a. Specific Aims

Racial minorities are disproportionately affected by SARS-CoV-2 infection, sequelae, and death. Nationally, Black people account for 20% of diagnosed SARS-CoV-2 infections and 22% of associated deaths, while representing only 13% of the population. However, because SARS-CoV-2 testing is limited among minority populations, infections in Black communities are less likely to be diagnosed relative to infections among white persons. Testing data thus potentially underestimate racial disparities in infection. Population-based research is needed to estimate SARS-CoV-2 burden and describe associated risk factors in samples that are inclusive of Black populations in the U.S. **The scientific premise of the proposed research is that identifying barriers and motivations for participation in population-based SARS-CoV-2 serosurveys among demographically diverse Black populations will inform strategies to increase participation in SARS-CoV-2 research. Ultimately, this will enable robust SARS-CoV-2 population-level burden of disease estimates and inform vaccine preparedness among this highly affected population.**

Serosurveys using probability-based sampling methods have potential to produce robust population-level SARS-CoV-2 burden of disease estimates. Typically, serosurveys use minimally invasive diagnostic testing (e.g., finger prick) to detect active virus and/or antibodies in conjunction with surveys about socio-demographic and behavioral risk factors for infection. **Unfortunately, published findings from U.S.-based studies indicate probability-based serosurveys suffer from sub-optimal response rates in Black populations.** Pilot findings from a national serosurvey conducted by members of our team also indicate considerably lower participation among Black versus white persons. Low response rates in Black populations are problematic for a few reasons. First, if participation is differential by infection risk (i.e., people with high risk are less likely to participate), burden of disease will be underestimated. Second, low participation reduces analytic power to detect risk factors for infection and how they vary socio-demographically in Black sub-populations (e.g., among persons with low vs. high education levels). Third, it forecasts underrepresentation in vaccine trials and acceptance. We need to understand how risk factors for SARS-CoV-2 vary across heterogeneous Black populations in order to target prevention responses.

Increasing participation in SARS-CoV-2 serosurveys across heterogeneous Black populations will improve validity of burden of disease estimates and allow for a more nuanced understanding of risk factors for infection. **To increase participation, we must first identify the reasons for low response rates among Black populations, and how these reasons vary socio-demographically.** Historic distrust of medical research among Black people is well-documented. However, current barriers to serosurvey participation (e.g., distrust, lack of perceived benefits, extant racism exacerbated and illuminated by the U.S. political climate, etc.) are unknown, as are factors that motivate participation in serosurveys. Reasons for non-participation in serosurveys may similarly influence willingness to participate in other SARS-CoV-2 research and willingness to receive vaccination. This work is broadly applicable to an array of prevention interventions.

Our multi-disciplinary research team, comprised of **epidemiologists, behavioral scientists, and community health practitioners** propose the following community-based participatory research in Atlanta, GA.

Aim 1: Convene a community advisory board (CAB) comprising leaders from organizations serving Black communities in Atlanta (e.g., professional, faith-based, health and social services).
The CAB will inform the research team on culturally-relevant considerations for the proposed research, methods to promote engagement with the researchers, and potential barriers and motivations to participation. The CAB will provide guidance on study protocols, development of data collection instruments for semi-structured interviews (Aim 2) and surveys (Aim 3), interpretation, and dissemination of findings.

Aim 2: In the context of a SARS-CoV-2 serosurvey, conduct 50 semi-structured interviews about barriers and motivations for serosurvey and vaccine participation with Black persons from 3 diverse neighborhoods, representing a range of socio-demographic characteristics.
Interviews will be used to identify a broad range of theory-informed factors (e.g., personal cognitions about competing risks and benefits, social norms, etc.) that may influence decisions about participation in SARS-CoV-2 serosurveys among persons who both choose and choose not to participate in serologic testing.

Aim 3: Determine the distribution of barriers and motivations for serosurvey participation across socio-demographic subgroups of Black persons using a quantitative survey.
We will survey approximately 2,000 Black persons residing in 3 socio-demographically diverse communities, also in the context of a serosurvey. We will use a theory-driven survey instrument, informed by findings from semi-structured interviews (Aim 2), to assess attitudes toward participation in serosurveys and vaccination. We will test how both participation in diagnostic testing and associated attitudes vary socio-demographically. We will also estimate presence of SARS-CoV-2 antibodies by respondent characteristics.

Summary: Black populations in the U.S. have high burden of SARS-CoV-2 disease but low rates of participation in serosurveys that estimate burden of infection and identify risk factors. As a result, racial disparities in infection are likely underestimated, and risk factors for infection among Black populations are not well understood. In the proposed work, we aim to answer the following questions: 1) What are the specific barriers and motivations that influence decisions about serosurvey participation among Black populations, and 2) How do these differ across socio-demographically diverse Black sub-populations? Findings from this study will be used to recommend strategies to increase representation of Black people in SARS-CoV-2 serosurveys that are tailored to sub-populations by gender, age, and socio-economic status. Importantly, these recommendations can also inform strategies for reaching Black populations with SARS-CoV-2 vaccination.

b. Significance

SARS-CoV-2 has caused more than 185,000 deaths in the U.S. in just over 6 months, and both cases and deaths continue to increase in many states.[1] Racial and ethnic minorities are disproportionately affected by SARS-CoV-2 infection and adverse outcomes, including death.[2-14] Black persons make up 20% of SARS-CoV-2 cases and 22% of SARS-CoV-2 deaths,[1] while representing just 13% of the U.S. population.[15] Racial disparities in SARS-Cov-2 infections are likely underestimated by testing data. More than 50% of diagnoses are missing race/ethnicity data,[1] and minority communities may have less access to, and/or usage of, testing services. Without an estimate of the true burden of SARS-CoV-2 infection among Black populations, the case fatality risk, which estimates deaths as a proportion of all cases, cannot be computed, nor can the proportions of death by race be compared. Therefore, the extent to which disproportionate deaths in this population are due to increased infection risk versus worse outcomes of infection cannot be determined.

SARS-CoV-2 serosurveys can produce robust burden of disease estimates and identify risk factors for infection in an underlying target population, making them an important supplement to surveillance data gleaned from testing.[16-20] Such serosurveys use minimally invasive diagnostic testing (e.g., finger prick) to detect active virus and/or antibodies in conjunction with a survey about socio-demographic and behavioral risk factors for infection. Serosurveys using convenience samples,[21] relying on research volunteers,[14] or using residual sera from banked specimens[22] can efficiently produce estimates of SARS-CoV-2 seroprevalence in targeted populations. However, serosurveys carried out using probability-based sampling methods most accurately represent underlying populations and are superior to other designs for surveillance purposes.[23-25] This is because factors motivating voluntary participation in surveys may be associated with SARS-CoV-2 risk, and these associations may change over time, resulting in varying selection bias and uninterpretable time trends.

The success of probability-based serosurveys in reducing selection bias relies heavily on adequate response rates. Unfortunately, U.S.-based serosurveys have reported considerably lower response rates compared to similarly designed studies in Europe, and U.S. response rates are disproportionately low among Black persons (Table 1).[26-29] Drs. Bradley (PI) and Rothenberg (Co-I) are currently investigators on the first national SARS-CoV-2 serosurvey (NIAID 3R01AI143875-02S1) led out of Emory University.[25] Early results from this work indicate similarly lower response rates among Black compared to white persons. Lower participation among populations most adversely affected is problematic for disease monitoring purposes but also has social implications. During the implementation of a Centers for Disease Control and Prevention (CDC) serosurvey conducted in two metro Atlanta counties,[26] local community leaders received numerous calls from distressed Black residents of these counties, some of whom referenced the Tuskegee syphilis study.[30]

Low levels of participation in serosurveys and other SARS-CoV-2 research among racial minorities precludes estimation of basic epidemiological parameters needed to design effective prevention and control interventions. If participation in serosurveys is differential by infection risk (i.e., people with high risk are less likely to participate), burden of disease among Black populations will be underestimated, as will racial disparities. Selection bias will afflict estimates from serosurveys similarly to those from testing data. Additionally, small numbers of Black respondents will limit analytic power to detect how risk factors for infection differ socio-demographically among Black sub-populations.

Table 1. Response and seroprevalence in probability-based SARS-CoV-2 serosurveys conducted in the U.S. and Europe

Location	Response rate	SARS-Co-V-2 seroprevalence	SARS-Co-V-2 seroprevalence among Black persons*	% of respondents who were Black*	% of underlying population represented by Black persons*
Orleans and Jefferson Parishes, LA[27]	10.6%	6.9%**	10.9%**	31.4%	43.3%
Dekalb and Fulton Counties, GA[26]	23.7%	2.7%	6.0%	38.2%	47.3%
Indiana (statewide)[28]	23.6%	2.8%**	4.8%***	7.7%***	13.1%***
Los Angeles County, CA[29]	44.3%	4.1%	6.9%	8.3%	11.0%
Spain (nationwide)[31]	69.8%	4.6%	-	-	-
Geneva, Switzerland[32]	34.9%	7.9%	-	-	-
England (nationwide)[33]	34.6%	6.0%	-	-	-

*US-based studies only; **Includes both PCR and antibody positivity; ***Reported collectively for non-white persons

The ability to conduct sub-group analyses among Black populations is essential. A large body of work guided by Intersectionality theory demonstrates the potential effect that the intersection of multiple identities (e.g., race, gender, social class, sexuality) may have on social determinants of health.[34-37] Unfortunately, most racial disparities research tends to treat race as monolithic.[34, 36, 37] Underrepresentation of minority populations in research results in findings that are only partially representative of the larger population. To increase serosurvey participation across heterogeneous Black sub-populations in the U.S., we seek to understand how reasons for non-participation, and motivations for participation, vary by socio-demographic characteristics in Black populations. This knowledge is necessary to increase participation in SARS-CoV-2 research generally and will also benefit vaccine preparedness among diverse Black populations.

Many Black people in the U.S. have well-founded distrust in medical research because of a history of medical abuse including the Tuskegee syphilis study.[38-44] A limited body of literature, primarily from the HIV field, suggests other barriers to research participation may include low awareness of research studies,[45] under-representation of Black people in leadership and conduct of research studies,[41, 46] and a lack of perceived benefits for research participation given racial inequities in healthcare access and quality.[46-53] While some lessons can be learned from this prior research, significant racial disparities in research participation persist. There is currently no information about factors influencing decisions about participation in SARS-CoV-2 serosurveys (e.g., trusted sources of health information, personal cognitions about competing risk and benefits, social norms). Barriers and motivations for participating in SARS-CoV-2 serosurveys may be unique to the novel infection, which is more widespread than other infections disproportionately affecting Black people and also has more variability in terms of outcomes. The current U.S. socio-political climate may also uniquely influence Black people's decisions about participation in medical research generally, and SARS-CoV-2 research specifically. Influencing factors may include, for example, amplified distrust of governmentally-endorsed research due to increased visibility of violence against Black people, discriminatory immigration policies, and cuts to social services programs that many racial and ethnic minorities depend on for healthcare.

