Assessing COVID-19 Vaccine Uptake Strategies in School Communities of St. Louis

Short Title: Vaccine Communication Study

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A Introduction

COVID-19 has challenged how public health and healthcare officials provide medical services, implement prevention strategies, and deliver resources to their communities. As of April 1st, 2022, over 79 million COVID-19 cases and 975,000 deaths have occurred in the United States[1,2]. Vaccines are highly effective prevention methods against COVID-19, especially COVID-19 associated-hospitalized and death. A recent MMWR stated "Among 1,228,664 persons who completed primary vaccination during December 2020–October 2021, severe COVID-19–associated outcomes (0.015%) or death (0.0033%) were rare".[3]

Low vaccination rates still persist in many different groups and especially among children 5 to 17 years of age. Multiple entities sought to understand vaccine hesitancy, barriers, and other factors that were impacting an individual's vaccination status. Studies have tested different strategies to increase vaccine uptake including text messages, communication strategies, and videos[4,5,6]. Additionally, prior research has attempted to answer questions about facilitators and barriers to getting vaccinated as well as trusted sources of information[7,8].

There is a multitude of recommendations present that highlight different vaccination strategy; however, it is still unclear which strategy is best to increase vaccination rates against COVID-19.

When understanding human behavior, there are different frameworks that can inform evidence-based practice. Michie (cite) offers a model that explains behavior as a combination of opportunity, capability, and motivation to act.

In this proposal, we will use a theoretically informed approach to test strategies to increase vaccine uptake. More specifically, we will test the hypothesis that individuals who receive a high intensity intervention, in this case a phone call from a peer to discuss vaccine barriers, will have greater vaccine uptake than unvaccinated participants that receive the low intensity intervention of a text message with a link to a multimedia page addressing vaccine hesitancy. We will utilize a Sequential Multiple Assignment Randomized Trial (SMART) design to access the efficacy of a low intensity versus higher intensity intervention measure within unvaccinated individuals.

This study will guide strategies in vaccine uptake interventions and its possible acceptance within unvaccinated individuals.

B Background

The PI, Dr. Jason Newland, has been engaged in the St. Louis community since the beginning of the pandemic to provide guidance and support on best practices for conducting in-person schooling and COVID-19 prevention. He is currently PI on a study on that evaluates COVID-19 testing strategies within underserved populations. Since May 1st, 2021, we have performed greater than 9500 SAS-CoV-2 PCR test within the staff, students, and their household members of the participating school districts in North County St. Louis. In addition, Dr. Jason Newland is a co-PI on an additional study (SSD) that utilizes weekly testing within schools dedicated to children with intellectual and developmental disability and effective messaging strategies. Since

November 23, 2021, this SSD study has performed approximately 16,500 SARS-CoV-2 PCR tests within the students and staff. In both studies, the research teams utilized the saliva-based SARS-CoV-2 diagnostic test [Washington University SARS-CoV-2 Ultrasensitive-High-Throughput-Saliva assay (WUSC2-UHT-S)] that was developed by the McDonnell Genome Institute (GTAC@MGI). Saliva samples can remain at ambient temperatures for 5 days with no effect to the assay sensitivity and does not require special training to collect. This test has undergone FDA evaluation to obtain EUA status and will be processed on WUSM campus at the Cortex CAP/CLIA-approved laboratory.

The WUSTL Brown School of Social Work and Public Health have built strong relationships with community organizations to understand barriers to SARS-CoV-2 testing, vaccination, and public health resources. These community partners have currently supported our study as being a reliable testing and vaccination referral site, providing guidance on appropriate messaging, and increasing awareness of the study. In addition, previously existing relationships with the St. Louis City of Health and affiliation with the school of Medicine will be provide an opportunity to streamline vaccine referral and processing for participants.

Community Partners

School Districts
The St. Louis area school districts of University City, Normandy, Ferguson-Florissant, Pattonville, St. Louis Language Immersion School, Maplewood-Richmond Heights, and Jennings will be partners throughout this project. These districts will collaborate with us by providing specific areas for testing in each participating school and by facilitating our engagement with their school communities. Additionally, they will provide input on the best messaging and communication strategies for study participation, barriers to testing, and how best to communicate test results and follow-up. The research team will conduct meetings with the superintendents and/or their designee to hear their concerns and feedback as well as to provide them an update on the study progress.

