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Article

Breaking down the monolith: Understanding flu vaccine uptake among African Americans☆

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ABSTRACT

Black adults are significantly less likely to be immunized for seasonal influenza when compared to Whites. This persistent disparity contributes to increased influenza-related morbidity and mortality in the African American population. Most scholarship on vaccine disparities has compared Whites and Blacks. Employing Public Health Critical Race Praxis, this study seeks to shift the focus to explore differences *within* the Black population. Utilizing a nationally-representative 2015 survey of US Black adults (n = 806), we explore differences by gender, age, income, and education across vaccine-related measures (e.g., perceived risk, knowledge, attitudes) and racial factors (e.g. racial salience, racial fairness, perceived discrimination). We also explore differences by vaccine behavior in the past five years among those who vaccinate every year, most years but not all, once or twice, and never. Greater frequency of flu vaccine uptake was associated with better self-reported vaccine knowledge, more positive vaccine attitudes, more trust in the flu vaccine and the vaccine process, higher perceived disease risk, lower perceived risk of vaccine side effects, stronger subjective and moral norms, lower general vaccine hesitancy, higher confidence in the flu vaccine, and lower perceived barriers. Logistic regression results highlighted other significant differences among the groups, emphasizing areas to target for improved vaccination rates. We find great diversity within the Black community related to influenza immunization decisions, highlighting the need to "break down the monolith" in future research.

1. Introduction

Immunization is a safe, effective, and low-cost preventive measure. However, adult immunization rates for seasonal influenza remain suboptimal, especially among African Americans. There is a persistent racial disparity in influenza immunization rates where Black adults are significantly less likely to be vaccinated than White adults (Centers for Disease Control and Prevention (CDC), 2016). During the 2015-16 influenza season, only 37% percent of Black adults were immunized, compared to 45% percent of White adults (CDC, 2016). A Black-White disparity in immunization rates has been observed across all ages and in high-risk populations including pregnant women, adults with chronic diseases, and health care workers (Lu et al., 2014). To explore this disparity, researchers have focused on differences *between* African American and White populations. However, to fully understand this issue, it is important for researchers to expand the scope of analysis to include differences *within* the African American population.

The existing literature has demonstrated that no single factor is responsible for the observed racial differences in vaccination; instead, it appears that multiple pathways function simultaneously to contribute to differential vaccine uptake (Quinn et al., 2017). Racially comparative studies have identified several key factors that are significantly different between racial groups, and contribute to lower uptake among African Americans, including vaccine attitudes and beliefs (Harris, Chin, Fiscella, & Humiston, 2006; Lindley, Wortley, Winston, & Bardenheier, 2006; Wooten, Wortley, Singleton, & Euler, 2012),

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knowledge (Bardenheier et al., 2006), access to vaccination (Lee, Mehrotra, Burns, & Harris, 2009; Lin et al., 2006), trust in health care providers and vaccines (Freimuth, Jamison, An, Hancock, & Quinn, 2017; Musa, Schulz, Harris, Silverman, & Thomas, 2009; Quinn, Kumar, Freimuth, Kidwell, & Musa, 2009; Redelings et al., 2012;), risk perception (Freimuth, Jamison, Hancock et al., 2017), and racial discrimination (Bleser, Miranda, & Jean-Jacques, 2016). These studies have confirmed the significance of age, health status, and socioeconomic status (SES) in vaccine uptake (Nagata et al., 2013; Yeung, Lam, & Coker, 2016). Although gender has also been identified as a significant factor, research on gender and flu vaccine is not consistent. A systematic review by Nagata and colleagues suggested that men are more likely to be vaccinated (regardless of race), while a separate systematic review by Yeung concluded that gender was not a consistent predictor of influenza vaccination (Nagata et al., 2013; Yeung et al., 2016). Taken together, these studies provide a solid foundation for inquiry, but because most fail to stratify by race to explore race-specific patterns of uptake, comparative studies alone cannot capture the dynamics that drive vaccination decisions within the Black community.

Only a handful of studies focus exclusively on vaccination within the Black adult population. This research tends to be qualitative with small samples, making it difficult to draw conclusions about the wider Black community (Cameron et al., 2009; Harris et al., 2006; Wray et al., 2007). These studies identified the most salient concerns within the African American community. For instance, Cameron et al. (2009) found that fear of vaccine side effects was common among older African Americans, and that fear and anxiety contributed to lower vaccine uptake. Similarly, in focus groups, older African Americans related concerns about vaccine safety and efficacy that were exacerbated by a sense of mistrust towards the health care system (but not of their own doctor) (Wray et al., 2007). We identified a single quantitative study with an entirely Black sample, which suggested that barriers, cues to action, and susceptibility were significant factors in vaccine decisions, but it focused on pneumococcal, not influenza vaccine (Fry et al., 2016). Other studies have samples that may be largely African American, but are focused on specific settings such as an urban clinic (Nowalk, Zimmerman, Tabbarah, Raymund, & Jewell, 2006), public housing (Schensul, Radda, Coman, & Vazquez, 2009), the "underserved" community (Vlahov, Bond, Jones, & Ompad, 2012), or the "hard-to-reach" population (Coady et al., 2008). In these instances, the primary focus is on the unifying characteristic of the subpopulation, not on race.

Despite the gaps in the literature, we can predict several patterns in influenza vaccine uptake within the Black community. Age is an important predictor, with older adults more likely to be vaccinated than younger adults (Yeung et al., 2016). Several studies have found a significant correlation between SES and vaccine uptake; as education and income increase, the likelihood of receiving a flu shot also increases (Linn, Guralnik, & Patel, 2010; Mulinari, Wemrell, Ronnerstrand, Subramanian, & Merlo, 2017). Patients who regularly see a provider are more likely to be vaccinated, as are adults with co-morbid conditions (Yeung et al., 2016).

There are factors specific to the Black population that may impact vaccine decision-making. Evidence of health care providers' differential treatment of African Americans is substantial (Nelson, Stith, & Smedley, 2002; Williams & Wyatt, 2015). Extensive scholarship documents Black attitudes toward health care, emphasizing the role of both historical research abuses (especially the infamous Tuskegee Syphilis Study (TSS)) and modern racial discrimination in fostering a deep distrust (Boulware, Cooper, Ratner, LaVeist, & Powe, 2003; Freimuth et al., 2001; Kennedy, Mathis, & Woods, 2006; Thomas & Quinn, 1991). This distrust is associated with lower participation in preventive health care, including vaccination (Armstrong et al., 2013; Musa et al., 2009). These issues have occasionally emerged in the vaccine disparities literature, as scholars recognize major themes of mistrust, the impact of racism, and historical medical injustices, and their contribution to suboptimal vaccine uptake among African Americans (Harris et al., 2006). Using a comparative approach, it is more difficult to fully explore these unique concerns as they relate to the Black community.

A failing of many racially comparative studies is the treatment of the minority population as a singular whole, erasing diversity within the group (Ramírez, Ford, Stewart, & Teresi, 2005). Ramírez et al. (2005: p. 1646) explained, "the presumption of social or cultural homogeneity exacerbates inaccurate cultural stereotypes and can lead to misleading conclusions". In some instances, this is the result of limitations, such as small sample size or convenience sampling; in other instances, it is the product of limited research questions (Jones, 2001). In still others, focus on the individual makes it difficult to extrapolate results to the population level, especially when recognizing the great fluidity within and between races (Green, Evans, & Subramanian, 2017). Jones (2001) argued that to enhance the understanding of race and racism in health disparities, it is imperative to "vigorously investigate" all race-related findings, including acknowledging the diversity within racial groups.