We propose a community-based participatory research study to understand barriers and motivations influencing participation in SARS-CoV-2 serostudies among Black populations in three majority Black, socio-economically diverse communities in Atlanta, GA. In Georgia, Black persons make up 40% of confirmed SARS-CoV-2 cases (among the 64% of cases with race/ethnicity data) and 32% of the state's population.[54]

Table 2. Demographic characteristics of focus zip codes [15, 55]

	30021*	30318	30310	City of Atlanta
Population, 2019	12,757	54,152	29,658	506,811
Population/sq. mile	6,956	2,659	3,363	3,154
Average persons per household	3.4	3.4	3.9	2.2
Median age	28	31	35	33
Median household income	$38,283	$47,918	$31,490	$55,279
Black or African American (%)	57.9	53.7	88.0	51.8
Foreign born (%)	53.5	8.0	2.0	7.1
HS graduate (%)	65.5	90.0	82.0	90.3
College degree (%)	22.8	48.0	22.0	49.9
In poverty (%)	33.1	22.2	28.7	21.6

*City of Clarkston

Two metro Atlanta counties (Fulton and DeKalb.[54]) contribute nearly 16% of the state's 238,860 cases. These counties are nearly 45% and 55%, respectively, Black or African American (Table 2).[15, 55] Approximately 14% of Fulton and DeKalb county residents live in poverty, and up to one-third of people live in poverty in highly disadvantaged zip codes. Socio-demographic heterogeneity in these three communities will allow us to examine how decision-making about serosurvey participation varies by demographic characteristics and social determinants of health.

Intersectionality theory allows for multiple demographic factors, such as race, class, gender and sexuality, to simultaneously be the focus of research questions, conceptual frameworks, and analysis.[35] Intersectionality disrupts the notion that identity factors are hierarchical, or that race is the most important factor over gender, class, and sexuality for communities of color. Rather, intersectionality asserts that race, gender, class and sexuality are all interlocked, cannot be separated, and should all be centered when examining the lived experiences of Black populations. Utilizing an intersectional framework for this project will allow us to gain nuanced perspectives from diverse Black populations in Atlanta regarding attitudes about serosurvey participation.

The family of value-expectancy theories will provide a guiding framework by which we seek to identify motives and barriers to participation in serosurvey testing. Value-expectancy theories posit that the propensity to engage in a behavior is a function of the expected outcomes of that behavior and the value of the outcomes.[56, 57] Within this family, the Theory of Reasoned Action posits one's attitudes toward a behavior are informed by 1) their beliefs that the behavior will lead to a particular outcome; and 2) subjective norms – i.e., the perceived social acceptability of engaging or not engaging in the behavior.[58] These attitudes in turn influence intentions to engage in the health related behavior. The Health Belief Model posits that health-related behavior is contingent on 1) personal investment in one's own health; 2) perceived threat to one's health; and 3) the perceived health benefits relative to the perceived costs (i.e., barriers) of the behavior.[59] See Table 4 for examples of how these theories will inform topics explored in semi-structured interviews.

The proposed research aims to identify reasons for non-participation in SARS-CoV-2 serosurveys among U.S. Black populations. However, many of the factors influencing non-participation in serosurveys are likely to similarly impact participation in other SARS-CoV-2 research and acceptability of pharmacologic interventions such as vaccines. **The findings from this study can therefore inform implementation of future interventions that are urgently needed to reduce SARS-CoV-2 infections in Black populations.**

c. Innovation

Most studies aiming to reduce health disparities compare racial minority groups to the majority (white) population. This is a tacit denial of the considerable heterogeneity within racial/ethnic groups. Among Black populations in Atlanta, there is considerable diversity in educational attainment, income, country of birth, and other socio-demographic and cultural characteristics. One innovation of this proposal is consideration of such heterogeneity in the study design. Our study will facilitate nuanced comparisons across Black sub-populations in terms of propensity to participate in SARS-CoV-2 serosurveys. Full representation of Black populations is needed in SARS-CoV-2 burden of disease estimates, and for informing prevention implementation models, and tailored strategies will be needed to increase participation across sub-populations. Second, we will offer participants SARS-CoV-2 antibody testing alongside data collection and use decisions about participation in such testing as a proxy measure for serosurvey participation. We will collect survey data assessing SARS-CoV-2 risk, as well as barriers and motivations for serosurvey participation. Taken together, these data can provide critical information about what types of selection bias may exist in SARS-CoV-2 serosurveys, e.g. if persons with more risk are less likely to participate, which is currently unknown. Third, although many surveys report characteristics of non-responders, few surveys are conducted primarily to determine the reasons for refusal. The format we have developed for offering participation in order to understand refusal will be an innovative contribution to the survey literature.

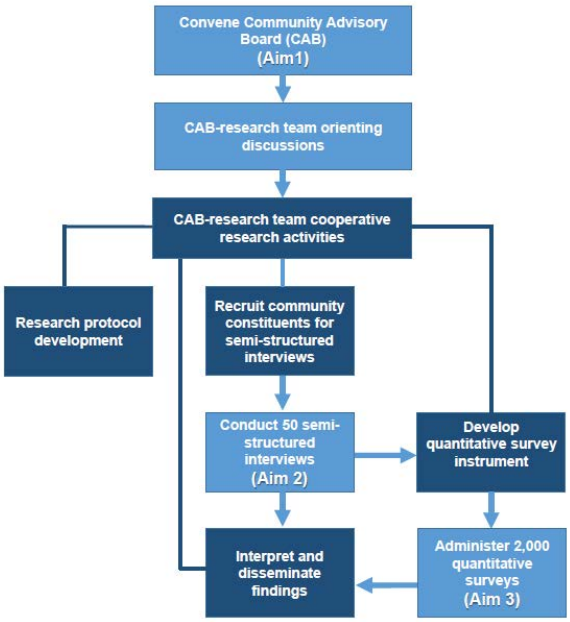
d. Approach

d.1 Overview of approach

To understand barriers and motivations influencing participation in SARS-CoV-2 serostudies among Black populations, we propose a three-part, community-engaged research design. In Aim 1, we will engage a community advisory board (CAB) including leaders of professional, faith-based, and health and social services organizations. We have identified several key community partners, (see section d.6 and letters of support), who will help us to recruit additional organizations serving a range of Black, socio-demographically diverse communities across three focus zip codes. Following a series of community orientation discussions with the CAB, the research team and CAB will work collaboratively to establish research protocols and design data collection instruments. In Aims 2 and 3, we will collect information about factors influencing serosurvey participation from respondents alongside a request to participate in SARS-CoV-2 antibody testing. The

decision about participating in antibody testing will be used as a proxy measure for the likelihood of actual participation in a SARS-CoV-2 serosurvey. In the true application of a serosurvey, participants would be asked to test for SARS-CoV-2 infection and/or antibodies followed by a survey about potential risk for, and exposure to, infection. In the present study, we are offering antibody testing as a way to measure how participants would likely respond if requested to participate in a serosurvey, which will allow us to analyze data on preferences alongside an "actual" decision. In Aim 2, we will conduct 50 semi-structured interviews with constituents of Black communities who are identified by CAB members and who represent diverse populations as defined by gender, age, and socio-economic status. These theory-informed, semi-structured interviews will seek information from participants about barriers and motivations influencing decisions about serosurvey participation. We aim to interview 25 persons who choose to participate in antibody testing and 25 who choose not to participate in antibody testing. In Aim 3, we will survey approximately 2,000 persons, randomly selected from households in the three focus zip codes, about barriers and motivations for serosurvey participation. Thematic findings from the qualitative interviews, as interpreted collaboratively with the CAB, will be used to develop the survey instrument, which will measure barriers and motivations in terms of their relative importance to respondents. Data will be analyzed by antibody test participation status and socio-demographic characteristics (e.g., gender, age, education level, income level) to assess how the distribution of factors influencing decisions about serosurvey participation differs across diverse Black populations.

Figure 1. Overview of community-engaged research



d.2 Research team and relevant experience

PI Bradley has extensive background in epidemiology and surveillance of infectious diseases, in both governmental (CDC), and academic (Johns Hopkins Bloomberg School of Public Health, GSU) settings, with particular expertise in design and use of probability-based survey methods for surveillance. She has considerable field experience leading outbreak investigations including design of surveillance systems for on-going burden of disease monitoring (HIV, syphilis, Ebola). She also has expertise in racial and socio-demographic disparities in infectious disease risk (HIV, STIs, Hepatitis C). **Co-I Rothenberg** has a long history of direct public health experience (as State Epidemiologist in New York), of national disease control and surveillance (CDC), and in academic public health (at Emory University and GSU). His pioneering work on transmission dynamics of STIs and HIV, focused on network approaches to disease risk, is the basis for a wide range of network theory applications to racial disparities in infectious diseases. Additionally, **Co-I Rothenberg** is part of a modeling group forecasting the trajectory of SARS-CoV-2 infections in multiple countries. **Consultant Sullivan** is an MPI for a NIAID-funded national probability serosurvey (3R01AI143875-02S1) that will produce national and some state estimates of active SARS-CoV-2 infection and antibodies alongside demographic and behavioral information, and **PI Bradley** and **Co-I Rothenberg** are Co-Is for this study. **Co-I Reidy** has extensive background in the behavioral science of health risk and promotion behaviors, in both governmental (CDC) and academic (School of Public Health GSU). He has expertise in measurement and quantitative methods for behavioral science. He has served as the statistician on multiple federally funded grants and teaches doctoral courses in measurement development. Currently he is PI on the evaluation of a social norms intervention to promote healthy relationships among ethnic and racial minority youth. **Co-I Newton** is a sociologist who specializes in critical race studies, with a focus on African Americans, systemic racism, and gendered racism. She frequently utilizes intersectionality as a theory and, methodologically, is an ethnographic and qualitative researcher who uses in-depth interviews and participant observation to gain fuller pictures of the lived experiences of African Americans with oppression. **Consultant Diallo**, Founder and President of SisterLove, Inc., has more than 35 years of experience as a community health worker, public health practitioner and instructor, intervention developer and implementer, non-profit executive and community-based research investigator and partner, and facilitator and organizational development consultant. She has worked with the University of Alabama at Birmingham, Emory University, and CDC on community-engaged research to develop and evaluate evidence-based interventions for women at risk and/or living with HIV/AIDS.