The study team will reach out to additional school districts within St. Louis County and St. Louis City to determine interests in collaborating with the study in the same capacity just listed. As other schools agree to participate, they will be added through the IRB and the protocol will be updated.

Health Programs/Clinics
The SPOT and CareSTL operate two school-based health clinics that will help us perform symptomatic and exposure testing for school staff, students, and families. These clinics will stock the saliva testing kits and will collaborate with the study team to properly obtain the tests and the required testing information. The individuals that will be testing will be added to the IRB as limited research team members prior to completing any research related activities, as was done with IRB 202104013 (Safe Return to Schools).

People's Health Clinic has several locations within the boundaries of the study school districts and may act as a COVID-19 vaccination and testing referral site for participants.

Community non-profit agencies
Several community organizations are engaged with the study team who will be critical to ensuring the study is responsive and meaningful for the communities we are serving in the study. They will provide specific guidance regarding: study design, implementation, and dissemination of findings. All three organizations (Beyond Housing and Better Family Life) are established and trusted leaders in our community and will inform recommendations and improvements to the communication and application of testing and the vaccine uptake trial. These partners will potentially distribute IRB approved recruitment materials to potential participants. They will also provide important context and perspective to the design of the qualitative activities, assist with participant recruitment, co-facilitate listening sessions, and actively engage in the interpretation and contextualization of the findings

Community Advisory Board

The CAB will be comprised of parents and students from each school district, school administrators, teacher representatives from the appropriate unions and schools, and representatives from the community partners assisting with the project. Current community partners include Better Family Life, Beyond Housing, People's Health Clinic, CareSTL and The SPOT Clinic (Table 1). The CAB was initially established in the Safe Return to School Study (202104013) and will continue during this study.

Table 1: Community Partner Overview	
Better Family Life	Provides comprehensive, holistic services & supports to build strong communities & families www.betterfamilylife.org
Beyond Housing	Dedicated to creating, more equitable communities through community development www.beyondhousing.org
People's Health Center	An FQHC that Provides quality health care to metro St. Louis- phcenters.org
The SPOT	Provides comprehensive health and social services to youth- thespot.wustl.edu
CareSTL Health	An FQHC that provides comprehensive health care to the St. Louis- carestlhealth.org

In the initial CAB meetings, the following topics have been discussed: best locations to perform symptomatic testing, both in the schools and in participating health centers, vaccine hesitancy in the community, appropriate recruitment/messaging strategies, necessary; study updates, and COVID-19 local, regional, and state updates. Our CAB will be essential in addressing barriers to testing and vaccination, follow-up care, and the importance of confidentiality. We will determine what information and resources are needed for individuals who test positive and address any concerns regarding confidentiality for these individuals. The CAB will meet at least monthly during the implementation of testing and more frequently if needed. Our team acknowledges that the success of this project will rely on these community partnerships and our maintenance of trust with these school communities. All our community partners serve the families in the study school districts. In order to maintain the trust of the schools and the community, the research team will present study team updates to the CAB and superintendents at least monthly.

School Liaisons
We will also have at least one, school-based liaisons from each school districts as another way for the study to remain engaged within the participating schools. A study team member will

reach out to individuals who have been seen to be actively engaged within their schools to determine their interest in a school liaison role with our team. These liaisons will help us understand the following: vaccine uptake barriers and uncertainties within our community, appropriate recruitment/messaging strategies, and reception of our study within their given school. The Study team will meet with liaisons monthly throughout the duration of the study.

C Study Overview

Study Aims

This study aims to do two things:

1. Understand COVID 19 and its impact on St Louis school districts over the course of the 2022-2023 academic year.
2. Assess two different strategies on their ability to increase vaccine uptake in these school districts.

Study Design

The above aims will be completed through two methods.

First, aim one will be achieved through an observational study design. This will involve testing individuals for COVID19 and understanding other important variables to assess for COVID 19 impact on individuals and school communities. Individuals can choose to receive testing and they will be able to receive tests. Individuals are eligible to be tested multiple times and the testing will occur along different timelines.

Second, individuals who have not gotten a COVID 19 vaccine will be eligible for the the vaccine trial. This will involve a randomized trial design. More specifically, this study will use a sequential multiple assignment randomized trial (SMART) design.[12] This design will allow participants to be randomized to one of two interventions. If individuals do not seek vaccination after the first intervention, they will again be randomized into the same two interventions. This will allow for testing of both interventions as well as understanding if the use of a more intense intervention (two ‘doses’) is optimal for vaccine uptake. Figure 1 provides a visual depiction of this study design.

