results not meaningful due to skew</i>

^Data for disagree were too sparse for analysis so omitted.

*Some categories were combined for small cell counts; see Methods for details.