d.3 Operational plan

Our multi-disciplinary research team will leverage existing relationships with community partners and a cohort of culturally competent, methodologically strong Georgia State University graduate students to carry out research rooted in the communities we aim to serve. We have representation on our research team (**Consultant Diallo**) from SisterLove, Inc., one of our community partners with substantial experience in community-participatory research related to HIV testing and vaccine trials in Black communities in Atlanta. Our graduate students will also be a significant asset to this research. Georgia State University is located in downtown Atlanta, 69% of our graduate students are racial/ethnic minorities,[60] and many are native Atlantans. **PI Bradley** will provide oversight of all research activities, including issues related to human subjects research, data collection, analysis, and dissemination. **Co-I Rothenberg** will lead sampling activities for the quantitative survey, advise on survey field work, and liaise with the laboratory on specimen collection, testing, shipment, and results interpretation. **Co-I Reidy** will lead development of the quantitative survey and will guide analytic plans for quantitative data analysis. **Co-I Newton** will lead development of the qualitative survey, train graduate students in qualitative data collection, and lead qualitative data analysis. **Consultant Sullivan** will draw on his considerable experience implementing a SARS-CoV-2 serosurvey (R01AI143875-02S1) to advise on issues surrounding recruitment, data collection including specimen collection, and laboratory-related issues. **Consultant Diallo** will be the primary liaison to the CAB. She will advise the research team on which community-based organizations should be included on the CAB to capture the diversity of African American and Black communities in the three focus zip codes, help to operationalize true collaboration between the CAB and research team on all research activities, and ensure that CAB input is appropriately incorporated in research activities and products. **Herschel Smith IV**, **MPH**, doctoral candidate, will lead the student data collection team and contribute substantially to other research activities. A team of six public health and sociology **graduate students** will collect qualitative and quantitative data. All team members will participate in data analysis, findings interpretation, and dissemination activities.

d.4 Preliminary work

PI Bradley has led community-based research in the context of HIV outbreak investigations, including a large outbreak in Indiana, which directly informed public health prevention and control strategies.[61, 62] Co-I Rothenberg has enrolled more than 40,000 (R01DA09966, U01AI47473, R01HD043678, R01DA13895, R01MH58077, R01DA019393, R01DA031171, R21DA030286) participants in Atlanta-based, infectious disease-related field research, and this work has led to over 50 peer-reviewed publications. (e.g.,[63-65]) Much of PI Bradley and Co-I Rothenberg's research has also been dedicated to explaining and reducing racial disparities in infectious diseases.[65-73] Consultant Sullivan is on the forefront of validating SARS-CoV-2 PCR and antibody tests for home use,[74] and is co-directing a NIAID-funded national serosurvey with PI Bradley and Co-I Rothenberg as Co-Is.[25] Co-I Reidy is currently the PI of a federally funded clinical trial (U01CE003215-01**)** involving a community based participatory research design in Atlanta high-schools. Additionally, as Co-I on GSU's prevention research center grant (1U48 DP006393-01), Reidy oversees translation and validation of survey measures into multiple languages associated with refugee participants' home language. Additionally, he has served as the statistician on multiple federally funded grants (CER-1409-21178; 90CU0062; 1U01CE002651-01; 5U01CE002115**)** and is currently a guest researcher at the Centers for Disease Control leading the development of a standardized measure to quantify latent classes persons exposed to violence. There are no preliminary data on reasons for non-participation in SARS-CoV-2 serosurveys, although Table 1 summarizes non-participation rates.

d.5 Characteristics of 3 target communities

We will include three communities, delineated by zip codes, in metro Atlanta: City of Clarkston, GA (incorporated area within DeKalb County, single zip code), and 30318 and 30310, both in Fulton County (Table 2). These communities are made up of more than 50% Black persons (range: 54–88%) and are socio-economically diverse (range: 22–33% living in poverty). Residents of the 30318 zip code are more educated than in the other 2 (48% with a bachelor's degree vs. 22%), and have an average household income of $47,918 compared to $38,283 in Clarkston and $31,490 in 30310. Clarkston is the most ethnically diverse community in Georgia and is a designated U.S. entry site for refugees. More than half its population is foreign born, though most are U.S. citizens. Clarkston is also the geographic focus of our CDC-funded Prevention Research Center at the GSU School of Public Health.[75] Clarkston and the Fulton County zip codes are

approximately 10.5 miles apart. Sampling participants from these three diverse zip codes with majority Black populations will facilitate comparisons of motivations and barriers to SARS-CoV-2 serosurvey participation by socio-demographic characteristics among diverse Black sub-populations.

d.6 Convening of community advisory board (Aim 1)

Community participation improves acceptability, inclusiveness, and usefulness of research studies.[76-79] Active involvement of communities is particularly important for studies focused on racial/ethnic disparities, as community leaders and constituents have in-depth knowledge of cultural and social considerations that are critically relevant to research methods and interpretation of findings.[79] We will convene a CAB as our first research activity, before writing protocols or seeking IRB approval. We will hold a series of discussions with CAB members about culturally-relevant considerations for the proposed research, after which multiple collaborative research activities will be conducted (see Figure 1). The CAB will be composed of leaders of professional, faith-based, health, and social services organizations serving Black populations in the three focus metro Atlanta zip codes. We currently have four organizations committed to serving on our CAB and our CAB liaison, **Consultant Diallo**, will advise on other important organizations to include given her long-standing ties with Black communities in Atlanta. **SisterLove, Inc.**, which Dr. Diallo founded in 1989, is a community-based HIV and reproductive health service and advocacy organization located in and serving Atlanta's 30310 zip code, which is most underserved of the three focus zip codes for this research. **BLKHLTH** is a Black-owned community-based organization founded by a group of young people who are recent MPH graduates. They provide community health education and engagement to empower metro Atlanta Black communities, including in our focus zip codes, to actively participate in improving health equity. The **Alpha Phi Alpha Fraternity** DeKalb County alumni chapter is an important professional networking organization for Black men in Atlanta that is also actively engaged in community service aiming to reduce racial inequities. Similarly, **Delta Sigma Theta Sorority** Stone Mountain-Lithonia Alumnae Chapter is a professional network for Black women in Atlanta engaged in community service in our focus project areas. Together, these organizations represent the diversity of Black communities we aim to describe in terms of gender, age, and socio-economic status, though we will recruit at least two additional organizations, including at least one faith-based organization, in consult with Dr. Diallo.

d.7 Overall data collection strategy

Both semi-structured interviews (Aim 2) and quantitative surveys (Aim 3) will be conducted alongside SARS-CoV-2 antibody testing. This strategy is intended to simulate a serosurvey, in which participants are asked to perform both PCR/antibody testing and a survey about demographic and behavioral characteristics. Both people who choose to participate and choose not to participate in antibody testing will be asked to complete either an interview or survey (depending on research aim). Participation (or not) in antibody testing will be used as a proxy measure for participation in a serosurvey. This will allow us to analyze data about barriers and motivations for serosurvey participation in conjunction with a participant's actual decision about participation.

When approaching potential participants for participation, we will explain we are conducting research on how many people in their community may have been infected with SARS-CoV-2 and also wish to understand more about what motivates people to take part in such testing. We will then employ a two-step consent process. In step 1, we will offer participants antibody testing alongside an explanation of the implications of testing and results. For participants who consent, the interviewer will guide them through the process of self-collecting a specimen, which entails pricking one's finger and depositing a few drops of blood onto a dried blood spot (DBS) card. In step 2, regardless of participant decision about antibody testing, we will ask them to take part in either a semi-structured interview (during AIM 2) or a survey (during AIM 3) about motivations and barriers for serosurvey participation. Participants may participate in either antibody testing or the interview/survey, neither, or both. Incentives for participation by activity (Table 3) will be explained in stages. The incentive for antibody testing will be described in step 1 of consent, and the incentive for the interview/survey will be described in step 2 of

Table 3. Participant incentives by research activity

	Semi-structured interview	Survey
Step 1: Agree to serology	$25	$25
Step 2: Agree to interview	$50 (total $75)	$40 (total $65)
Step 2: Do not agree to interview	$25	$25
Step 1: Do not agree to serology	$0	$0
Step 2: Agree to interview	$50	$40
Step 2: Do not agree to interview	$0	$0

Note: incentives differ by activity based on expected participant effort

consent. Importantly, antibody tests will be processed, participants will receive their results, and we will analyze and disseminate results (Aim 3).

d.8 Semi-structured interviews (Aim 2)

The goal of the semi-structured interviews is to identify the broad range of factors that may decrease (e.g., belief that one is unlikely to contract COVID, fear that one's DNA could be used to implicate someone in a crime) and increase (e.g., the belief that they are helping their community, receiving monetary incentive) the probability Black people decide to participate in a SARS-CoV-2 serosurvey. In collaboration with the CAB, we will develop open-ended questions for the semi-structured interview to assess five pertinent health behavior domains derived from the Theory of Reasoned Action and the Health Belief Model. See Table 4 for an example of how these theories will be used to guide the generation of interview questions tapping each of the 5 pertinent domains. The phrasing of all interview questions will be developed at approximately the 4th grade reading level. Though the research team and CAB will develop the interview instrument with some presupposition to barriers, the semi-structured interview will be administered in a way intended to elicit thoughts and opinions about participation in serosurveys without a priori hypotheses about specific barriers or motivations to participation.