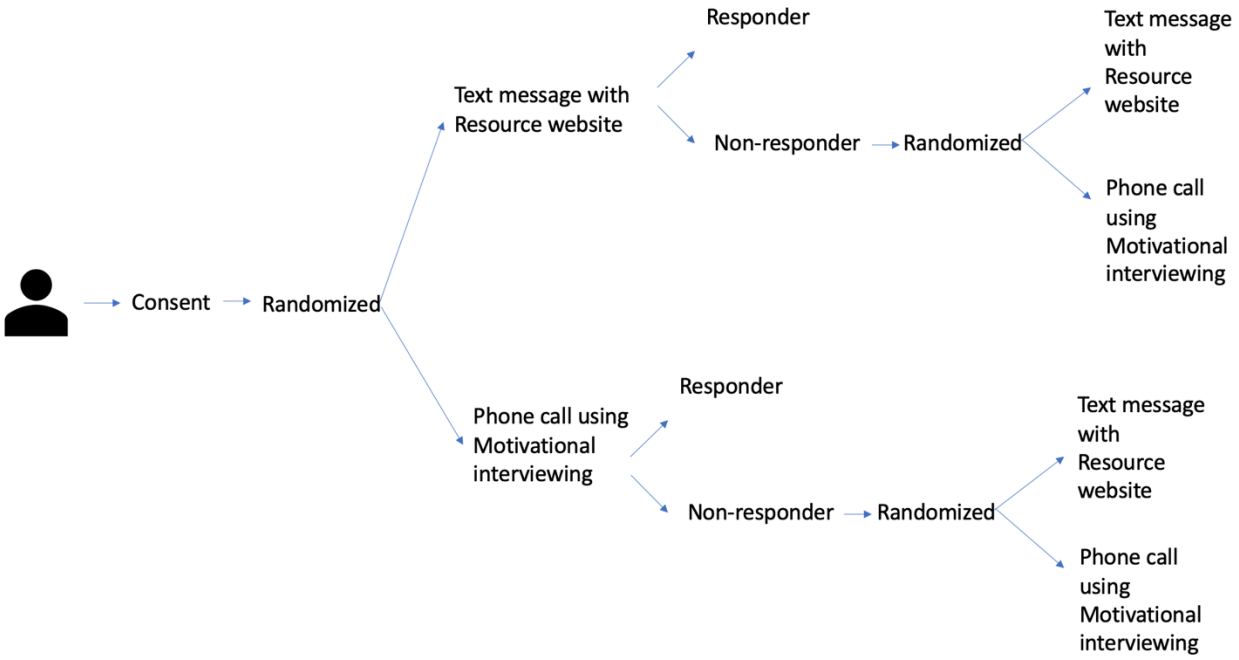

Figure 1. SMART design with interventions for vaccine uptake trial

Framework/theory

The interventions for this study have been informed by multiple frameworks. The Michie framework offers the idea that an individual's choice is driven by three components: motivation, opportunity, and capability. The two domains most relevant for this study are opportunity and motivation. All individuals enrolled will be eligible to receive a COVID-19 vaccine. The study will work to ensure the opportunity is available for all individuals to access the vaccine through partnerships with community programs offering COVID-19 vaccination. This study has been designed to understand what dose of an intervention can increase vaccine uptake. We hypothesize that the intervention will increase individual motivation to get a vaccine, which will serve to change participant behavior.

The two interventions have been informed by psychology and health communications. Psychology literature has informed the use of motivational interviewing as a collaborative communication style. Previous literature has shown that motivational interviewing can address concerns and hesitancy in other areas of health behavior. Ultimately, this leads to an increase in desired behavioral outcomes and is a pragmatic, easy to deliver intervention. The other intervention is text message directing the unvaccinated to accessible information. This intervention follows practices that are established by health communications literature, including providing information that is digestible and accessible. The messaging will be based on collaborative communication which was identified by our CAB as the best approach.

Description of milestones and timeline completion

The overall proposed project activities and timeline are shown below. This project has an anticipated on- year timeline.