Public Health Critical Race (PHCR) Praxis offers a theoretical foundation to shift the focus of traditional disparities research by foregrounding the role of race and racism in health (Ford and Airhihenbuwa, 2010b; Thomas, Quinn, Butler, Fryer, & Garza, 2011). PHCR Praxis incorporates the trans-disciplinary methodologies of Critical Race Theory into both scholarship and applied practice of public health. Instead of obscuring racial differences, the PHCR paradigm makes race and racism a research focus. This requires recognizing that though race holds no biological significance, it remains a powerful social construct, and continues to be made manifest in the daily lived experiences of individuals as they navigate life in a racialized society (Ford & Airhihenbuwa, 2010a). PHCR Praxis has guided the conceptualization and measurement of race in our study.

A central tenet of PHCR is "centering in the margins," the process of refocusing analysis away from the dominant societal groups and on to the experiences of socially marginalized groups (Ford & Airhihenbuwa, 2010b). Racially comparative approaches, by their very nature, set up a "deficits approach" to understanding disparities, subconsciously normalizing the experiences of the dominant (i.e., White) population (Daniels & Schulz, 2006). We recognize that racism also impacts other minority groups; however, we believe that by focusing our research exclusively on African Americans, we may begin to recontextualize how we approach health disparities research with African Americans. PHCR incorporates elements of intersectionality theory, which emphasizes the overlapping and interlocking aspects of social categories, including race, gender, and class (Ford & Airhihenbuwa, 2010a). In embracing PHCR, we seek to explore differences within the African American population based on gender, income, and education. In this article, we employ the PHCR framework to re-center the focus of disparities discourse by exploring the differences in vaccine attitudes, beliefs, and behavior within a nationally representative sample of the African American population.

We also developed measures for two of the five racial factors (racial consciousness and racial fairness) based on our exploratory qualitative research, and in accordance with principles of PHCR Praxis. Ford and Airhihenbuwa emphasized the importance of racial consciousness in an era of widespread "colorblindness" where the erasure of racial differences is conflated with the absence of racism (2010a). We designed our racial fairness measure to capture some of the contemporary mechanisms of racism, instead of the overt instances of discrimination that defined racism in the past. Today's racism is often characterized by more subtle forms of "everyday" racism that may be perceived by minority groups as "unfairness" (Ford & Airhihenbuwa, 2010a).

To operationalize these concepts, Fig. 1 describes the integration of demographics, standard and novel factors associated with vaccine uptake, and racial factors, where the arrows embody the hypothesized flow of direct and (partially and/or totally) mediated relations. The standard vaccine-related factors include attitudes, risk perception,

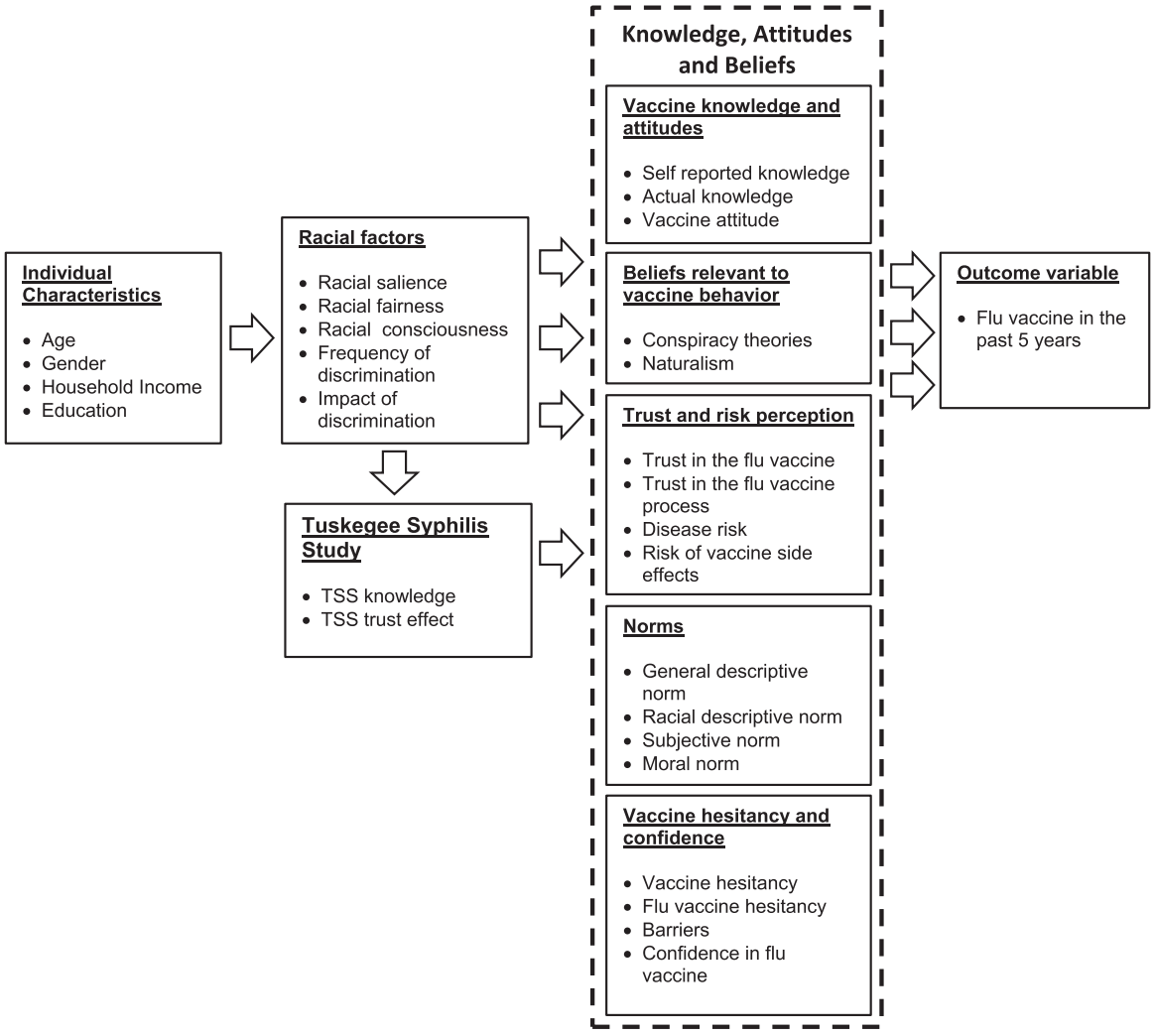

Fig. 1. Conceptual Framework for Influenza Vaccine Uptake Among African Americans.

social norms, knowledge (both self-report and objective), and trust in the flu vaccine. We also included novel measures related to vaccine uptake, derived from our extensive preliminary qualitative research, which include attitudes about naturalism, conspiracy beliefs, and trust in the vaccine production process. Our qualitative research revealed that Black adults were more likely to discuss reliance on home remedies and other "natural" health approaches (which we describe as "naturalism"), were more likely to describe conspiracy theories (e.g., patients used as "guinea pigs," communities receiving diluted vaccine), and were more distrusting of the agencies and entities involved in vaccine production, distribution, and administration (Quinn et al., 2016). Utilizing the concept of voice from PHCR, we translated the qualitative results into quantitative items.

Finally, we include factors designed to specifically assess racial consciousness in a health care context, racial salience, perceptions of racial fairness inside the health care system, and both frequency and impact of experiences of discrimination in health care. Our previous work with these items suggests that race and racism shape health care experiences, which also impacts vaccine decisions (Quinn et al., 2017).

This research builds on the literature and proposes a new approach to understanding flu vaccination within the Black community. This study seeks to expand our understanding of vaccine disparities, and in doing so offers an innovative approach to exploring race and racism within this context. We propose these research questions:

1. Within a nationally representative sample of African Americans, what demographic factors (age, gender, education, and income) are significantly associated with differences in racial factors, and with key vaccine-related variables?
2. What are the associations between flu vaccine behavior in the past five years and possible predictors, including racial factors, demographics, and vaccine-related variables?
3. What is the strength of each predictor for vaccine behavior in the last five years?