Table 4. Examples of Interview Questions Assessing Health Behavior Domains

Theory of Reasoned Action	**Belief Behavior will lead to Perceived Outcome**	- What are some reasons you agreed / did not agree to do the COVID-19 test? - Do you think there are possible bad outcomes/benefits from doing a COVID-19 test for research studies? What are they? - What kinds of things might increase your likelihood of agreeing to be tested?
	Subjective Norms: Perceived Acceptability	- Where do you get information about COVID-19? - Who do you trust to tell you the truth about COVID-19? - What do other people in your community think about doing a COVID-19 test for research studies?
Health Belief Model	**Personal Investment in Own Health**	- How much do you worry about your health? - What kinds of things do you do to stay healthy?
	Perceived Threat to Health	- How likely do you think it is you will get COVID-19? - If you get COVID-19, what do you think would happen?
	Cost/Benefit	- What kinds of things might make taking the COVID-19 test more useful to you? - Is there something that might ease your mind about taking the COVID-19 test?

d.8.1 Sampling and Recruitment

Barriers and motivations for serosurvey participation may vary across Black sub-populations (e.g., men vs. women, high vs. low education, early vs. late adulthood, etc.). Therefore, we will attempt to maximize the diversity in our sample in terms of gender, age, and education. With help from the CAB, we will purposively sample socio-demographically diverse community members for semi-structured interviews. CAB members and the study team will jointly reach out to potential participants for recruitment using mail, phone, or e-mail, explaining that the semi-structured interview will include, depending on participant preferences, antibody testing and/or an open-ended discussion about participation in SARS-CoV-2 testing research studies. Prior research suggests 12-17 interviews are necessary to achieve theme saturation.[80, 81] Given themes may vary to some degree across Black sub-populations, we will increase the number of interviews to ensure saturation achieved across these groups. We will recruit approximately 50 persons (25 who participate in antibody testing and 25 who do not) to complete the semi-structured interviews on assessing barriers to and motivations for participation. We will employ a purposive quota sampling procedure wherein we will attempt to interview a relatively equal number of participants across sub-groups outlined in Table 5.

Table 5. Representation of groups for the qualitative survey

Refuse antibody testing		Participate in antibody testing	
Male; HiEd; Old	Female; HiEd; Old	Male; HiEd; Old	Female; HiEd; Old
Male; HiEd; Young	Female; HiEd; Young	Male; HiEd; Young	Female; HiEd; Young
Male; LoEd; Old	Female; LoEd; Old	Male; LoEd; Old	Female; LoEd; Old
Male; LoEd; Young	Female; LoEd; Young	Male; LoEd; Young	Female; LoEd; Young

d.8.2 Interview procedures

For persons amenable to participation on initial contact from the CAB/research team, a study team member will set up an appointment by mail, phone, or e-mail for an interview at the participant's preferred private location. We will use CDC-recommended personal protective equipment (PPE) for study staff and participants, which

will vary depending on whether the interview takes place indoors or outdoors. We will separately offer antibody testing and participation in an interview (see section d.7). For those who consent to interview, we will conduct a 45 – 60 minute semi-structured interview about factors across theory-driven domains that may influence decisions about serosurvey participation.

d.8.3 Analysis of Qualitative Data

Interviews will be audio recorded (with no identifying content) and transcribed via professional transcription services. Transcripts will be coded in Nvivo software. We will use a thematic analysis approach that will allow us to discover emerging perceptions and meaningful categories for our participants and to iteratively generate themes during the review of coded transcripts.[82, 83] We follow a five-stage analysis plan.[84] 1) coders read the transcripts, familiarizing themselves with their content and developing a coding system to characterize this content; 2) they re-read each transcript and apply these codes to narrative segments; 3) coders develop visual display matrices for each topic, with matrix rows containing relevant narrative segments from each interview; 4) coders examine data in each matrix to discern primary concepts and relationships across interviews (this data reduction process involves grouping and condensing similar narrative material to identify, describe, and contextualize concepts and relationships); and 5) data are interpreted in light of the research aims and relevant literature. We will identify commonly expressed themes across the sample and evaluate potential differences by antibody participation status, gender, age, and educational attainment. These findings, including language used by participants, will be utilized in Aim 3 to develop the survey instrument measuring barriers and motivations for serosurvey participation.

d.9 Quantitative Survey (Aim 3)

d.9.1 Purpose of survey

The primary purpose of the quantitative serosurvey is to measure how the themes identified as barriers and motivations for serosurvey participation in the qualitative survey are distributed across respondents' socio-demographic characteristics, as well as the relative strengths of barriers and motivations in terms of predicting participation in antibody testing. In addition, we will assess participants' risk for SARS-CoV-2 infection (e.g., risk and prevention behaviors). Simultaneous collection of data on antibody testing participation status and infection risk will allow us to identify potential sources of selection bias in serosurveys and to make recommendations about which barriers and motivations influencing serosurvey participation are most important to address across Black sub-populations with highest SARS-CoV-2 risk who may currently be under-represented in serosurveys.

d.9.2 Survey instrument design

We will develop a quantitative survey instrument to collect data on barriers and motivations for SARS-CoV-2 serosurvey participation as well as the relative strengths of these as influencing factors for decision-making about serosurvey participation. Participants will be asked to the endorse factors that are most important, with some indication of relative importance, in determining their willingness to participate in antibody testing as part of a research study. Factors included will be determined by commonly occurring themes from the theory-driven semi-structured interviews and in collaboration with the CAB. We will also collect information about socio-demographic characteristics of respondents and perceived and actual SARS-CoV-2 risk, based on prevention and risk behaviors. All items will be written at a 4th grade reading level. Prior to data collection, we will conduct cognitive interview with volunteers from the CAB to ensure the clarity, comprehension, and cultural appropriateness of all survey questions. Poor survey items will be revised or removed.

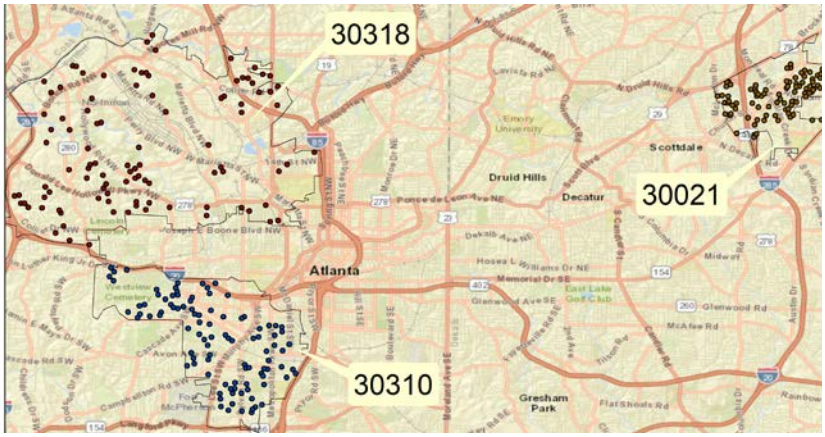
d.9.3 Sample size calculation

The study will involve descriptive comparisons and statistical models (e.g. logistic regression, latent class analysis), both within and across target zip codes. Random selection will allow us to make comparisons between and among sub-groups. At a sample size of N=650 for each of 3 focus zip codes, we can detect a difference in proportions of 10 percentage points with each two way comparison of respondents in the three zip codes with 90% power. In the multiple regression context, when examining the influences on a particular reasons for refusal, the sample size provides a power of >95% to detect an Odds Ratio of 2.0 for the effect of a variable on a binary outcome. In the analysis that combine zip codes, the total sample size (N=1950) will be adequate for all important comparisons. Our sample size anticipates a higher than expected non-response rate. At a non-response rate of 50% (that is, only 325 of the 650 agree to participate in the survey), analytic power to detect a 10 percentage point difference in two-tailed comparisons is reduced to 80%.

d.9.4 Sampling

We will sample households from three zip codes in DeKalb and Fulton counties (see Table 2). Both county governments make publically available the entire file of land parcels, thereby providing a master list of addresses in the three zip codes. We will create an initial random sample of 1000 parcel/addresses in census block groups that are at least 80% Black in each of the 3 zip codes, in a multistep process: 1) extract all residential parcels from the county parcel data (using class code = R3); 2) select parcels by census block group; dissolve all residential parcels into fewer polygons for GIS, thereby constraining the range to generate random points; 3) generate random points with the constraint that they must be at least 50 meters apart; 4) overlay the points on the parcel map to identify the actual parcel addresses. The initial steps, producing a spot map, are demonstrated in Figure 2. We will sample without replacement until we have achieved a sample size of 650 in each zip code.

Figure 2. Sampling result



d.9.5 Recruitment

First, we will contact households by mail to let them know that a study representative from Georgia State University and affiliated community-based organizations will be contacting them to explain a study that we are doing about Covid-19. We will ask sampled households to complete a brief registration, including household enumeration, using a web-based form. We will contact participants who complete registration through mail, phone, or e-mail (depending on preferred method) to schedule a meeting at the participant's preferred private location. We will visit households who do not complete registration, and if no one answers the door, will re-visit three times before considering them non-responders. Regardless of registration status, we will attempt to recruit a person in the household, aged at least 18 years, with the next birthday for participation. Other recruitment procedures will be identical to those used for semi-structured interviews.

d.9.6 Survey procedures

Survey procedures will be similar to semi-structured interview procedures in that we will separately offer antibody testing and survey participation (see section d7). For those who consent, we will administer a 30–45 minute survey assessing strengths of barriers and motivations for serosurvey participation, demographic characteristics, and perceived and actual risk for SARS-CoV-2 infection. Participants will be offered options to complete the survey either in person or using a web-based application, and persons choosing the web-based option will be e-mailed an incentive upon completion.

d.9.7 Analysis of quantitative data

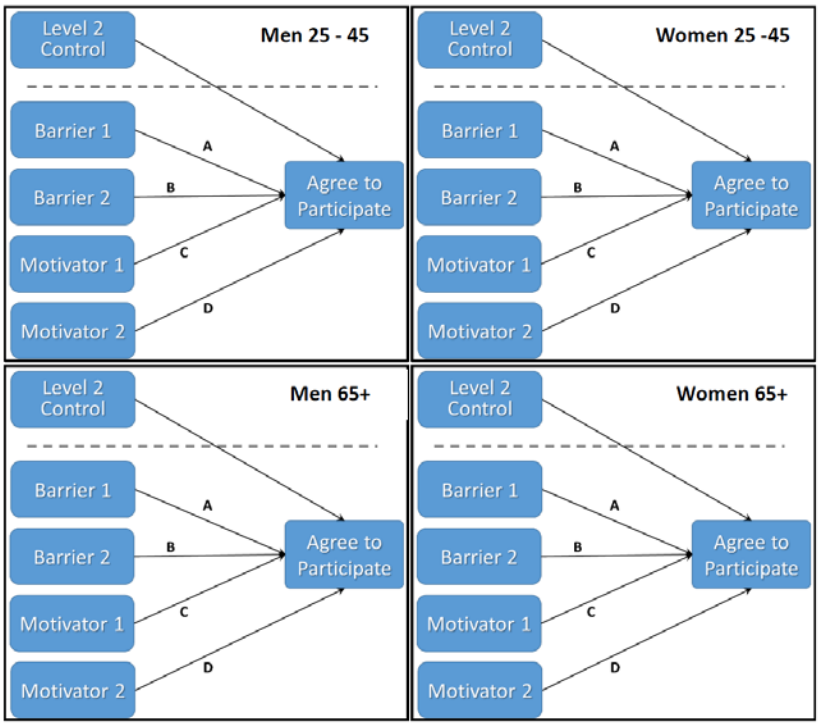
Our survey instrument will provide individual information on demographics, behavior, psychosocial factors, and the motivating factors for participating or not participating in a serosurvey. In addition, because we are sampling by zip codes, we will have neighborhood level data (at the census block level) in considerably greater detail than provided in Table 1. Finally, we will have data to examine the strength and distribution of the major theoretical constructs that seek to explain participation. We will use the questions associated with each of these constructs to produce an estimate of the strength of the construct for descriptive purposes, and will use the details from these responses for more extensive modeling (see below). The primary analytic question will be to compare persons who participate with those who refuse, using the variety of epidemiologic measures that have been obtained. We envision a staged analysis:

Outcome #1: Participation in serologic testing by socio-demographic characteristics and SARS-CoV-2 risk

In the first stage, the association of socio-demographic (e.g., age, gender, education) and SARS-CoV-2 risk behavior variables with antibody (serologic) testing participation will be tested. Simple point biserial and phi correlations will be computed for continuous/ordinal (e.g., age, education, income) and binary (e.g., gender)

variables respectively. Additionally, we will test the potential association of neighborhood level characteristics (e.g., percent unemployment, percent rental housing, etc.) using multilevel logistic regression. Census block will be used as the clustering variable. Any neighborhood characteristics that are found to be significantly associated with participation in antibody testing will be included in the next stage of analysis as control variables.

Figure 3. Example of a Multiple Group MSEM Logistic Regression



Outcome #2: Relative strengths of reasons for participation and non-participation in serosurveys by socio-demographic characteristics and participation status

In the second stage of analysis, we will compute a series of multivariable logistic regressions within a multiple-group, multilevel structural equation modeling (MSEM) framework.[85] MSEM is ideally suited to address potentially complex data (e.g., missingness, categorical outcomes, clustering). An additional benefit of the MSEM framework is the ability to obtain a suite of fit indices to judge the validity of parameter estimates. Analyses will be conducted with the Mplus (v8.4) software using maximum likelihood estimation. MLE in combination with bootstrapping can provide parameter estimates and standard errors that are stable and robust to violations of assumptions and consequences of overfitting regression models.[86-89] Intra-Class Correlations will be computed for all variables at the census block (level 2) and standard errors will be adjusted for this clustering effect in all analyses. Missing data will be handled via multiple imputation. We will use logistic regression to test which barriers and motives for participation in serosurveys most strongly predict one's likelihood of agreeing to participate. Binary antibody testing antibody testing participation response will be regressed simultaneously on all barriers and motives. Neighborhood factors associated with antibody testing participation will be included in models as a level 2 control variables. Standardized and exponentiated regression coefficients (i.e., odds ratios) will be used to determine the relative effect sizes for each factor related to antibody testing participation.

Within the multi-group MSEM framework (see figure 3 for example), we will test whether parameter estimates are comparable across various subgroups using corrected χ^2 difference tests.[90] If constraining parameter estimates to be equal across groups causes a statistically worse fit to the data, as indicated by a significant χ^2 difference test, then that parameter is significantly different across two or more groups. The utility of the multi-group framework is that it allows us to test differences in specific parameters (e.g., path A or path C) across a subset of groups (e.g., young men vs. older men, young men vs. older women, etc.) or test multiple parameters across all groups. Thus, we are able to determine which barriers and motives for serosurvey will be most impactful within and across groups. This will allow researchers and surveillance experts to implement tailored recruitment strategies as needed to increase response rates.

Outcome #3: Barriers to non-participation in serosurveys among persons refusing antibody testing

In stage 3 of analysis, we will conduct finite mixture modeling among the group of individuals refusing antibody testing participation to identify latent classes of individuals based on barriers and motives. Latent class and profile analysis (LCA and LPA) are person-centered finite mixture modeling procedures that use multiple binary (LCA) or continuous (LPA) indicators to estimate distinct latent classes of individuals.[91] The primary goal of LCA/LPA is to maximize the homogeneity within groups and maximize the heterogeneity between groups. Each case entered into the LCA/LPA model receives a probability of membership for each class; class assignment is made based on the highest probability. Each class yields a probability profile in which the frequency of each of the indicators in each class is estimated. The number of classes is guided by theory and the use of comparative fit indices across models with sequentially increasing numbers of classes.[91-93] We will

use the Akaike Information Criteria (AIC) and sample size adjusted Bayesian Information Criterion (aBIC), the Vuong-Lo-Mendell-Rubin Likelihood Ratio Test (LMR) to determine the optimal number of classes.[91-93] The best fitting, most parsimonious models are those that minimize the fit indices (AIC and aBIC) and for which adding an additional class leads to a worsening of fit as indicated by the LMR. In addition to the enumeration process, we will examine relative entropy values and average posterior probabilities (APPs). The APPs provide class-specific measures of how well the set of indicators predict class membership in the sample. Values above .70 suggest that the latent classes are well separated and class assignment accuracy is adequate.[91-93] Entropy is a summary index that indicates the model's relative precision in classifying all individuals in the sample across classes. Values nearest to 1 indicate the best classification with values above .80 considered to be high entropy.[91-93] Because classification error may increase by chance alone for models with more latent classes, one should not use this parameter as part of the model selection process during class enumeration.[91] However, low entropy values do indicate a great deal of classification error.

This approach will be used to identify potential classes based on individuals' responses to survey items assessing their barriers and motives for nonparticipation in serosurvey testing. That is, we can determine whether there are groups of people that are similar based on constellations of reasons for not participating in the serosurvey. Moreover, we can determine the proportion of people that fall into each class. Thus, we can identify the largest groups of people and devise recruitment strategies based on the motivation/barriers characteristics of those groups, thereby most efficiently and broadly maximizing increases in response rates.

Outcome #4: Presence of SARS-CoV-2 antibodies by individual and neighborhood characteristics

To further understand how SARS-CoV-2 risk is distributed across individual and neighborhood-level variables, we will compare antibody positivity by socio-demographic, behavioral, and neighborhood-level variables using multi-level logistic regression models. The State of Georgia reports 7.4% of antibody tests are positive, cumulative from the beginning of the pandemic.[54] Coupled with undiagnosed infections, particularly among Black populations, it is likely that 7.4% is a considerable underestimate and a substantial number of positives will be available for analysis. These analyses will be conducted in R, SAS, and MPLUS.

d.10 Laboratory protocol and methods

Specimens for laboratory testing will be collected using finger pricks/DBS cards for serology. Participants will perform a finger prick with an automated lancet and fill in a Whatman 5-spot DBS card for the detection of antibodies to SARS-CoV-2. A 6mm punch will obtained from the dried-blood spot and the material will undergo a standard antibody extraction method using TRIS buffer. Once the material is added to the reaction tube, the EIA primary and secondary antibodies for the screening test (SARS-CoV-2 assay, total immunoglobulins; BioRad, Hercules, CA; Sensitivity: 99.2%; Specificity: 99.6% for IgG, IgM, and IgA) will be added using an automated liquid handler instrument (DSX; Dynex Technologies, Chantilly, Virginia). Specimens that screen positive with the BioRad assay will be confirmed with a second assay with high specificity for IgG and IgA (euroIMMUN IgG, Mountain Lakes, NJ; Sensitivity: 90%, Specificity: 100%; euroIMMUN IgA performance not yet documented by FDA). This combination of confirmatory isotypes addresses both early and long-term immune responses, and IgA appears at approximately the same time post-infection as IgM and at higher concentrations. The protocol will follow the manufacturer's guidelines for reaction conditions, data interpretation, and ensuring that internal controls pass. Based on the FDA-evaluated sensitivity and specificity of the two tests, the predictive value of the algorithm for a positive test (PPV) is 100% in all cases, and the predictive value of a negative test (NPV) ranges from 99.4%-99.99%, depending on prevalence of antibodies in the population.[94] Our contract laboratory, Molecular Testing Labs (MTL) has a strong history of validating serologic tests for infectious diseases on DBS specimens (HbSag, HCV, HIV, syphilis, HSV2) under CAP, having performed 121,164 antibody tests on DBS specimens in the past year. Consultant Sullivan and MTL current work together on a national SARS-CoV-2 serosurvey. We will monitor the dynamic and emerging pipeline of serology test systems and will save duplicate DBS punches at -80ºC to maintain options for redundant testing if better testing options become available later.

d.11 Products of the research

Based on our findings, and in collaboration with our CAB, we will make community-endorsed recommendations for increasing participation of Black populations in serosurveys and future SARS-CoV-2 prevention interventions such as vaccination. Recommendations will be tailored to Black sub-populations by gender, age, and socio-economic status. These recommendations may be most relevant in urban areas that are reasonably comparable to metro Atlanta. To address this potential limitation, we will also produce a validated, theory-

driven survey instrument that can be used to assess barriers and motivations for serosurvey participation in Black populations across diverse settings.

d.12 Data sharing with RADx-UP partners

We are committed to sharing de-identified data and data collection instruments through the RADx-UP Coordination and Data Collection Center (CDCC) and directly with other cooperative agreement recipients. Our data collection will occur in two phases, qualitative and quantitative, and we will share data from each phase as they come in, on an on-going basis. We will also prepare briefs to share with other project partners every other month including data summaries, challenges encountered, and lessons learned.

d.13 Study limitations and alternatives considered

The proposed study will take place in the context of a rapidly changing pandemic. As such, we will be mindful of the evolving state of knowledge regarding SARS-CoV-2 diagnostics, clinical characteristics, and natural history of infection. We will ensure study operations and analytic tools are flexible to relevant scientific advancements. We expect non-response to be a challenge for this proposed research, as it is for SARS-CoV-2 serosurveys. We will work with our CAB members, who are entrenched in the focus communities, to improve community trust and participation. While this level of community engagement may not be possible for every serosurvey, it is necessary for our research design, which aims to access community perspectives on participation in SARS-CoV-2 public health activities. One possible solution for dealing with particularly low response is to use cluster sampling and request participation from all adult members of responsive households. We may also choose to invoke a chain link sampling process, in which participants suggest peers or family members for participation. These approaches limit both randomness and variability, but are potential solutions if needed. Notably, our quantitative survey is powered to accommodate non-response up to 50% of optimal sample size, though this will limit multiply stratified comparisons to some extent. Last, on-going community transmission of SARS-CoV-2 in Atlanta may limit our ability to hold in person meetings with our CAB and if transmission increases, possibly to conduct face-to-fact interviews. It is likely we will hold CAB meetings virtually for the foreseeable future. The use of self-collected specimens for antibody testing in mail-able kits and a web-based survey means we could also move data collection activities, including semi-structured interviews to a virtual format if necessary.