Table 2. Project Timeline (5/1/2022-4/30/2023)												
Milestones/Project Activities	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**
Finalize all materials necessary for the vaccine strategies utilized in the SMART trail	●											
Add additional 3-5 school districts to be eligible for drive-up testing that will begin in May	●											
Obtain IRB Approval	●											
Submit to Clinical Trails.gov	●											
Implement tracking log to implement strategies	●											
Enroll unvaccinated participants from students, staff, and family members that utilized drive-up testing in the vaccine strategy SMART study.		●										
Implement data coordination, collaboration, harmonization w/ RADx-UP CDCC	●	●	●	●	●	●	●	●	●	●	●	●
Conduct monthly superintendent meetings	●	●	●	●	●	●	●	●	●	●	●	●
Conduct symptomatic testing for all established school districts	●	●	●	●	●	●	●	●	●	●		
Analyze testing data										●	●	
Conduct Listing sessions & Interviews				●	●	●	●					
Conduct Qualitative analysis								●	●			
Share data with Duke coordinating Center	●	●	●	●	●	●	●	●	●	●	●	●
Disseminate result										●		●

Study Setting and Populations.

The following school districts in St. Louis County will be included: University City, Ferguson-Florissant, Normandy, Pattonville, St. Louis Language Immersion School, Maplewood-Richmond Heights, and Jennings. Additional schools within the STL County and STL City region will be reached out as potential testing sites. Individuals who are students, staff, and household members of students and staff are eligible to participate in the SARS-CoV-2 testing portion of the study. All St. Louis City and St. Louis County residents along with students, staff, and their household members within the school districts will be eligible for the vaccine uptake trial if they: (1) are not vaccinated (defined as never having received any dose of a COVID-19 vaccine series) but (2) are eligible to receive an approved COVID-19 vaccine.

Testing

Any eligible participant is able to receive a COVID-19 test if they either (1) have COVID-19 symptoms; (2) have a known exposure to COVID-19; (3) need a test for travel, attending an event, or work-related requirement. Individuals are able to be tested repeatedly. Testing sites will occur regularly. There is no intervention being delivered in the testing component of the trial.

Interventions

The two interventions will be: (1) Short Message Service (SMS) with an associated link to a multi-media website and (2) Phone call with a peer.

In intervention 1, the participant will receive a SMS with a brief message containing the following: (1) statement encouraging them to get vaccinated, (2) the study's hotline number for a team member to assist in referring them for a vaccination, (3) a link to a multi-media page with videos and additional resources encouraging individuals to be vaccinated.

The multi-media website will be housed in the Safe Return To School website and updated by a designated study team members. This page will include the following COVID-19-related resources: publicly available vaccine promotion videos, videos consisting of community members discussing vaccine topics, resources regarding local vaccine sites, and links to additional literature resources.

In intervention 2, the participant's peer will be a study team member who has the same or similar racial demographic as the participant. All team members conducting the peer phone calls will be trained in motivational interviewing. The participant will be called by their peer via zoom or phone. Motivational interviewing techniques will be utilized with the participant to promote vaccine uptake. The team member will use a facilitator guide throughout the peer intervention.

D Study **Procedures**

D1 Testing

Recruitment and Consent

All research activities will occur among the students, parents/guardians, staff (teachers, aides, nurses, administrators) and household members of our participating school districts. All students, school staff, and their household members (all ages) are eligible for inclusion in the study. The participating school districts will share project description through multiple methods (e.g., email, electronic platforms, meetings) with parents/caregivers and school staff. Individuals who are ineligible for testing (i.e. those who are not students, staff, and household members of students and staff of the participating school districts) will be referred to community testing sites for COVID-19 testing.

Testing Locations

Relationships have already been built with the superintendents of the University City, Normandy, Ferguson-Florissant, Pattonville, and Jennings school districts regarding the importance of implementing SARS-CoV-2 testing. The study team have already established weekly testing and drive-up testing sites within these districts during the academic 2021-2022 year in IRB 202104013.

CareSTL, SPOT Clinic, and University City school nurses have been added as testing sites for the Safe Return to Schools study. These same sites will be utilized for this study.

Testing Consent:

For symptomatic and/or exposure testing, we will obtain written or verbal consent and assent (when appropriate) prior to testing. A copy of the consent information will be provided.

Children 8-17 years of age who are developmentally able will provide assent. Children 7 and under will not be providing assent due to their age and development. The consenting/assenting process will be done virtually, in person or by phone.

Situations might arise that would prevent the parent/legal guardian not physically present or able to provide written or e-consent. Examples include the following: parent/guardian working and unable to access necessary technology, or extenuating circumstances prevent access to the informed paper and e-consents. During these circumstances, the research team will verify the parent/guardian relationship with participant, conduct a verbal consent to the parent/guardian by reading a consent script. A copy of the consent will be provided to the child and/or their caretaker at site. Verbal consent will be documented within REDCap.