2. Methods

2.1. Study population and data collection

This research is part of a larger, mixed-methods investigation of the novel factors that influence Black-White disparities in adult influenza immunization. In February 2015, we contracted with The GfK Group to conduct a national web-based survey, using its KnowledgePanel, which is representative of the US. For this study, analysis was limited to respondents who self-identified as non-Hispanic Black/African American. GfK allows individuals to select multiple racial categories; however, adults who indicated mixed race status by selecting racial categories in addition to Black/African American were not eligible for the survey. A total of 1599 eligible Black adults were invited to complete the survey and 819 respondents completed the survey (completion rate: 51.2%). Of the 819 completed surveys, 806 cases were deemed valid for final analyses (Table 1). All materials and study protocols were reviewed and

Table 1
Sample demographics and flu vaccination behavior.

	African American (n = 806) (%)
Sex	
Male	44.7%
Female	55.3%
Age	
18–29	17.9%
30–44	19.3%
45–59	31.1%
60 +	31.6%
Education	
Less than High School	9.1%
High School	30.9%
Some College	33.5%
Bachelor's Degree or higher	26.5%
Income	
Less than $24,999	33.4%
$25,000-$49,999	26.5%
$50,000-$74,999	16.8%
$75,000 or more	23.4%
Vaccine Behaviors (Past 5 years)	
Never	38.1%
Once or Twice	18.7%
Most years but not all	12.7%
Every Year	30.6%

Note: All percentages are unweighted.

approved by the University of XX's Institutional Review Board (367080).

2.2. Measures

This survey was based on two years of exploratory qualitative research with African Americans and Whites including 28 semi-structured interviews and 9 focus groups (n = 90). All survey items were pretested in 16 cognitive interviews to test the validity of each item. We also utilized exploratory factor analysis to finalize our measures.

Table 2 identifies all items and their scale of measurement. Demographics included gender, age, education, and income. The racial factors included five items: racial salience (adapted from Resnicow et al., 2009; Sellers, Smith, Shelton, Rowley, & Chavous, 1998), racial fairness, racial consciousness, frequency of discrimination, and impact of discrimination. Racial salience captures the centrality and significance of race in one's identity, whereas racial consciousness refers to the awareness of one's own race in a health care setting. Racial fairness assesses perceived sense of equal treatment among racial groups in a health care context, while the two measures of discrimination capture total instances of perceived racial discrimination and the impact of discriminatory events in limiting one's access to health care.

Additional vaccine-related items included vaccine knowledge and attitudes, beliefs in conspiracy theories and naturalism, items related to the Tuskegee Syphilis Study (TSS), trust in the flu vaccine, risk perception, and social norms related to vaccination. Our outcome measure was influenza vaccination behavior in the past five years.

2.3. Statistical analysis

The data file provided design-based weights to account for panel recruitment, as well as both panel-based and study-specific post stratification weights benchmarked against demographic and geographic distributions of the adult population derived from the 2014 Current Population Survey. We used post stratification weights to adjust for both nonresponse and for under/oversampling of specific subpopulations. All analyses were weighted to be representative of the adult African American population in the US. To do this, GfK utilized benchmarks of the following metrics: gender by age (4 categories), census region (4 categories), metropolitan status, education level (4 categories), household income (4 categories), and internet access.

Statistical analyses proceeded in two phases. First, to assess the associations among the racial factors, vaccine-related variables, and demographic factors, we computed the mean scores of the racial factors and vaccine-related variables across different levels of each demographic variable and reported the p values produced by ANOVA. Further, we used the same method to explore the relations of demographic, racial, and vaccine-related factors to influenza vaccine behavior in the past five years. In addition to the omnibus tests produced by ANOVA, Tukey's honestly significant difference (HSD) post hoc tests were also conducted to isolate differences. Second, and for our last research question, we investigated variables' value for predicting vaccine frequency using three separate logistic regressions: every year vs. most years, most years vs. once or twice, and once or twice vs. never. The goal was to try to understand what variables appeared most relevant in moving individuals up the scale. All analyses were conducted using SPSS (version 22).

3. Results

For the first research question on the associations (via subgroup means) between the racial factors and vaccine-related variables and each of the demographic factors, we confirmed significant differences by age, income, education, and gender (Table 3). Three of the five racial factors – racial salience, racial fairness, and racial consciousness – were statistically significantly associated with age, income, and education. However, few differences were linear. Further, as income increased, racial consciousness in a health care setting decreased. Regarding gender, the only significant difference was in racial consciousness, as females reported greater consciousness of their own race in a health care setting.

Of the vaccine-related variables, several significant patterns were observed. As seen in Tables 3.1 and 3.2, many variables were significantly related to only one or two of the demographic variables (i.e., age, education, income, and gender). Several, however, were significantly related to three, including the following: vaccine knowledge (increases as age, education, and income increase); knowledge of the Tuskegee Syphilis Study (TSS) (highest among adults 60 +, increases with both education and income); trust in the flu vaccine and trust in the vaccine process (both increase with age and income, while adults with only a high school diploma have the lowest trust for both measures); general descriptive norms (increases with age, decreases with education and income); flu vaccine hesitancy (decreases with age, education, and income); and confidence in flu vaccine (increases with age and income, but also highest with adults with less than a high school education). Gender was not as relevant as the other three demographic variables in terms of vaccine-related variables, yielding statistically significant differences between males and females in terms of risks of disease and vaccine side effects (both higher for females), general and racial descriptive norms (both higher for females), general and flu vaccine hesitancy (higher for females), and impact of TSS on trust (higher for males).

For the second research question, we examined the associations between flu vaccine behavior over five years and its possible predictors (Table 4). Most demographic, racial, and vaccine-related factors were statistically associated with flu vaccine behavior, except education, racial salience, and TSS knowledge. The homogeneous subsets based on the results of Tukey's HSD tests indicated where the statistically significant differences were across the subgroups of flu vaccine behavior. Our results suggest that the population can be viewed as four distinctive types of vaccine takers: always, most years, once or twice, and never. To interpret the relative standing of each type of vaccine takers in terms of the predictors of their behavior, there were clear linear relations between flu vaccine behavior and many predictors. Higher frequency of taking the flu vaccine was associated with better self-reported vaccine knowledge, more positive vaccine attitudes, more trust in the flu

Table 2
Survey measures.