d.14 Study timeline

Year	One				Two			
Quarter	1	2	3	4	1	2	3	4
Convene community advisory board								
Develop protocols and qualitative interview guide								
Hire study staff								
IRB submission and approval								
Recruitment for qualitative interviews								
Conduct qualitative interviews								
Analyze qualitative data								
Develop quantitative survey instrument								
Conduct quantitative surveys								
Analyze quantitative data, disseminate findings								
Disseminate interim results to RADx-UP partners and other investigators conducting serosurveys in the U.S.								

d.15 Conclusion

We know that SARS-CoV-2 disproportionately affects U.S. Black populations, but due to reliance on testing data for surveillance, we do not know to what extent and have little information on the risk factors driving higher rates of infection and worse outcomes among Black people. Serosurveys using probability-based sampling methods can produce robust estimates of population-level disease burden and risk factors, but improvements to design and recruitment methods are needed to increase representation of Black populations in such research. Understanding barriers and motivating factors for participation in SARS-CoV-2 serosurvey research is critical to increasing representation, and this information can be used to improve acceptability of other, related public health interventions such as vaccination. Our research team, situated in a predominantly Black institution in Atlanta, in collaboration with our highly engaged CAB, is uniquely suited to accomplish this work.

References

1. Centers for Disease Control and Prevention. CDC COVID Data Tracker 2020 [cited 2020 August 13]. Available from: https://www.cdc.gov/covid-data-tracker/.
2. Chowkwanyun M, Reed AL. Racial Health Disparities and Covid-19 — Caution and Context. [published online ahead of print, 2020 May 6] N Engl J Med 2020;101056/NEJMp2012910 doi:101056/NEJMp2012910. 2020. doi: 10.1056/NEJMp2012910.
3. Gold JA, Wong II, Szablewski CM. Characteristics and Clinical Outcomes of Adult Patients Hospitalized with COVID-19 — Georgia, March 2020. MMWR Morb Mortal Wkly Rep. 2020;ePub: 29 April 2020.
4. Millett GA, Jones AT, Benkeser D, Baral S, Mercer L, Beyrer C, Honermann B, Lankiewicz E, Mena L, Crowley JS, Sherwood J, Sullivan P. Assessing Differential Impacts of COVID-19 on Black Communities. Ann Epidemiol. 2020 Epub May 14, 2020. doi: 10.1016/j.annepidem.2020.05.003. PubMed PMID: 32419766
5. Lash N, Wezerek G. Why Georgia Isn't Ready to Reopen, in Charts: New York Times; [April 25, 2020]. Available from: https://www.nytimes.com/interactive/2020/04/24/opinion/coronavirus-covid-19-georgia-reopen.html?action=click&module=Opinion&pgtype=Homepage.
6. Azar KMJ, Shen Z, Romanelli RJ, Lockhart SH, Smits K, Robinson S, Brown S, Pressman AR. Disparities In Outcomes Among COVID-19 Patients In A Large Health Care System In California. Health Aff (Millwood). 2020:101377hlthaff202000598. doi: 10.1377/hlthaff.2020.00598. PubMed PMID: 32437224.
7. Bibbins-Domingo K. This Time Must Be Different: Disparities During the COVID-19 Pandemic. Ann Intern Med. 2020. doi: 10.7326/M20-2247. PubMed PMID: 32343767; PMCID: PMC7192360.
8. Bowleg L. We're Not All in This Together: On COVID-19, Intersectionality, and Structural Inequality. Am J Public Health. 2020:e1. doi: 10.2105/AJPH.2020.305766. PubMed PMID: 32463703.
9. Gaglioti A, Douglas M, Li C, Baltrus P, Blount M, Mack D. County-Level Proportion of Non-Hispanic Black Population is Associated with Increased County Confirmed COVID-19 Case Rates After Accounting for Poverty, Insurance Status, and Population Density. 2020.
10. Kim SJ, Bostwick W. Social Vulnerability and Racial Inequality in COVID-19 Deaths in Chicago. Health Educ Behav. 2020:1090198120929677. doi: 10.1177/1090198120929677. PubMed PMID: 32436405.
11. McGonagle D, Plein S, O'Donnell JS, Sharif K, Bridgewood C. Increased cardiovascular mortality in African Americans with COVID-19. Lancet Respir Med. 2020. doi: 10.1016/S2213-2600(20)30244-7. PubMed PMID: 32473125; PMCID: PMC7255150.
12. Poteat T, Millett G, Nelson LE, Beyrer C. Understanding COVID-19 Risks and Vulnerabilities among Black Communities in America: The Lethal Force of Syndemics. Ann Epidemiol. 2020. doi: 10.1016/j.annepidem.2020.05.004. PubMed PMID: 32419765; PMCID: PMC7224650.
13. Price-Haywood EG, Burton J, Fort D, Seoane L. Hospitalization and Mortality among Black Patients and White Patients with Covid-19. N Engl J Med. 2020. doi: 10.1056/NEJMsa2011686. PubMed PMID: 32459916.
14. Rosenberg ES, Tesoriero J, Rosenthal EM, Chung R, Barranco MA, Styer LM, Parker MM, Leung SJ, Morne J, Greene D, Holtgrave DR, Hoefer D, Kumar J, Udo T, Hutton B, Zucker HA. Cumulative incidence and diagnosis of SARS-CoV-2 infection in New York. Annals of Epidemiology. 2020;48:23 - 9. doi: https://doi.org/10.1101/2020.05.25.20113050; PMCID: PMC7297691.
15. U.S. Census Bureau. Census QuickFacts 2020 [cited 2020 August 13]. Available from: https://www.census.gov/quickfacts/fact/table/clarkstoncitygeorgia,atlantacitygeorgia,dekalbcountygeorgia,fultoncountygeorgia,GA/SBO010212#SBO010212.
16. Brown TS, Walensky RP. Serosurveillance and the COVID-19 Epidemic in the US: Undetected, Uncertain, and Out of Control. JAMA. 2020. doi: 10.1001/jama.2020.14017. PubMed PMID: 32692350.
17. Clapham H, Hay J, Routledge I, Takahashi S, Choisy M, Cummings D, Grenfell B, Metcalf CJE, Mina M, Barraquer IR, Salje H, Tam CC. Seroepidemiologic Study Designs for Determining SARS-COV-2 Transmission and Immunity. Emerging infectious diseases. 2020;26(9). doi: 10.3201/eid2609.201840. PubMed PMID: 32544053.
18. Peeling RW, Olliaro PL. The time to do serosurveys for COVID-19 is now. Lancet Respir Med. 2020. doi: 10.1016/S2213-2600(20)30313-1. PubMed PMID: 32717209; PMCID: PMC7380934.
19. Krammer F, Simon V. Serology assays to manage COVID-19. Science. 2020;368(6495):1060-1. doi: 10.1126/science.abc1227. PubMed PMID: 32414781.
20. Goudsmit J. The paramount importance of serological surveys of SARS-CoV-2 infection and immunity. Eur J Epidemiol. 2020;35(4):331-3. doi: 10.1007/s10654-020-00635-2. PubMed PMID: 32318914; PMCID: PMC7173354.