Participants will also consent to be emailed a common data element survey by the study. In the case of a minor in the study, their consenting parent/guardian will be asked to complete the assessment. The consent will have an opt-out option for participants who consent to completing the survey but do not consent to have their information shared with the NIH or community partners.

We will also recruit Spanish speaking individuals and will use IRB approved consents and data collection forms translated to Spanish.

Testing Processing

Sample collection:

We have partnered with ShieldT3 and will use their saliva-based FDA approved (EUA#: EUA202555) covidSHIELD test. All coordinators and staff supervising the testing will complete the training module provided by ShieldT3.

We will use a standardized sample collection kit provided by provided by Shield T3. Kits contain barcoded sample collection tube, CLIA/CAP-compliant label, and a zip-top biohazard bag. 500 µl of saliva will be collected from each subject under the supervision of a trained individual adhering to CAP/CLIA guidelines. For students unable to direct saliva into the tube because of poor motor control, we may use a sponge applicator or a pipette to obtain the saliva.

This testing will be provided for both virtual and in-person staff and students. Testing sites will operate approximately 5 days a week between the 5-8 sites. At each site, the test samples will be collected on a designated time and day once a week. Additionally, all test samples will be collected in a designated area. For those in virtual learning, or those who are family members and/or household members a drive-up testing area will be available at each site. In situations where transportation is limited, home visits will be offered.

Barcode scanning and data entry into a HIPAA-compatible Research Electronic Data Capture (REDCap) database will occur at time of collection and will include all information needed for eventual National / County-level reporting and contact tracing (demographics, communal housing status, etc.) (Test Order and Testing Registration data collection forms). Labeled samples are transferred to the zip-top bag which is externally sterilized with an alcohol wipe, then will be shipped by FedEx to the ShieldT3 lab in Kentucky.

CareSTL, SPOT Clinic, and nurse testing within the schools will occur within the respective clinic's operating hours. They will follow all of the same procedures, except will not do any entry of information into REDCap due to limited research involvement. Once a sample is collected, a WUSM employed study team member will collect the test within 12 hours of administration to complete processing.

Follow-up Protocols:
Testing results will be available within 12 to 72 hours. We have established the necessary reporting elements and mechanisms to send results to the State of Missouri, as well as a system to deliver test results by email to participants if they elect. All students, staff, and household members with positive results will be notified by Dr. Newland and/or a member of the study team and information regarding appropriate isolation and quarantining for contacts will be provided to comply with prevailing National/County health department recommendations. Additional financial and social services needed for the student and family due to isolation and/or quarantine procedures may be coordinated with the school and community partners. Finally, all positive individuals may have a 3-week phone call follow-up to inquire about the outcome of their illness including the need to seek medical attention and/or be hospitalized.

Common Data Elements Survey
Individuals completing the common data element surveys who have agreed to referral and indicate certain needs or resource limitations will be referred to community partners. This will be done through information being provided to the community partner for follow up with the individual.

The questions in both of these include those related to: housing, employment, health insurance, languages spoken in the home, family income, work PPE and distancing, vaccinations, reasons for getting/not getting a COVID-19 vaccine, alcohol and tobacco/nicotine use, previous COVID-19 testing, accessibility to testing, perceived accuracy of testing, perceived benefits of testing, perceived risks of testing, intention to be testing, food insecurity, trust of sources to provide correct information about COVID-19, height, weight, health status, teacher or student, grade taught/ grade student is in, type of learning, classroom setting, sports/ band/choir/drama/clubs participation, before or after school program, percent of time spent closer than 6 feet to others, percent of time mask is worn, percent of time able to social distance, access to handwashing, COVID symptoms, quarantine status/length, COVID test results, type of test, last day in person school, mitigation strategies by the individual/case at school, exposures outside school setting in the 14 days prior to exposure (contact) or 2 days prior to symptom onset (COVID sample if asymptomatic) (case) up until isolation, mask/social distance used at outside school settings. To reduce the length of the interview, these individuals will also be asked to complete some questions via RedCap.

D2 Vaccine Uptake Trial

Recruitment and Consent
Note: Individuals will be consented separately from the testing procedures and testing consent. Even if individuals are provided information on this study at testing, they will have time to review materials and decide on participation prior to completing the consent for the vaccine trial. Participation in this is not a requirement for testing.