Concept / Variable	Type of scale & # of items	Cron-bach's alpha	Abbreviated Item Wording	Response Categories (# of Scale Points)
Outcome: Flu vaccine behavior in the past 5 years	1	-	How often in the past 5 years have you gotten a flu vaccine	Every year (1) - Never (4)
Demographics				
Age	1	-	Age	18–29 (1), 30–44 (2), 45–59 (3), and 60 + (4)
Education	1	-	Highest degree received	Less than high school (1) - Bachelor's degree or higher (4)
Household income	1	-	Household income	Less than $24,999 (1) - More than $75,000 (4)
Gender	1	-	Gender	Male (1) Female (2)
Racial factors				
Racial salience	Mean of 6 items	0.902	1. Being Black has a lot to do with how I feel about myself 2. Being Black is an important part of my self-image 3. Many things that are important to me are connected to my Black identity 4. Both in my public and private thoughts, race is an important part of who I am 5. Many things that make me happy are connected to the fact that I am Black, 6. I have a strong sense of belonging to the Black community	Does not describe (1) - Describes very well (4)
Racial fairness	Mean of 2 items	0.762	1. The government acts in the best interest of people in my racial group 2. People of my race are treated fairly in a healthcare setting	Never (1) - Very often (5)
Racial consciousness in health care setting	Mean of 4 items	0.769	1. I think about my race when I am in a healthcare setting 2. Because of my race I have less reason to trust flu vaccine than other groups 3. Racism makes a difference in getting access to certain medicines or treatments 4. The healthcare system favors my race over other groups	Never (1) - Very often (5)
Frequency of discrimination	1	-	How often have you experienced racial discrimination in healthcare settings	Never (1) - Frequently (3)
Impact of discrimination	1	-	How much has racial discrimination interfered with your getting good health care	Not at all (1) – A lot (4)
Vaccine knowledge and attitudes				
Self-reported knowledge	1	-	How much would you say you know about the flu vaccine	Nothing (1) - A great deal (5)
Knowledge	Count of # true-false statements correct (7)	-	1. The flu vaccine helps stimulate a natural immune response 2. A flu vaccine will protect you from the flu for many years 3. The flu vaccine does not include all the types of flu circulating in the US this year 4. Flu vaccines must be tested and approved every year 5. Flu vaccines change every year because the types of flu virus change all the time 6. Even if the flu vaccine does not contain all types of virus going around it can still help reduce the seriousness and length of time I am sick if I get the flu 7. The flu vaccine this year is less effective than most years	True or False
Vaccine attitudes	1	-	In general how much do you favor or oppose the flu vaccine	Strongly oppose (1) - strongly favor (5)
Tuskegee Syphilis Study				
TSS knowledge	1	-	How much have you heard or read about the Tuskegee Syphilis Study	None at all (1) - A great deal (4)
TSS trust effect	Mean of 4 items	0.882	Does your knowledge of the Tuskegee Syphilis Study influence your trust of the government, the health care system, vaccines in general, or the flu vaccine?	Decreases my trust (1) - Increases my trust (3)
Beliefs in conspiracy and use of naturalism				
Conspiracy	Mean of 5 items	0.883	1. The main reason for promoting the flu vaccine is for drug companies to make money 2. The flu vaccine is a way to experiment on people without their knowledge 3. Harmful side effects from the flu vaccine are often covered up 4. The flu vaccine is used as a way to harm certain groups of people 5. A lot of important information about the flu vaccine is not shared with the public	Not at all true (1) - Definitely true (4)
Naturalism	1	-	I use home remedies instead of vaccines to prevent the flu	Does not describe me (1) - Describes very well (4)
Trust and risk perception				
Trust in flu vaccine	1	-	Overall how much do you trust the flu vaccine	Not at all (1) - Completely (5)

(*continued on next page*)

Table 2 (*continued*)

Concept / Variable	Type of scale & # of items	Cron-bach's alpha	Abbreviated Item Wording	Response Categories (# of Scale Points)
Trust in vaccine process	Mean of 5 items	0.940	When it comes to the vaccine process, how much do you trust: (1) the World Health Organization, (2) the pharmaceutical or drug companies, (3) the U.S. Food and Drug Administration (FDA), (4) the Centers for Disease Control and Prevention (CDC), and (5) the professionals who give the flu vaccine	Not at all (1) - Completely (5)
Perceived disease risk (conditional on actual vaccine behavior	Mean of 4 items	0.816	1. How likely are you to get the flu (cognitive) 2. How severe do you think the flu would be (cognitive) 3. How much would you worry about the flu (affective) 4. How much regret do you think you would feel if you did get the flu (affective)	4 and 5-point scales
Perceived vaccine risk (conditional on actual vaccine behavior)	Mean of 4 items	0.830	1. How likely are you to have side effects of the vaccine (cognitive) 2. How severe do you think the side effects would be (cognitive) 3. How much would you worry about side effects (affective) 4. How much regret do you think you would feel if you did have side effects (affective)	4 and 5-point scales
NORMS				
General descriptive norm	1	-	How many {of the people in the US} do you think get a flu vaccine every year	Few (1) - Nearly All (5)
Racial descriptive norm	1	-	How many {of people of your race} do you estimate get a flu vaccine every year	Few (1) - Nearly All (5)
Subjective norm	1	-	Of the people close to you what proportion want you to get a flu vaccine	Few (1) - Nearly all (5)
Moral norm	1	-	It is my moral obligation to other people to get a flu vaccine	Agreement: Not at all (1) - Very strongly (4)
Vaccine confidence and hesitancy				
Vaccine hesitancy	1	-	Overall, how hesitant are you about getting vaccinations	Not at all hesitant (1) - Very hesitant (4)
Flu vaccine hesitancy	Mean of 2 items	0.698	1. How much did you think about it before you got the flu vaccine this season 2. How much concern, if any, did you have about getting the flu vaccine this season	None at all (1) - A great deal (4)
Barriers	Mean of 2 items	0.834	Rating of adjectives describing the flu vaccine: (1) Affordable (2) Convenient	Not at all (1) - Very much (4)
Confidence in vaccine decision	1	-	How confident were you in your decision about the flu vaccine (wording conditional on their actual decision)	Not at all confident (1) - Very confident (4)
Confidence in flu vaccine	Mean of 4 items	0.912	Rating of adjectives describing the flu vaccine: (1) Necessary (2) Important (3) Safe (4) Effective	Not at all (1) - Very much (4)

Table 3.1
Means and standard deviations of the racial factors and vaccine-related variables by selected demographic variables (Age and education).