21. Dingens AS, Crawford KH, Adler A, Steele SL, Lacombe K, Eguia R, Amanat F, Walls AC, Wolf CR, Murphy M, Pettie D, Carter L, Qin X, King NP, Veesler D, Krammer F, Chu HY, Englund JA, Bloom JD. Seroprevalence of SARS-CoV-2 among children visiting a hospital during the initial Seattle outbreak. medRxiv. 2020. doi: 10.1101/2020.05.26.20114124. PubMed PMID: 32511483; PMCID: PMC7273251.
22. Havers FP, Reed C, Lim T, Montgomery JM, Klena JD, Hall AJ, Fry AM, Cannon DL, Chiang CF, Gibbons A, Krapiunaya I, Morales-Betoulle M, Roguski K, Rasheed MAU, Freeman B, Lester S, Mills L, Carroll DS, Owen SM, Johnson JA, Semenova V, Blackmore C, Blog D, Chai SJ, Dunn A, Hand J, Jain S, Lindquist S, Lynfield R, Pritchard S, Sokol T, Sosa L, Turabelidze G, Watkins SM, Wiesman J, Williams RW, Yendell S, Schiffer J, Thornburg NJ. Seroprevalence of Antibodies to SARS-CoV-2 in 10 Sites in the United States, March 23-May 12, 2020. JAMA Intern Med. 2020. doi: 10.1001/jamainternmed.2020.4130. PubMed PMID: 32692365.
23. Frasier A, Guyer H, DiGrande L, Domanico R, Cooney D, Eckman S. Design for a Mail Survey to Determine Prevalence of SARS-CoV-2 (COVID-19) Antibodies in the United States. Survey Research Methods. 2020;14(2):131-9.
24. Shook-Sa BE, Boyce RM, Aiello AE. Estimation Without Representation: Early Severe Acute Respiratory Syndrome Coronavirus 2 Seroprevalence Studies and the Path Forward. J Infect Dis. 2020. doi: 10.1093/infdis/jiaa429. PubMed PMID: 32750135.
25. Siegler AJ, Sullivan P, Sanchez TH, Lopman B, Fahimi M, Sailey C, Frankel M, Rothenberg R, Kelley C, Bradley H. Protocol for a national probability survey using home specimen collection methods to assess prevalence and incidence of SARS-CoV-2 infection and antibody response. Annals of Epidemiology. 2020. Epub August 10, 2020. PubMed PMID: 32791199.
26. Biggs HM, Harris JB, Breakwell L, Dahlgren FS, Abedi GR, Szablewski CM, Drobeniuc J, Bustamante ND, Almendares O, Schnall AH, Gilani Z, Smith T, Gieraltowski L, Johnson JA, Bajema KL, McDavid K, Schafer IJ, Sullivan V, Punkova L, Tejada-Strop A, Amiling R, Mattison CP, Cortese MM, Ford SE, Paxton LA, Drenzek C, Tate JE, Team CDCFS. Estimated Community Seroprevalence of SARS-CoV-2 Antibodies - Two Georgia Counties, April 28-May 3, 2020. MMWR Morb Mortal Wkly Rep. 2020;69(29):965-70. doi: 10.15585/mmwr.mm6929e2. PubMed PMID: 32701941; PMCID: PMC7377817 Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.
27. Feehan AK, Fort D, Garcia-Diaz J, Price-Haywood E, Velasco C, Sapp E, Pevey D, Seoane L. Seroprevalence of SARS-CoV-2 and Infection Fatality Ratio, Orleans and Jefferson Parishes, Louisiana, USA, May 2020. Emerging infectious diseases. 2020;26(11). doi: 10.3201/eid2611.203029. PubMed PMID: 32731911.
28. Menachemi N, Yiannoutsos CT, Dixon BE, Duszynski TJ, Fadel WF, Wools-Kaloustian KK, Unruh Needleman N, Box K, Caine V, Norwood C, Weaver L, Halverson PK. Population Point Prevalence of SARS-CoV-2 Infection Based on a Statewide Random Sample - Indiana, April 25-29, 2020. MMWR Morb Mortal Wkly Rep. 2020;69(29):960-4. doi: 10.15585/mmwr.mm6929e1. PubMed PMID: 32701938; PMCID: PMC7377824 Journal Editors form for disclosure of potential conflicts of interest. Nir Menachemi reports a grant from State of Indiana which funded this study. Virginia Caine reports that she is a member of the MMWR Editorial Board. Brian E. Dixon and William F. Fadel report grants from the Indiana State Department of Health. Paul K. Halverson reports a grant from the State of Indiana. No other potential conflicts of interest were disclosed.
29. Sood N, Simon P, Ebner P, Eichner D, Reynolds J, Bendavid E, Bhattacharya J. Seroprevalence of SARS-CoV-2-Specific Antibodies Among Adults in Los Angeles County, California, on April 10-11, 2020. JAMA. 2020. doi: 10.1001/jama.2020.8279. PubMed PMID: 32421144; PMCID: PMC7235907.
30. Politico. Trump's fragmented pandemic response may undermine push to address racial disparities 2020 [cited 2020 April 13]. Available from: https://www.politico.com/news/2020/07/26/cdc-pandemic-response-racial-disparities-381416.
31. Pollan M, Perez-Gomez B, Pastor-Barriuso R, Oteo J, Hernan MA, Perez-Olmeda M, Sanmartin JL, Fernandez-Garcia A, Cruz I, Fernandez de Larrea N, Molina M, Rodriguez-Cabrera F, Martin M, Merino-Amador P, Leon Paniagua J, Munoz-Montalvo JF, Blanco F, Yotti R, Group E-CS. Prevalence of SARS-CoV-2 in Spain (ENE-COVID): a nationwide, population-based seroepidemiological study. Lancet (London, England). 2020. doi: 10.1016/S0140-6736(20)31483-5. PubMed PMID: 32645347; PMCID: PMC7336131.
32. Stringhini S, Wisniak A, Piumatti G, Azman AS, Lauer SA, Baysson H, De Ridder D, Petrovic D, Schrempft S, Marcus K, Yerly S, Arm Vernez I, Keiser O, Hurst S, Posfay-Barbe KM, Trono D, Pittet D, Getaz L, Chappuis F, Eckerle I, Vuilleumier N, Meyer B, Flahault A, Kaiser L, Guessous I. Seroprevalence of anti-SARS-CoV-2 IgG antibodies in Geneva, Switzerland (SEROCoV-POP): a population-based study. Lancet (London, England). 2020;396(10247):313-9. doi: 10.1016/S0140-6736(20)31304-0. PubMed PMID: 32534626; PMCID: PMC7289564.

33. Ward H, Atchison CJ, Whitaker M, Anslie KEC, Elliot J, Okell LC, Redd R, Ashby D, Donnelly CA, Barclay W, Darzi A, Cooke G, Riley S, Elliot P. Antibody prevalence for SARS-CoV-2 in England following first peak of the pandemic: REACT2 study in 100,000 adults. MedRxiv. 2020. doi: https://doi.org/10.1101/2020.08.12.20173690.
34. Cole ER. Intersectionality and research in psychology. Am Psychol. 2009;64(3):170-80. doi: 10.1037/a0014564. PubMed PMID: 19348518.
35. Crenshaw K. Mapping the Margins: Intersectionality, Identity Politics, and Violence Against Women of Color. Stanford Law Review. 1991;43(6):1241 - 99.
36. Syed M. Disciplinarity and methodology in intersectionality theory and research. Am Psychol. 2010;65(1):61-2. doi: 10.1037/a0017495. PubMed PMID: 20063919.
37. Viruell-Fuentes EA, Miranda PY, Abdulrahim S. More than culture: structural racism, intersectionality theory, and immigrant health. Soc Sci Med. 2012;75(12):2099-106. doi: 10.1016/j.socscimed.2011.12.037. PubMed PMID: 22386617.
38. Charatz-Litt C. A chronicle of racism: the effects of the white medical community on black health. J Natl Med Assoc. 1992;84(8):717-25. PubMed PMID: 1507263; PMCID: PMC2571643.
39. el-Sadr W, Capps L. The challenge of minority recruitment in clinical trials for AIDS. JAMA. 1992;267(7):954-7. PubMed PMID: 1734108.
40. Jones JH. The Tuskegee legacy. AIDS and the black community. Hastings Cent Rep. 1992;22(6):38-40. PubMed PMID: 1428848.
41. Shavers VL, Lynch CF, Burmeister LF. Racial differences in factors that influence the willingness to participate in medical research studies. Ann Epidemiol. 2002;12(4):248-56. doi: 10.1016/s1047-2797(01)00265-4. PubMed PMID: 11988413.
42. Welsh KA, Ballard E, Nash F, Raiford K, Harrell L. Issues affecting minority participation in research studies of Alzheimer disease. Alzheimer Dis Assoc Disord. 1994;8(Suppl. 4):38-48. PubMed PMID: 11657672.
43. Corbie-Smith G, Thomas SB, St George DM. Distrust, race, and research. Arch Intern Med. 2002;162(21):2458-63. doi: 10.1001/archinte.162.21.2458. PubMed PMID: 12437405.
44. Gamble VN. A legacy of distrust: African Americans and medical research. Am J Prev Med. 1993;9(6 Suppl):35-8. PubMed PMID: 8123285.
45. Harris Y, Gorelick PB, Samuels P, Bempong I. Why African Americans may not be participating in clinical trials. J Natl Med Assoc. 1996;88(10):630-4. PubMed PMID: 8918067; PMCID: PMC2608128.
46. Scharff DP, Mathews KJ, Jackson P, Hoffsuemmer J, Martin E, Edwards D. More than Tuskegee: understanding mistrust about research participation. J Health Care Poor Underserved. 2010;21(3):879-97. doi: 10.1353/hpu.0.0323. PubMed PMID: 20693733; PMCID: PMC4354806.
47. Katz RV, Green BL, Kressin NR, Claudio C, Wang MQ, Russell SL. Willingness of minorities to participate in biomedical studies: confirmatory findings from a follow-up study using the Tuskegee Legacy Project Questionnaire. J Natl Med Assoc. 2007;99(9):1052-60. PubMed PMID: 17913117; PMCID: PMC2139897.
48. Smedley BD, Stith AY, Nelson AR. Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Washington, D.C.: National Academies Press; 2003.
49. Thomas SB, Quinn SC. The Tuskegee Syphilis Study, 1932 to 1972: implications for HIV education and AIDS risk education programs in the black community. Am J Public Health. 1991;81(11):1498-505. doi: 10.2105/ajph.81.11.1498. PubMed PMID: 1951814; PMCID: PMC1405662.
50. Buchbinder SP, Metch B, Holte SE, Scheer S, Coletti A, Vittinghoff E. Determinants of enrollment in a preventive HIV vaccine trial: hypothetical versus actual willingness and barriers to participation. J Acquir Immune Defic Syndr. 2004;36(1):604-12. doi: 10.1097/00126334-200405010-00009. PubMed PMID: 15097304.
51. Frew PM, Archibald M, Diallo DD, Hou SI, Horton T, Chan K, Mulligan MJ, del Rio C. An extended model of reasoned action to understand the influence of individual- and network-level factors on African Americans' participation in HIV vaccine research. Prev Sci. 2010;11(2):207-18. doi: 10.1007/s11121-009-0162-9. PubMed PMID: 20012200; PMCID: PMC2858782.
52. Frew PM, Archibald M, Martinez N, del Rio C, Mulligan MJ. Promoting HIV Vaccine Research in African American Communities: Does the Theory of Reasoned Action Explain Potential Outcomes of Involvement? Challenge (Atlanta Ga). 2007;13(2):61-97. PubMed PMID: 20686675; PMCID: PMC2913490.
53. Newman PA, Duan N, Lee SJ, Rudy E, Seiden D, Kakinami L, Cunningham W. Willingness to participate in HIV vaccine trials: the impact of trial attributes. Prev Med. 2007;44(6):554-7. doi: 10.1016/j.ypmed.2006.12.007. PubMed PMID: 17275895; PMCID: PMC2819663.