Individuals who are eligible for the study must meet all three of the following criteria: (1) Is not completely up to date with their COVID-19 vaccinations per CDC guidelines, (2) is considered eligible by the CDC at the time of enrollment to receive a COVID-19 vaccine, (3) is a resident of St. Louis City or St. Louis County, staff or student, or household member of staff or student of one of the participating school districts. Ineligible individuals consist of the following: (1) Is up to date with COVID-19 vaccinations per CDC guidelines, (2) ineligible to receive any COVID-19 vaccine due to medical history or age, (3) is not a resident of St. Louis City or St. Louis County, a staff or student, or household member of staff or student of one of the participating school districts, or (4) participant (or their parents) do not provide consent.

Prior to enrollment, we will obtain either written, or electronic written consent prior to the intervention from the participant (18+) or from parent (under 18). A copy of the consent information will be provided.

Within families, the intervention measures will occur with the parents. When multiple participants from one family would like to enroll into the study, a parent will be designated to receive the interventions on behalf of children less than 18. The parent will answer questions on behalf of the child. The child will not directly receive any of the intervention measures or directly provide any information. Participants between 8 and 17 years of age who are developmentally able will provide assent. Follow-up and communication will occur with this designated family member. The consenting/assenting process will be done virtually, in person or by phone.

We will also recruit Spanish speaking individuals and will use IRB approved consents and data collection forms translated to Spanish.

Randomization
Once enrolled into the study, each participant will be initially randomized into one of the two intervention groups: (1) SMS + multi-media page, or (2) Phone call with a peer. For household members, randomization will occur at the family unit and all participants will receive the same intervention. All participants will be asked at the start of the study a vaccine-uptake survey regarding the following: their overall willingness to get vaccinated and willingness to vaccinate their children (if applicable); factors that increase and decrease willingness to vaccinate, and their barriers that inhibited their ability to vaccinate.

Within one week of enrollment, the participant/family unit will receive the first intervention. A study team member will follow-up with the participant(s) to determine any changes in vaccination status at the two-weeks receiving their first intervention. If the participant(s) have no changes in their vaccination status, the participant/family unit will undergo a second round of randomization within one week of this follow-up. The same two interventions will be used, so an

individual will receive *either* a second exposure to the same intervention or the intervention that they did not initially receive. After two weeks of the participant's 2nd randomization, a study team member will follow-up a second time to determine vaccination status. During each follow-up session, a study team will provide the same vaccine-uptake survey to the participant and offer to provide vaccine resources on where to obtain a vaccine for the participants. If a participant receives a vaccine an additional phone call will be performed 4 weeks after their first vaccine dose to assess if they completed the primary vaccination series. Compensation of $100 will be provided for those individuals consenting to this study. This compensation will be provided in allotments of $50 after completing the consent document and then $25 after each randomization. If a participant does not need to be randomized a second time, the second $25 will be provided when learning of the participant receiving their vaccine.

Assessing Vaccine Strategies

The primary outcome of this study will be the percentage of individuals who received an initial vaccination within two weeks of a study intervention. Vaccine uptake will be primarily assessed by verbal confirmation of recent vaccination during a follow-up visit with a study team member. We will ask for visual documentation of the vaccine card or receipt that demonstrates the vaccine has been administered. Any participants lost to follow-up will be presumed "Unable to determine." A secondary outcome will be the number of individuals that complete their primary vaccination series within 6 weeks of their first dose.

In addition, data from the vaccine-uptake survey will analyzed for trends in willingness to vaccinate within participants. Changes promoting vaccine willingness could be indicative of an impactful vaccine intervention.

E Statistical Plan

Statistical considerations

Primary analysis

Our primary hypothesis is that the initial strategy of peer counseling will result in the highest vaccine uptake. To test this hypothesis we will use a generalized linear mixed model approach, assuming a binomial distribution and a logit link function. The intervention (peer counseling vs SMS + multimedia website) will be modeled as a fixed effect, and household will be included as a random effect to adjust for within household clustering. As this hypothesis focuses on addressing the best initial intervention, we will include only data collected through the first assessment in this analysis (~ 2 weeks following enrollment). If we find a significant difference ($P < 0.05$) and the proportion of vaccinated participants is greater in the peer counseling group, then we will conclude that the peer counseling is superior to the SMS + video as an initial vaccination strategy. We will also evaluate whether there is evidence of imbalance between the intervention groups for a variety of covariates including: age, race/ethnicity, sex, zip code, school district, highest education level, vaccine hesitancy, influenza vaccine history, previous COVID-19 illness, household member vaccinated, health insurance type, and perceived COVID-19 risk. If we find some evidence of a difference between the initial intervention groups ($P <$

0.10) then those variables will be included in the final multivariable model to estimate the adjusted difference between the interventions. If we find no appreciable difference between the adjusted and unadjusted differences, then we will report the unadjusted difference as our primary result.