	Age					Education				
	18–29 n = 201 (SD)	30–44 *n* = 211 (SD)	45–59 *n* = 221 (SD)	60+ *n* = 176 (SD)	Mean diff. (*p* value)	< High school *n* = 116 (SD)	High school *n* = 273 (SD)	Some college *n* = 256 (SD)	Bachelor's degree or higher *n* = 164 (SD)	Mean diff. (*p* value)
Racial factors										
Racial salience	2.35 (0.84)	2.19 (0.89)	2.40 (0.95)	2.55 (0.92)	0.002**	2.41 (1.01)	2.22 (0.91)	2.41 (0.90)	2.51 (0.82)	0.008**
Racial fairness	3.11 (0.91)	2.79 (1.04)	3.18 (0.86)	3.40 (0.70)	0.000***	3.22 (1.11)	3.08 (0.95)	3.07 (0.89)	3.14 (0.75)	0.515
Racial consciousness	2.52 (0.97)	2.29 (0.95)	2.38 (0.83)	2.24 (0.79)	0.018*	2.45 (1.04)	2.40 (0.95)	2.31 (0.85)	2.32 (0.75)	0.409
Frequency of discrimination	1.37 (0.57)	1.34 (0.51)	1.28 (0.50)	1.36 (0.52)	0.306	1.36 (0.56)	1.32 (0.50)	1.34 (0.51)	1.34 (0.56)	0.869
Impact of discrimination	1.43 (0.66)	1.43 (0.76)	1.48 (0.79)	1.39 (0.73)	0.726	1.52 (0.82)	1.41 (0.75)	1.48 (0.72)	1.35 (0.67)	0.179
Vaccine knowledge and attitudes										
Self-reported knowledge	3.12 (1.15)	3.17 (1.19)	3.09 (1.22)	3.09 (0.98)	0.871	2.86 (1.16)	3.05 (1.18)	3.24 (1.14)	3.22 (1.05)	0.014*
Knowledge	4.68 (1.83)	5.03 (1.57)	5.24 (1.38)	5.69 (1.27)	0.000***	4.96 (1.46)	4.94 (1.67)	5.28 (1.57)	5.42 (1.42)	0.004**
Vaccine attitudes	3.06 (1.06)	3.27 (1.09)	3.61 (1.18)	3.73 (1.20)	0.000***	3.39 (1.20)	3.33 (1.08)	3.47 (1.17)	3.46 (1.25)	0.539
TSS knowledge	2.00 (1.00)	2.17 (1.11)	2.10 (1.06)	2.37 (1.07)	0.009**	1.73 (0.93)	1.91 (1.03)	2.33 (1.04)	2.56 (1.05)	0.000***
TSS trust effect	1.64 (0.44)	1.74 (0.56)	1.62 (0.46)	1.64 (0.44)	0.166	1.67 (0.48)	1.72 (0.51)	1.67 (0.50)	1.57 (0.40)	0.084
Beliefs in conspiracy and use of naturalism										
Conspiracy	2.12 (0.72)	1.94 (0.78_	1.94 (0.75)	1.90 (0.74)	0.019*	2.03 (0.79)	1.95 (0.76)	2.01 (0.77)	1.94 (0.66)	0.670
Naturalism	1.62 0.89)	1.68 (1.05)	1.57 (0.90)	1.48 (0.91)	0.187	1.55 (0.89)	1.64 (0.97)	1.60 (0.96)	1.53 (0.92)	0.710
Trust and risk perception										
Trust: flu vaccine	2.62 (1.07)	2.79 (1.13)	2.99 (1.13)	3.18 (1.20)	0.000***	3.04 (1.18)	2.71 (1.18)	2.97 (1.11)	2.94 (0.66)	0.019*
Trust: vaccine process	2.78 (0.99)	2.87 (1.11)	3.07 (0.95)	3.30 (0.86)	0.000***	3.00 (1.00)	2.84 (1.08)	3.05 (0.96)	3.17 (0.89)	0.006**
Disease risk	1.85 (0.73)	1.95 (0.72)	2.04 (0.81)	2.12 (0.88)	0.008**	2.22 (0.88)	1.88 (0.73)	1.99 (0.78)	2.00 (0.80)	0.001**
Vaccine risk	2.12 (0.82)	1.97 (0.74)	1.91 (0.82)	1.92 (0.80)	0.036*	2.03 (0.82)	2.03 (0.83)	1.95 (0.77)	1.90 (0.78)	0.306
Norms										
General descriptive norm	2.91 (0.89)	2.87 (0.94)	3.03 (0.90)	3.14 (0.92)	0.018*	3.36 (0.85)	3.00 (1.00)	2.98 (0.86)	2.72 (0.82)	0.000***
Racial descriptive norm	2.56 (0.11)	2.42 (0.90)	2.55 (1.08)	2.68 (1.01)	0.094	3.08 (1.05)	2.56 (1.08)	2.52 (0.95)	2.21 (0.91)	0.000***
Subjective norm	2.44 (1.40)	2.23 (1.31)	2.34 (1.46)	2.84 (1.62)	0.000***	2.77 (1.46)	2.30 (1.42)	2.45 (1.47)	2.46 (1.48)	0.055
Moral norm	1.90 (0.88)	1.93 (1.03)	1.99 (1.03)	2.06 (1.05)	0.430	2.21 (1.00)	1.86 (0.97)	2.01 (1.03)	1.92 (1.00)	0.016*
Vaccine confidence and hesitancy										
Vaccine hesitancy	2.05 (1.03)	1.97 (0.86)	1.97 (0.99)	1.94 (1.04)	0.685	2.10 (1.07)	2.09 (0.87)	1.86 (0.97)	1.90 (0.92)	0.021*
Flu vaccine hesitancy	1.92 (0.90)	1.85 (0.85)	1.68 (0.81)	1.72 (0.84)	0.016*	2.02 (0.94)	1.80 (0.86)	1.77 (0.87)	1.65 (0.72)	0.006**
Barriers	2.17 (0.82)	2.11 (0.88)	2.05 (0.86)	1.79 (0.74)	0.000***	1.95 (0.78)	2.15 (0.90)	2.01 (0.83)	1.94 (0.79)	0.039*
Confidence in decision	3.13 (1.04)	3.15 (1.02)	3.27 (0.97)	3.37 (0.92)	0.068	3.02 (1.03)	3.13 (1.11)	3.33 (0.91)	3.38 (0.84)	0.003**
Confidence in flu vaccine	2.76 (0.80)	2.82 (0.84)	3.07 (0.79)	3.25 (0.72)	0.000***	3.15 (0.76)	2.83 (0.87)	3.00 (0.79)	3.03 (0.75)	0.002**

Note. *p < .05; **p < .01; ***p < .001.

Table 3.2
Means and standard deviations of the racial factors and vaccine-related variables by selected demographic variables (Income and gender).

	Income					Gender		
	< 24,999 n = 244 (SD)	25,000 - 49,999 n = 214 (SD)	50,000 - 74,999 n = 13 (SD)	> 75,000 n = 217 (SD)	Mean diff. (p value)	Male n = 361 (SD)	Female n = 448 (SD)	Mean Diff. (p value)
Racial factors								
Racial salience	2.25 (1.00)	2.32 (0.84)	2.49 (0.83)	2.47 (0.89)	0.029*	2.35 (0.87)	2.38 (0.93)	0.592
Racial fairness	2.97 (1.11)	3.22 (0.82)	3.17 (0.86)	3.12 (0.78)	0.035*	3.08 (0.92)	3.13 (0.91)	0.413
Racial consciousness	2.43 (1.01)	2.42 (0.84)	2.41 (0.90)	2.19 (0.79)	0.014*	2.29 (0.89)	2.42 (0.90)	0.036*
Frequency of discrimination	1.33 (0.52)	1.35 (0.52)	1.33 (0.51)	1.34 (0.55)	0.964	1.30 (0.50)	1.37 (0.54)	0.053
Impact of discrimination	1.52 (0.81)	1.45 (0.71)	1.32 (0.59)	1.40 (0.75)	0.082	1.40 (0.70)	1.46 (0.76)	0.235
Vaccine knowledge and attitudes								
Self-reported knowledge	3.13 (1.25)	3.00 (1.10)	2.95 (1.03)	3.32 (1.10)	0.007**	3.07 (1.14)	3.16 (1.14)	0.239
Knowledge	4.67 (1.63)	5.20 (1.61)	5.20 (1.65)	5.58 (1.25)	0.000***	5.18 (1.65)	5.11 (1.50)	0.506
Vaccine attitudes	3.36 (1.16)	3.42 (1.11)	3.43 (1.11)	3.43 (1.24)	0.909	3.45 (1.06)	3.38 (1.23)	0.389
TSS knowledge	1.89 (1.04)	2.08 (1.01)	2.28 (1.03)	2.43 (1.10)	0.000***	2.17 (1.10)	2.14 (1.04)	0.655
TSS trust effect	1.72 (0.55)	1.64 (0.46)	1.58 (0.41)	1.68 (0.47)	0.189	1.72 (0.46)	1.61 (0.49)	0.011*
Beliefs in conspiracy and use of naturalism								
Conspiracy	2.01 (0.79)	2.01 (0.73)	2.00 (0.67)	1.89 (0.77)	0.254	1.95 (0.73)	2.00 (0.76)	0.323
Naturalism	1.67 (0.99)	1.75 (1.02)	1.42 (0.80)	1.46 (0.86)	0.002**	1.57 (0.91)	1.61 (0.49)	0.552
Trust and risk perception								
Trust: flu vaccine	2.69 (1.22)	2.87 (1.15)	2.92 (1.04)	3.10 (1.09)	0.002**	2.91 (1.11)	2.87 (1.18)	0.675
Trust: vaccine process	2.91 (1.10)	2.90 (0.95)	2.97 (0.92)	3.21 (0.96)	0.003**	3.06 (1.03)	2.94 (0.98)	0.085
Disease risk	2.02 (0.82)	2.00 (0.72)	1.85 (0.76)	2.03 (0.83)	0.149	1.84 (0.73)	2.10 (0.81)	0.000***
Vaccine risk	1.98 (0.79)	2.05 (0.84)	1.92 (0.74)	1.95 (0.81)	0.456	1.85 (0.76)	2.08 (0.82)	0.000***
Norms								
General descriptive norm	3.18 (0.99)	2.92 (0.88)	2.93 (0.85)	2.88 (0.88)	0.001**	2.85 (0.93)	3.10 (0.89)	0.000***
Racial descriptive norm	2.81 (1.07)	2.51 (0.93)	2.47 (1.07)	2.35 (1.01)	0.000***	2.41 (0.97)	2.66 (1.07)	0.000***
Subjective norm	2.47 (1.47)	2.39 (1.35)	2.37 (1.46)	2.52 (1.57)	0.742	2.45 (1.46)	2.44 (1.47)	0.947
Moral norm	2.04 (1.00)	2.03 (1.00	1.74 (0.89)	1.96 (1.05)	0.030*	1.90 (0.95)	2.02 (1.04)	0.087
Vaccine confidence and hesitancy								
Vaccine hesitancy	2.16 (1.05)	1.91 (0.99)	1.92 (0.87)	1.88 (0.93)	0.007**	1.89 (0.95)	2.05 (1.00)	0.021*
Flu vaccine hesitancy	1.95 (0.93)	1.81 (0.86)	1.68 (0.67)	1.67 (0.84)	0.002**	1.68 (0.84)	1.88 (0.85)	0.000***
Barriers	2.10 (0.88)	2.06 (0.84)	2.08 (0.79)	1.91 (0.82)	0.091	2.09 (0.82)	2.00 (0.86)	0.121
Confidence in decision	3.04 (1.09)	3.15 (1.01)	3.28 (0.98)	3.47 (0.82)	0.000***	3.22 (1.04)	3.23 (0.96)	0.882
Confidence in flu vaccine	2.97 (0.85)	2.91 (0.82)	2.85 (0.79)	3.10 (0.76)	0.021*	2.99 (0.77)	2.95 (0.84)	0.511