54. Georgia Department of Public Health. Covid-19 Daily Status Report 2020 [cited 2020 August 17]. Available from: https://dph.georgia.gov/covid-19-daily-status-report.
55. TownCharts. Georgia Demographics Data 2020 [cited 2020 May 1]. Available from: https://www.towncharts.com/Georgia/Demographics/30310-Zipcode-GA-Demographics-data.html.
56. Prentice-Dunn S, Rogers RW. Protection motivation theory and preventive health: Beyond the health belief model. Health education research. 1986;1(3):153 - 61.
57. Rogers RW. A Protection Motivation Theory of Fear Appeals and Attitude Change1. J Psychol. 1975;91(1):93-114. doi: 10.1080/00223980.1975.9915803. PubMed PMID: 28136248.
58. Fishbein M, Ajzen I. Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Reading, MA: Addison-Wesley; 1975.
59. Rosenstock IM. The health belief model and preventive health behavior. Health education monographs. 1974;2(4):354 - 86.
60. Health GSUSoP. School of Public Health Fast Facts 2020 [August 27, 2020]. Available from: https://publichealth.gsu.edu/files/2020/06/SPH-Quick-Facts-2020.pdf.
61. Bradley H, Hogan V, Agnew-Brune C, Armstrong J, Broussard D, Buchacz K, Burton K, Cope S, Dawson E, De La Garza G, Gerard A, Granado M, Gupta R, Haddy L, Hoffman W, Johnson SD, Kirk N, Lee C, Lyss S, Mark-Carew M, Quilter L, Reynolds P, Rose B, Thompson A, Varella L, Weidle P, White B, Wills D, Young SA, Hoots BE. Increased HIV diagnoses in West Virginia counties highly vulnerable to rapid HIV dissemination through injection drug use: a cautionary tale. Ann Epidemiol. 2019;34:12-7. doi: 10.1016/j.annepidem.2019.02.012. PubMed PMID: 30967302.
62. Conrad C, Bradley HM, Broz D, Buddha S, Chapman EL, Galang RR, Hillman D, Hon J, Hoover KW, Patel MR, Perez A, Peters PJ, Pontones P, Roseberry JC, Sandoval M, Shields J, Walthall J, Waterhouse D, Weidle PJ, Wu H, Duwve JM, Centers for Disease C, Prevention. Community Outbreak of HIV Infection Linked to Injection Drug Use of Oxymorphone--Indiana, 2015. MMWR Morb Mortal Wkly Rep. 2015;64(16):443-4. PubMed PMID: 25928470; PMCID: PMC4584812.
63. Cooper HL, Haley DF, Linton S, Hunter-Jones J, Martin M, Kelley ME, Karnes C, Ross Z, Adimora AA, del Rio C, Rothenberg R, Wingood GM, Bonney LE. Impact of public housing relocations: are changes in neighborhood conditions related to STIs among relocaters? Sex Transm Dis. 2014;41(10):573-9. doi: 10.1097/OLQ.0000000000000172. PubMed PMID: 25211249; PMCID: PMC4163933.
64. Rothenberg R, Dai D, Adams MA, Heath JW. The HIV endemic: maintaining disease transmission in at-risk urban areas. Sexually Transmitted Diseases. 2017;44(2):71-8. doi: 10.1097/OLQ.0000000000000561. PubMed PMID: 28081043; PMCID: PMC5234687
65. Rothenberg R, Peterson J, Brown M, Kraft JM, Trotter R, 2nd, Beeker C. Heterogeneity of risk among African-American men who have sex with men. Int J STD AIDS. 2007;18(1):47-54. doi: 10.1258/095646207779949826. PubMed PMID: 17326863.
66. Beer L, Bradley H, Mattson CL, Johnson CH, Hoots B, Shouse RL, Medical Monitoring P. Trends in Racial and Ethnic Disparities in Antiretroviral Therapy Prescription and Viral Suppression in the United States, 2009-2013. J Acquir Immune Defic Syndr. 2016;73(4):446-53. doi: 10.1097/QAI.0000000000001125. PubMed PMID: 27391389; PMCID: PMC5085853.
67. Beer L, Mattson CL, Bradley H, Skarbinski J, Medical Monitoring P. Understanding Cross-Sectional Racial, Ethnic, and Gender Disparities in Antiretroviral Use and Viral Suppression Among HIV Patients in the United States. Medicine (Baltimore). 2016;95(13):e3171. doi: 10.1097/MD.0000000000003171. PubMed PMID: 27043679; PMCID: PMC4998540.
68. Bradley H, Mattson CL, Beer L, Huang P, Shouse RL, Medical Monitoring P. Increased antiretroviral therapy prescription and HIV viral suppression among persons receiving clinical care for HIV infection. AIDS. 2016;30(13):2117-24. doi: 10.1097/QAD.0000000000001164. PubMed PMID: 27465279; PMCID: PMC5084085.
69. Bradley H, Viall AH, Wortley PM, Dempsey A, Hauck H, Skarbinski J. Ryan White HIV/AIDS Program Assistance and HIV Treatment Outcomes. Clin Infect Dis. 2016;62(1):90-8. doi: 10.1093/cid/civ708. PubMed PMID: 26324390; PMCID: PMC5087096.
70. Chowdhury P, Beer L, Shouse RL, Bradley H, Medical Monitoring P. Brief Report: Clinical Outcomes of Young Black Men Receiving HIV Medical Care in the United States, 2009-2014. J Acquir Immune Defic Syndr. 2019;81(1):5-9. doi: 10.1097/QAI.0000000000001987. PubMed PMID: 30789449.
71. Grey JA, Rothenberg R, Sullivan PS, Rosenberg ES. Racial differences in the accuracy of perceived partner HIV status among men who have sex with men (MSM) in Atlanta, Georgia. J Int Assoc Provid AIDS Care. 2015;14(1):26-32. doi: 10.1177/2325957414555226. PubMed PMID: 25348797; PMCID: PMC5106333

72. Hernandez-Romieu AC, Sullivan PS, Rothenberg R, Grey J, Luisi N, Kelley CF, Rosenberg ES. Heterogeneity of HIV Prevalence Among the Sexual Networks of Black and White Men Who Have Sex With Men in Atlanta: Illuminating a Mechanism for Increased HIV Risk for Young Black Men Who Have Sex With Men. Sex Transm Dis. 2015;42(9):505-12. doi: 10.1097/OLQ.0000000000000332. PubMed PMID: 26267877; PMCID: PMC4536576.
73. Peterson JL, Rothenberg R, Kraft JM, Beeker C, Trotter R. Perceived condom norms and HIV risks among social and sexual networks of young African American men who have sex with men. Health Educ Res. 2009;24(1):119-27. doi: 10.1093/her/cyn003. PubMed PMID: 18281710.
74. Sullivan PS, Sailey C, Guest JL, Guarner J, Kelley C, Siegler AJ, Valentine-Graves M, Gravens L, Del Rio C, Sanchez TH. Detection of SARS-CoV-2 RNA and Antibodies in Diverse Samples: Protocol to Validate the Sufficiency of Provider-Observed, Home-Collected Blood, Saliva, and Oropharyngeal Samples. JMIR Public Health Surveill. 2020;6(2):e19054. doi: 10.2196/19054. PubMed PMID: 32310815; PMCID: PMC7184968.
75. Georgia State University. Prevention Research Center at Georgia State 2020 [cited 2020 May 17]. Available from: https://prc.gsu.edu/.
76. Afifi RA, Abdulrahim S, Betancourt T, Btedinni D, Berent J, Dellos L, Farrar J, Nakkash R, Osman R, Saravanan M, Story WT, Zombo M, Parker E. Implementing Community-Based Participatory Research with Communities Affected by Humanitarian Crises: The Potential to Recalibrate Equity and Power in Vulnerable Contexts. Am J Community Psychol. 2020. doi: 10.1002/ajcp.12453. PubMed PMID: 32797639.
77. Holden K, Akintobi T, Hopkins J, Belton A, McGregor B, Blanks S, Wrenn G. Community Engaged Leadership to Advance Health Equity and Build Healthier Communities. Soc Sci (Basel). 2016;5(1). doi: 10.3390/socsci5010002. PubMed PMID: 27713839; PMCID: PMC5048675.
78. Payton Foh E, Echeverria SE. Incorporating Health Equity and Community Perspectives During COVID-19: Commonalities with Cardiovascular Health Equity Research. Ethn Dis. 2020;30(3):421-4. doi: 10.18865/ed.30.3.421. PubMed PMID: 32742144; PMCID: PMC7360187.
79. Williamson HJ, Chief C, Jimenez D, Begay A, Milner TF, Sullivan S, Torres E, Remiker M, Samarron Longorio AE, Sabo S, Teufel-Shone NI. Voices of Community Partners: Perspectives Gained from Conversations of Community-Based Participatory Research Experiences. Int J Environ Res Public Health. 2020;17(14). doi: 10.3390/ijerph17145245. PubMed PMID: 32708111; PMCID: PMC7400085.
80. Francis JJ, Johnston M, Robertson C, Glidewell L, Entwistle V, Eccles MP, Grimshaw JM. What is an adequate sample size? Operationalising data saturation for theory-based interview studies. Psychol Health. 2010;25(10):1229-45. doi: 10.1080/08870440903194015. PubMed PMID: 20204937.
81. Guest G, Bunce A, Johnson L. How many interviews are enough? An experiment with data saturation and variability. Field Methods. 2006;18(1):59 - 82.
82. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative research in psychology. 2006;3(2):77-101.
83. Neale J, Allen D, Coombes L. Qualitative research methods within the addictions. Addiction. 2005;100(11):1584-93. doi: 10.1111/j.1360-0443.2005.01230.x. PubMed PMID: 16277621.
84. Tolley EE, Ulin PR, Mack N, Robinson ET, Succop SM. Qualitative methods in public health: a field guide for applied research. Hoboken, NJ: John Wiley & Sons; 2016.
85. Asparouhov T, Muthén B. Multiple group multilevel analysis. Mplus Web Notes. 2012;16(15):1-45.
86. Austin PC, Steyerberg EW. The number of subjects per variable required in linear regression analyses. J Clin Epidemiol. 2015;68(6):627-36. doi: 10.1016/j.jclinepi.2014.12.014. PubMed PMID: 25704724.
87. Babyak MA. What you see may not be what you get: a brief, nontechnical introduction to overfitting in regression-type models. Psychosom Med. 2004;66(3):411-21. doi: 10.1097/01.psy.0000127692.23278.a9. PubMed PMID: 15184705.
88. Enders CK. Applied Missing Data Analysis. Methodology in the Social Sciences Series. New York, NY: Guilford Press; 2010.
89. Freedland KE, Reese RL, Steinmeyer BC. Multivariable models in biobehavioral research. Psychosom Med. 2009;71(2):205-16. doi: 10.1097/PSY.0b013e3181906e57. PubMed PMID: 19218467.
90. Satorra A, Bentler PM. Ensuring Positiveness of the Scaled Difference Chi-square Test Statistic. Psychometrika. 2010;75(2):243-8. doi: 10.1007/s11336-009-9135-y. PubMed PMID: 20640194; PMCID: PMC2905175.
91. Masyn KE. In: Little TD, editor. The Oxford Handbook of Quantitative Methods New York: Oxford University Press; 2013. p. 551-611.
92. Nylund KL, Asparouhov T, Muthen B. Deciding on the number of classes in latent class analysis and growth mixture modeling. A Monte Carlo simulation study. Structural Equation Modeling. 2007;14:535-69.

93. Wang J, Wang XH. Structural equation modeling: Applications using Mplus. Hoboken, NJ: John Wiley and Sons; 2012.
94. U.S. Food & Drug Administration. EUA Authorized Serology Test Performance 2020 [cited 2020 June 2, 2020]. Available from: https://www.fda.gov/medical-devices/emergency-situations-medical-devices/eua-authorized-serology-test-performance.