Secondary analyses

Our secondary analyses will entail analysis of non-responders as well as subgroup analyses. For those that do not respond to the initial intervention, we hypothesize that switching the intervention will result in the greatest vaccine uptake. We will use the same analytic strategy as in the analysis of the primary outcome, with the exceptions that: (1) we will only analyze participants that did not respond to the initial intervention (i.e., non-responders); and (2) we will test the null hypothesis of no difference in the proportion of participants agreeing to a vaccine between those non-responders that switched (peer→SMS + multimedia website, SMS + multimedia website →peer) compared to those that did not switch (peer→peer, SMS + multimedia website →SMS + multimedia website).

For both the analysis of the initial intervention, and the non-responder analysis we will conduct several subgroup analyses. The subgroup analyses will entail analysis of vaccine uptake stratified by: age (<5, 5-11, 12-17, 18 and older), race (white vs black vs other), school district, health insurance, and gender identity. We will use the same analytical approach as previously discussed for the primary and secondary analyses. Results from these subgroup analyses will enable us to determine whether any of these groups modify the effect of vaccine uptake. Furthermore, estimates from these analyses (in addition to the primary analysis) are critical for understanding the factors that potentially modify vaccine uptake and applying results from our studies to other target populations with similar characteristics[9,10].

Sample size estimates

We powered this study to test the primary hypothesis that an initial intervention of peer counseling will result in greater vaccine uptake compared to the SMS + multimedia website intervention. The sample size needed to test this hypothesis was based on pilot data as well as scientific literature on vaccination uptake. One research study estimated an increase COVID-19 vaccine uptake rate of 3.6% with a text reminder treatment compared to a holdout arm that did not receive a reminder[11C]. Our listening session data from our community members, felt that receiving vaccination information from a peer would be helpful in becoming vaccinated. Additionally, peer counseling has been noted to increase breastfeeding rates in different race/ethnicity groups of at least 15%. For this reason, we estimate that 15% of participants will agree to a vaccine after having a conversation with a peer. Pilot data available for the study population indicated that the median household size was 1, and for the power analysis we assume 1 person per household but in the main analyses we will include a random effect to account for possible clustering at the household level if there is greater than one person per household. The aforementioned estimates from the literature served as our targets, but due to the inherent uncertainty in the application of results from prior studies to different target populations, we estimated the necessary sample sizes for a range of vaccine uptake-rates (Table 1). Based on these estimates we anticipate that a total drop-out adjusted sample size (peer counseling, SMS + multimedia website) ranging from 285 (increase in vaccine uptake of 12%) to 1113 (increase in vaccine update of 5%) would provide a minimum of 80% power to detect the

effect of interest. These sample sizes are attainable as we already have approximately 1000 unvaccinated individuals that we can contact for enrolment. Additionally, we will be adding more school districts to be eligible for testing. Lastly, we will recruit for enrollment beyond just testing as we utilize our community partners to help us with recruitment.

Increase in % uptake of vaccine	Total sample (unadjusted for drop out)	Total sample size + design effect*	Total sample (adjusted for 20% drop out)
5%	712	890	1113
7%	416	520	650
9%	282	353	442
12%	182	228	285

Table 1. Sample size estimates for different scenarios comparing the peer intervention to the SMS + multimedia website intervention. All scenarios assume 80% power and a 3.6% vaccine uptake rate for SMS + multimedia website based on results from Dai et al. 2021.
*Design effect assumes an intracluster correlation of 0.50 and an average cluster size of 1.5.

Data management
All testing data are maintained in a secure, password-protected REDCap database. Information collected on paper forms is stored in locked filing cabinets on a restricted-access floor at WUSM. Prior to undergoing testing, participants will complete a HIPAA authorization form and/or informed consent to allow SARS-CoV-2 testing data to be shared with the State of Missouri. All participants are assigned an ID number, and testing information is kept separate from the demographic data. Subjects who test positive are contacted by phone to be given their results. This information will be shared only with the participant unless an informed consent is signed that will allow sharing of their data with the RADx-UP Coordination and Data Collection Center.. Data are stored using HIPAA-compliant encryption to comply with all local, state, and national regulations for health-related data.