Note. *p < .05; **p < .01; ***p < .001.

vaccine and the vaccine process, higher perceived disease risk, lower perceived risk of vaccine side effects, higher subjective norms (perception that people close to them wanted them to be vaccinated), a higher moral norm (perceived obligation to get vaccinated), lower general vaccine hesitancy, higher confidence in the flu vaccine and their confidence in vaccine decision, and lower perceived barriers.

The other predictors demonstrated different patterns among the four types of vaccine takers. The always vaccine takers were different from all other groups, in that they were statistically significantly older, had lower perceived racial consciousness, were more knowledgeable about the flu vaccine, were less likely to believe in conspiracy theories, were less likely to use naturalism, and were more confident in their vaccine decision. The groups who get vaccinated most years and once/twice were less distinctive, but did demonstrate more hesitancy in getting the flu vaccine when compared to the always and never takers. The once/twice takers were statistically significantly different from all other groups in that they had the lowest household income, and greatest reported frequency and impact of discrimination. The never vaccinated group showed statistically significant lower trust due to the TSS than the other types of vaccine takers.

With regard to the strength of each predictor for flu vaccine behavior, three separate logistic regressions compared the adjacent vaccine behavior subgroups (i.e., every year vs. most years, most years vs. once or twice, once or twice vs. never) (Table 5). The variable of confidence in their flu vaccine decision was not included in the analysis because this is a post hoc status that was asked after the vaccine behavior had already taken place, and thus was not an appropriate predictor. To illustrate, age, specific knowledge of the flu vaccine, risk of disease, and the subjective norm were significantly positively associated with getting the flu vaccine every year compared to most years (i.e., odds ratios greater than 1), while household income and flu vaccine hesitancy were significantly negative predictors (i.e., odds ratios less than 1). For African Americans who got vaccinated most years compared to once or twice, the only significant predictor was perceived risk of the disease. When comparing those African Americans who got the flu vaccine once or twice and those who never got the flu vaccine, significantly positive predictors include trust in flu vaccine and moral norms. At the same time, household income, TSS knowledge, trust in vaccine process, as well as descriptive norms were significantly negatively associated with getting the flu vaccine once or twice rather than never.

4. Discussion

This study sought to examine the complex interplay of factors associated with African American adults' decisions surrounding flu vaccination, utilizing exploratory qualitative research and innovative concepts from PHCR Praxis. Our first research question examined the association of gender, age, education, and income with racial factors and multiple vaccine-related variables. The significance of our findings highlights the need to consider the heterogeneity within the Black population when approaching vaccine disparities. Differences in age, gender, income, and education contribute to different experiences in the health care system. For example, older Black adults reported the highest levels of racial salience and racial fairness in health care but also the lowest levels of racial consciousness in a health care context, while lower income adults reported the reverse, with significantly lower racial salience, the lowest perceived fairness, and the highest levels of racial consciousness. Our measures of racial factors were designed with the health care system in mind, and our findings highlight the need for more effective approaches to providing care to African American patients. With well-documented evidence of racial bias in health care setting, this suggests that health professions training and

Table 4
Means and standard deviations of the demographic, racial, and vaccine-related variables at different levels of vaccine behavior.

	Vaccine Behavior				Overall n = 806 (SD)	*p*	Homogeneous Subsets
	1 Every year *n* = 214 (SD)	2 Most years *n* = 104 (SD)	3 Once or twice *n* = 150 (SD)	4 Never *n* = 337 (SD)			
Demographics							
Age	3.02(0.98)	2.37(1.04)	2.16(1.03)	2.27(1.07)	2.46	0.000***	342, 1
Education	2.53(1.00)	2.63(1.04)	2.57(0.97)	2.60(0.93)	2.58	0.802	1342
Household income	2.47(1.20)	2.46(1.18)	2.12(1.14)	2.47(1.16)	2.40	0.014*	3, 241
Gender	1.56(0.50)	1.67(0.47)	1.66(0.48)	1.47(0.50)	1.56	0.000***	41, 132
Racial factors							
Racial salience	2.47(0.91)	2.43(0.89)	2.34(0.87)	2.29(0.92)	2.37	0.137	4321
Racial fairness	3.27(0.87)	3.10(0.94)	3.05(0.86)	3.04(0.95)	3.11	0.033*	4321
Racial consciousness	2.12(0.83)	2.51(0.90)	2.49(0.91)	2.42(0.91)	2.36	0.000***	1, 432
Frequency of discrimination	1.30(0.51)	1.42(0.57)	1.47(0.61)	1.28(0.47)	1.34	0.001***	412, 23
Impact of discrimination	1.35(0.66)	1.47(0.78)	1.67(0.83)	1.38(0.71)	1.44	0.000***	142, 23
Vaccine knowledge and attitudes							
Self-reported knowledge	3.51(1.06)	3.35(1.08)	3.10(1.11)	2.81(1.14)	3.12	0.000***	43, 32, 21
Knowledge	5.79(1.20)	5.14(1.54)	5.13(1.54)	4.76(1.66)	5.15	0.000***	432, 1
Vaccine attitudes	4.32(0.82)	3.65(1.19)	3.36(1.00)	2.80(0.98)	3.42	0.000***	4, 3, 2, 1
TSS knowledge	2.25(1.11)	2.19(1.01)	2.03(0.94)	2.14(1.11)	2.16	0.307	3421
TSS trust effect	1.76(0.49)	1.69(0.44)	1.76(0.46)	1.53(0.46)	1.66	0.000***	4, 213
Beliefs in conspiracy and use of naturalism							
Conspiracy	1.70(0.61)	2.02(0.68)	2.13(0.78)	2.07(0.79)	1.97	0.000***	1, 243
Naturalism	1.23(0.62)	1.56(0.77)	1.79(1.02)	1.74(1.06)	1.59	0.000***	1, 243
Trust and risk perception							
Trust in flu vaccine	3.79(0.80)	3.36(0.90)	2.82(0.95)	2.20(1.01)	2.89	0.000***	4, 3, 2, 1
Trust in vaccine process	3.60(0.77)	3.16(0.95)	2.97(0.77)	2.59(1.03)	3.00	0.000***	4, 32, 1
Disease risk	2.61(0.75)	2.29(0.66)	2.05(0.68)	1.46(0.49)	1.99	0.000***	4, 3, 2, 1
Vaccine risk	1.60(0.58)	1.86(0.69)	2.16(0.71)	2.18(0.90)	1.98	0.000***	1, 2, 34
Norms							
General descriptive norm	3.15(0.87)	3.04(0.82)	3.08(0.85)	2.82(0.97)	2.99	0.000***	42, 231
Racial descriptive norm	2.69(0.99)	2.64(1.06)	2.68(1.02)	2.37(1.04)	2.55	0.001***	42, 231
Subjective norm	3.42(1.53)	2.76(1.33)	2.43(1.23)	1.76(1.15)	2.45	0.000***	4, 32, 1
Moral norm	2.47(1.08)	2.37(1.06)	2.04(0.89)	1.50(0.73)	1.97	0.000***	4, 3, 21
Vaccine confidence and hesitancy							
General vaccine hesitancy	1.41(0.68)	1.75(0.74)	2.14(1.00)	2.34(1.01)	1.98	0.000***	1, 2, 34
Flu vaccine hesitancy	1.75(0.92)	2.11(0.82)	2.17(0.85)	1.55(0.72)	1.79	0.000***	41, 23
Barriers	1.55(0.66)	1.86(0.62)	2.11(0.83)	2.36(0.85)	2.03	0.000***	1, 2, 3, 4
Confidence in decision	3.58(0.68)	3.10(0.97)	3.12(0.83)	3.08(1.17)	3.23	0.000***	423, 1
Confidence in flu vaccine	3.55(0.53)	3.23(0.56)	2.92(0.74)	2.54(0.79)	2.97	0.000***	4, 3, 2, 1

Note. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$. The homogeneous subsets were obtained through Tukey's HSD tests. The numbers shown in the homogeneous subsets column represent the responses to the flu vaccine behavior outcome: 1 = Every year, 2 = Most years, 3 = Once or twice, 4 = Never.

health care systems must take a more systematic approach to ensuring fair treatment in the health care setting. This may require new educational approaches including strategies such as Implicit Association Testing to prepare providers to more effectively treat patients who differ from them racially (The Joint Commission, 2016).

Of the demographic variables, age had the most powerful associations with the greatest number of racial and vaccine-related factors. We observed that older adults had the most positive vaccine attitudes, highest trust, highest confidence in the flu vaccine, and lowest scores on conspiracy and naturalism, which can depress vaccine acceptance. These findings are not surprising given existing comparative studies that demonstrate a positive association between age and flu vaccine acceptance, but they do confirm that this pattern holds within the African American population (Nagata et al., 2013). However, given the change to a universal recommendation for the flu vaccine, and particularly the need for high-risk individuals to get the vaccine, we must be able to more effectively reach African Americans across the age span and increase the overall vaccination rate. That will specifically require deliberate outreach to younger and middle aged adults.

Results for education and income were more surprising. While we found significant differences by education for vaccine knowledge, trust in the vaccine and vaccine process, disease risk, both descriptive norms, the moral norm, and all hesitancy and confidence variables, it was not necessarily a graded trend. As income rose, so did vaccine knowledge, knowledge of the TSS, and trust. Of particular interest, we observed those with the lowest income are most likely say they use natural remedies rather than a flu vaccine. In our qualitative research, we found that for many African Americans, their use of home remedies and alternative medicine was passed through family traditions (Quinn et al., 2016). Although those traditions may have arisen due to lack of access to care in past, their continued use by the lowest income group suggests a need to address cost as a barrier. However, it will also require a respectful approach so that those who have embraced naturalism in lieu of the flu vaccine are not dismissed by health care providers, but instead health care providers engage with them in a conversation about their concerns regarding the vaccine.

Perhaps one of our most interesting findings was a non-significant finding. In our qualitative research, many African Americans raised the specter of the TSS as a justification for their doubts about the flu vaccine (Quinn et al., 2016). Operating from the position of "centering in the margins," we moved from those conversations to examining this quantitatively, and specifically asked about the impact of the TSS on their trust in government, the health care system, vaccines in general and the flu vaccine specifically. Yet we found no significant differences in the impact of the TSS on trust in the flu vaccine by age, education, or income. However, we found a significant impact on never takers, who reported that the TSS decreased their trust in the flu vaccine. Clearly, the cultural legacy of the TSS remains important, particularly for those most resistant to the flu vaccine. However, addressing it alone, without considering other factors, will not be likely to impact vaccine behavior.

Mulinari et al. (2017) had questioned the value of social and demographic categories in addressing flu vaccination. In our approach,

Table 5
Logistic regression results.

	Every year vs most years			Most years vs once or twice			Once or twice vs never		
		95% CI for OR			95% CI for OR			95% CI for OR	
	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper
Demographics									
Age	1.65*	1.07	2.53	1.32	0.88	1.98	0.96	0.67	1.37
Education	0.95	0.55	1.65	0.81	0.47	1.39	1.51	0.97	2.35
Household income	0.58**	0.38	0.87	1.45	0.92	2.30	0.64*	0.42	0.96
Gender	0.94	0.40	2.19	1.75	0.68	4.48	1.41	0.64	3.08
Racial factors									
Racial salience	1.11	0.71	1.74	0.94	0.55	1.59	0.54*	0.33	0.90
Racial fairness	1.05	0.55	2.01	1.28	0.70	2.33	0.97	0.61	1.54
Racial consciousness	0.58	0.32	1.04	1.73	0.87	3.46	0.98	0.56	1.70
Frequency of discrimination	0.67	0.26	1.69	1.78	0.78	4.09	1.68	0.69	4.07
Impact of discrimination	1.40	0.72	2.69	1.15	0.59	2.26	0.82	0.42	1.62
Vaccine knowledge and attitudes									
Self-reported knowledge of the flu vaccine	1.50	0.94	2.40	0.94	0.61	1.47	1.20	0.80	1.79
Specific knowledge of the flu vaccine	1.52*	1.08	2.15	0.96	0.68	1.36	1.11	0.80	1.54
Flu vaccine attitude	0.92	0.56	1.52	1.65	0.91	2.98	1.22	0.71	2.10
Tuskegee Syphilis Study									
TSS knowledge	1.12	0.66	1.92	1.08	0.58	2.02	0.53**	0.33	0.85
TSS trust effect	0.78	0.27	2.31	0.63	0.20	2.01	2.43	0.90	6.57
Beliefs in conspiracy and use of naturalism									
Conspiracy	0.98	0.48	1.99	1.20	0.49	2.91	1.43	0.74	2.75
Naturalism	0.82	0.39	1.71	0.97	0.51	1.84	1.21	0.79	1.86
Trust and risk perception									
Trust in flu vaccine	0.63	0.31	1.29	1.04	0.50	2.16	4.00***	2.05	7.78
Trust in vaccine process	1.10	0.58	2.06	0.82	0.40	1.69	0.48*	0.25	0.94
Disease risk	3.67**	1.62	8.34	2.44*	1.08	5.49	1.35	0.65	2.82
Vaccine risk	0.61	0.24	1.54	0.75	0.29	1.96	0.92	0.55	1.52
Norms									
Descriptive norm (general population)	0.57	0.28	1.16	0.99	0.47	2.13	1.52	0.89	2.60
Descriptive norm (racial groups)	1.89	0.96	3.71	1.10	0.56	2.14	0.45**	0.26	0.78
Subjective norm	1.60**	1.16	2.21	0.83	0.59	1.16	1.44*	1.03	2.02
Moral norm	0.76	0.47	1.23	0.79	0.46	1.34	2.50***	1.49	4.22
Vaccine confidence and hesitancy									
General vaccine hesitancy	0.67	0.34	1.30	0.59	0.32	1.08	1.41	0.87	2.31
Flu vaccine hesitancy	0.52*	0.28	0.97	0.62	0.31	1.24	0.95	0.58	1.55
Barriers	0.60	0.25	1.48	0.78	0.33	1.86	0.84	0.44	1.59
Confidence in flu vaccine	0.60	0.18	1.99	1.28	0.38	4.27	0.78	0.33	1.85

Note. OR = odds ratio; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

the inclusion of multiple other measures, many of which are grounded in our qualitative research, enriches our ability to understand the diversity within the population. Our results suggest a critical point: tailoring strategies and messages designed to increase flu vaccine uptake on simple demographics alone is not sufficient to move people toward routine vaccine behavior. In health communication, message tailoring refers to the process of creating communication based on individual characteristics, in contrast to message targeting, which is based on crafting communications to reach entire demographic group (Campbell & Quintiliani, 2006). By identifying different behavioral groups within the African American population, messaging can be developed to target specific groups based on individual concerns, rather than the entire group or specific social categories such as lower income groups.