Our existing Consortium Data Reporting Unit (CDRU), in collaboration with our data manager, will coordinate the submission of common data element metrics on SARS-CoV-2 testing-related outcomes to the RADx-UP CDCC at Duke University. We will comply with data sharing as mandated by the NIH and follow guidance provided by the CDCC for data acquisition, collection, and curation, including appropriate consent for data sharing and implementation of the schemas proposed under the ABOUT ML effort. The CDRU will also ensure compliance with federal, state, and local requirements and policies for testing, reporting, and surveillance. The CDRU will also work closely with the CDCC to employ a common set of tools to promote collection of comparable data on social determinants of health, including measures from the PhenX Toolkit. Effective implementation strategies for rapid adoption will be disseminated through the CDCC.

We will work collaboratively with the Duke CDCC in reviewing and revising our data collection tools to ensure we are collecting the appropriate CDEs. We will share our data with Duke

CDCC. Finally, we will share our findings with the participating school districts and community partners at regular intervals throughout the project.

F Study Monitoring

Important to this study is the monitoring of the social, ethical, and equity implications associated with the testing and vaccination implementation in these underserved communities. All participants will be given the opportunity to express their concerns and identify barriers to participating in the study at time of enrollment. Additionally, a study email and phone number will be available for participants to provide feedback and voice any concerns about the project.

G References

1. Centers for Disease Control and Prevention. COVID-19; 2022, https://www.cdc.gov/coronavirus/2019-ncov/index.html. Accessed March 1, 2022.

2. Centers for Disease Control and Prevention. COVID-19 Mortality Overview. 2022; https://www.cdc.gov/nchs/covid19/mortality-overview.htm. Accessed March 1, 2022.

3. Centers for Disease Control and Prevention. COVID-19; 2022, https://www.cdc.gov/mmwr/volumes/71/wr/mm7101a4.htm#:~:text=COVID%2D19%20vaccines%20are%20highly,death%20(0.0033%25)%20were%20rare., Accessed March 1, 2022

4. Milkman. K, Patel. M, Gandhi. L, Duckworth, A. A megastudy of text-based nudges encouraging patients to get vaccinated at an upcoming doctor's appointment. *PNAS.* 2021; 118 (20)

5. Humiston. S, Bennett, N. Long, C. et al. Increasing Inner-City Adult Influenza Vaccination Rates: A Randomized Controlled Trial. *Public Health Reports*. 2011; 126:39-47

6. Centers for Disease Control and Prevention. Immunization Strategies for Healthcare Practices and Providers. 2021; https://www.cdc.gov/vaccines/pubs/pinkbook/strat.html . Accessed April 11, 2022.

7. Morales-Campos, D.Y., Flores, B.E., Donovan, E. *et al.* A qualitative descriptive study of providers' perspectives on human papillomavirus vaccine administration among Latino/a adolescents in South Texas clinics: barriers and facilitators. *BMC Public Health*. 2022; **22,** 443

8. Shen SC, Dubey V. Addressing vaccine hesitancy: Clinical guidance for primary care physicians working with parents. *Can Fam Physician*. 2019;65(3):175-181

9. Mehrotra, M. L., M. L. Petersen, and E. H. Geng. Understanding HIV Program Effects: A Structural Approach to Context Using the Transportability Framework. *Jaids-Journal of Acquired Immune Deficiency Syndromes*. 2019; **82**:S199-S205.

10. Pearl, J., and E. Bareinboim. External Validity: From Do-Calculus to Transportability Across Populations. Statistical Science. 2014; **29**:579-595.

11. Dai, H., S. Saccardo, M. A. Han, L. Roh, N. Raja, S. Vangala, H. Modi, S. Pandya, M. Sloyan, and D. M. Croymans. Behavioural nudges increase COVID-19 vaccinations. Nature, 2021; **597**:404-409.

12. Almirall, D., Nahum-Shani, I., Sherwood, N. E., & Murphy, S. A. (2014). Introduction to SMART designs for the development of adaptive interventions: with application to weight loss research. *Translational behavioral medicine*, *4*(3), 260–274. https://doi.org/10.1007/s13142-014-0265-0