One unique contribution of this study was our ability to distinguish among four distinct groups, based on vaccine behavior in the past five years: always, most years, once/twice, and never. We were then able to examine demographics, racial factors, and vaccine-related factors for each group. This analysis can suggest how public health professionals could target specific variables to potentially move those in one group toward increased vaccine uptake, ultimately shifting the groups toward always takers. This fits with our current understanding of vaccine behavior as a continuum (Quinn et al., 2016). Factors that were significantly different among behavioral groups and offer the greatest possibility for improving uptake include: trust in the vaccine, perceived disease risk, perceived risk of vaccine side effects, knowledge, vaccine attitudes, subjective norms, barriers, and confidence.

For example, we observe a graded decline in perceived disease risk, from the highest levels of perceived risk among always takers to the lowest levels of perceived risk among never takers. This makes sense as individuals with higher perceived risk are more likely to act to take preventative action (including getting a flu shot) to avoid the risk (Brewer et al., 2007). This graded decline in perceived risk presents a key opportunity for public health messages (Quinn, 2017). The heavy burden of chronic diseases in the Black community places many African Americans at elevated risk of serious influenza-related complications, including death. Increasing perceived risk of the disease, coupled with raising awareness of the recommendations for annual vaccination for all adults, especially those with chronic diseases, could alter behavior. However, there was an interesting split between the groups on perceived risk of side effects of the vaccine with the always and most takers significantly lower than the other groups. Typically, most communication focuses on the risk of influenza. To move individuals toward most or every year, we would suggest that communication campaigns address vaccine fears directly. This could include messages explaining the routine annual testing and approval process by the FDA, as well as a more open discussion of possible mild vaccine side effects and the rarity of severe side effects. Quinn (2017) also emphasized the vital importance of health care providers in discussing perceived risk, both of the disease and vaccine side effects, coupled with a strong recommendation and offer of the vaccine during the provider visit.

Of critical importance for public health is the issue of barriers, real or perceived, to getting a flu vaccine. We found significant differences

between all behavioral groups: all but the always group reported barriers as a problem. We operationalized barriers as the affordability and convenience of the vaccine. In our qualitative work, we found that African Americans reported more concerns about cost (Quinn et al., 2016). As long as flu vaccines are covered as an essential service through the Affordable Care Act, and with the increasing distribution of the vaccine across a wide range of sites from local workplaces to grocery stores, we should communicate more explicitly about cost and accessibility, and consequently, reduce perceived barriers.

There remains another critical opportunity for communication related to social norms that could shift African Americans toward greater vaccine uptake. We found a graded decline in the subjective norm, "Of the people close to you, what proportion want you to get a flu vaccine?" with the proportion of those advocating flu vaccine declining dramatically across the groups. In our qualitative research, we found that there is no firm norm about flu vaccine in the Black community (Quinn et al., 2016). However, other work suggests that spouses/partners and children were somewhat to very influential in the vaccine decision (Quinn et al., 2017). Therefore, we suggest there may be ways to create a stronger norm. For many African Americans, the critical importance of family ties could be a lever through which to increase the expectation of vaccination. Communication could focus on recognizing the need for vaccination among older family members and those with chronic conditions that place them at high risk. Strengthening a subjective norm could be valuable within families and also the broader community.

As we reflect on our exploratory conceptual framework, we can assert that the four behavioral groups are characterized differently on these factors. We are cognizant that some factors, such as racial fairness, the frequency of discrimination and its impact on health care, and racial consciousness, may not be within the scope of what public health professionals can change. Furthermore, we recognize the influence of factors both inside and outside of the health care system that may influence these attitudes, and acknowledge that given the current political and social context, these attitudes likely have changed since we conducted our survey in 2015. However, health care professionals and systems must be more proactive in structural changes that can eliminate racial discrimination and differential treatment, which can potentially make a modest impact on vaccine disparities. Increasing racial diversity in the health care workforce may be one step, but the nature of institutional racism will require systemic change. In keeping with PHCR Praxis tenets, we also recognize that reducing barriers requires efforts from health care systems to address the social determinants that limit health care access.

Racial fairness, racial consciousness, and the frequency of discrimination emerged as important concepts. We believe that the ongoing efforts of health professions to enhance their practitioners' capacity to work effectively with racial and ethnic minorities remains critical. Multiple organizations recognize that eliminating such bias will require active engagement of health care professionals and systems in examining their own interactions with African Americans and undertaking systemic efforts to address bias that undermines the quality of care and interactions with African American patients (The Joint Commission, 2016; Williams & Wyatt, 2015).

PHCR Praxis (Ford & Airhihenbuwa, 2010a, 2010bb) informed our study, as did other critiques of the limited use of race as a demographic variable. We approach race not as a biological reality, but as a powerful social construct. As such, we recognize that as a variable, race is not a proxy for socioeconomic status, biology, or culture (Jones, 2001). It is perhaps best at capturing the lived experiences of racism shared by African Americans living in a racialized society. By examining within group differences, we were able to explore the intersections of race, age, gender, income, and education, which interact to affect life experiences of African Americans. We drew upon PHCR's call to critically examine one's own discipline, which has done little to fully explore how the lived experience of race impacts vaccine uptake. Consequently, we designed this study to explore racial factors and experiences in innovative ways. Many of our measures were created based on topics shared by African Americans during qualitative work, thereby giving voice to African American participants. This research advances the study of vaccine disparities by enabling us to more thoroughly understand the diverse lived experience of being African American as it relates to vaccine decision-making.

Certainly, a cross-sectional study can be more limited than a longitudinal study in terms of establishing solid connections between predictors and outcomes. The current study, in its sheer volume of analyses (e.g., numerous predictors within three logistic regressions), also could have falsely detected relations between variables in some cases (Type I errors), while possibly failing to detect other relations of consequence (Type II errors) in subgroup analyses with smaller sample sizes. Further, due to the exploratory nature of this investigation, we chose to assume the relatively low risk of false detection or potential failed detection when drilling down in an attempt to understand vaccination subgroups. The payoff of these analytical choices is that, on balance, we believe our results have yielded a fairly nuanced foundation for tailored communication about the flu vaccine while addressing the diversity of the African American population. In health communication, tailoring is a strategy designed to target based on individual characteristics, not group characteristics (Kreuter et al., 2003). Tailoring means creating communications in which information about a given individual is used to determine what specific content he or she will receive, the contexts or frames surrounding the content, by whom it will be presented and even through which channels it will be delivered. Although tailoring can and should be done to make communications culturally appropriate, their effectiveness would increase with more nuanced messages enabled by our results based on previous vaccine behavior. For example, many health communication messages focus on perceived disease risk. We know that for those who take the vaccine only once or twice or have never taken it, addressing disease risk is vitally important but it is equally important to address the risk of vaccine side effects. For health care providers, assessing previous vaccine behavior would enable them to determine what might be key effective messages depending on that history.

We also open a new line of inquiry that enables researchers to explore the intersection between the lived experiences of being African American and flu vaccine behavior, which is often not considered within this larger cultural context. Future research should further explore some of these novel and important areas in order to make a real impact in improving flu vaccination rates among African Americans.

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