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Determinants of Influenza Vaccination among High-Risk Black and White Adults

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Abstract

Background—Adults with chronic conditions are at much greater risk of influenza-related morbidity and mortality, yet flu vaccine uptake remains suboptimal. Research focused on the high-risk population has been limited, particularly related to racial disparities in vaccination. We explore a broad range of demographic, racial, and psychosocial factors to identify predictors of vaccination among high-risk adults, with a focus on identify differences between Black and White adults.

Methods—We conducted an online survey in March 2015, utilizing international research firm GfK's KnowledgePanel, for a nationally representative sample of Black and White adults (≥18, USA) and limited analysis adults with high-risk of influenza-related complications. Using two-way ANOVA, we assessed demographic, racial, and psychosocial predictors across vaccine uptake in the past five years and across racial group.

Results—424 (52.2%) Black and 388 (47.8%) White respondents with high-risk complications completed the survey. 383 (47.3%) reported vaccination annually, 99 (12.2%) most years, 104

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(12.9%) once/twice, and 223 (27.6%) never. ANOVA confirmed significant differences in vaccine behavior for most demographic predictors (except education), all racial factors (including racial fairness, experiences of discrimination, etc.), and most psychosocial factors (including vaccine attitudes, trust in the vaccine, etc.). ANOVA confirmed significant differences for most factors by race. We observed significant interaction effects between race and vaccine behavior for subjective social status, access to medical care, knowledge of vaccine recommendations, vaccine attitudes, perceived side effect risks, descriptive norms, subjective norms, flu vaccine hesitancy, and flu vaccine confidence, thus implying racial differences in the connection between vaccine uptake and key demographic, racial, and psychosocial factors.

Conclusions—This study provides a novel examination of flu vaccine behavior among high-risk Blacks and Whites that identified factors influencing vaccine uptake. We found significant differences by race. Health care professionals can use this information to more effectively target high-risk adults during flu season.

Keywords

United States; Influenza vaccination; High-risk population; Chronic conditions; Racial disparities; African Americans

Introduction

Adults with certain chronic diseases are at greater risk for influenza-related complications, including hospitalizations and death[1]. These high-risk conditions include asthma, chronic lung disease, heart disease, neurological conditions, kidney and liver disorders, endocrine disorders (including diabetes), and living with weakened immune systems (including adults living with HIV and cancer)[1]. Flu can exacerbate cardiovascular diseases, resulting in increased cardiac dysfunction and heart failure, worsen type II diabetes, and further complicate breathing for those with asthma and other lung conditions [2–5]. A recent meta-analysis concluded that influenza comorbidity with any single risk factor was significantly associated with pneumonia infection, hospital admission, admission to an intensive care unit, and death [6].

The Advisory Committee on Immunization Practices (ACIP) strongly recommends yearly vaccination for this high-risk group, a recommendation echoed by major medical organizations [5, 7–10]. During the 2015–16 flu season, only 46% of high-risk adults age 18–64, and 63% of all adults over age 65 were immunized [11]. Furthermore, there is evidence of racial disparities among high-risk populations, with racial/ethnic minorities less likely to receive an influenza vaccine [12–14].

Despite the importance of immunization for high-risk groups, scholarship on this high-risk population is still limited. Existing studies have utilized national datasets to confirm suboptimal influenza vaccination, but are limited in their investigation of psychosocial factors that explain vaccination behavior [13, 15, 16]. Known predictors tend to be based on demographics and healthcare access; influenza vaccination rates increase with age, the number of comorbid conditions, and as access to care improves [13, 15, 16]. Vaccination rates also vary by condition, with separate studies dedicated to specific conditions, such as

asthma or COPD, but fewer comprehensive investigations [16–19]. While studies of national datasets are useful in documenting the prevalence of influenza immunization among high-risk populations, they are limited in their ability to explore the full range of factors that may influence vaccine decisions, and consequently, to assist in increasing vaccination rates. Furthermore, in most studies, analysis has been limited to vaccine behavior for a single flu season.

Racial disparities in immunization among high-risk populations are even less studied. This is particularly concerning when considering that minority populations shoulder a disproportionate burden of many chronic diseases, placing them at greater risk for influenza-related complications [12]. There is a well-documented disparity in influenza immunization in the total population, with Black adults significantly less likely to be immunized than White adults [11, 20]. Research on the racial disparities in influenza immunization in the general population have identified several psychosocial and behavioral factors associated with vaccine uptake including; perceived risk, trust, vaccine attitudes, social norms, and experiences of racism in the healthcare system [20–22]. Among the high-risk populations, this disparity varies by age group and disease type but has been observed under varying conditions in several studies [13, 23, 24].

This study aimed to assess immunization attitudes and behaviors among Black and White adults at higher risk for influenza-related complications. The first objective was to document vaccine behaviors in the past five years for high-risk Black and White adults. A second objective was to test for the main effect of vaccine behavior, the main effect of race, and also identify any interaction effects associated with vaccine behavior and race across demographic, racial, and psychosocial factors.

Methods

In this cross-sectional study, we conducted a nationally representative survey of non-institutionalized, non-Hispanic, White and Black adults (≥18 years) residing in the United States. Analysis was limited to high-risk adults, who self-identified as having one or more of these conditions: asthma, chronic bronchitis, COPD, cancer (all types except for skin cancer), cystic fibrosis, diabetes, epilepsy, heart attack, heart disease, high blood pressure, HIV/AIDS, kidney disease, and/or stroke.

Theoretically, we were guided by the principles of Public Health Critical Race (PHCR) Praxis, an interdisciplinary approach, rooted in the scholarship of Critical Race Theory, which seeks to explicitly highlight the role of race in understanding racial disparities in health [25, 26]. We designed our survey instrument to assess a wide range of vaccine attitudes and behaviors, building upon extensive preliminary qualitative research with Black and White adults in the Washington, DC metropolitan area (n=110)[27]. Qualitative research was guided by the grounded theory, an inductive and iterative process that is designed to explore emergent themes [28]. All survey items were pre-tested in cognitive interviews (n=16) to ensure item clarity. We contracted with The GfK Group to conduct the survey. To recruit participants for its KnowledgePanel, Gfk utilizes an address-based sampling frame that captures approximately 97% of U.S. households, including those without landline

telephone service or Internet access [29]. Panel members are provided with laptops and Internet access, if needed. Consent is obtained at the time of recruitment to the panel. For each survey, samples are drawn from active panel members using a probability-proportional-to-size weighted sampling approach. Selected panelists were invited to participate via email, and received reminder e-mails and phone calls after 3 days to ensure high response rates. Participants receive no more than one survey per week, to minimize participant fatigue. For completing the survey, respondents were rewarded with an incentive equivalent to $5. GfK both pre-tested and pilot tested the survey items prior to the final survey entering the field. The final survey was in the field from March 27 to April 4, 2015. Data analysis was performed from April to June of 2017. The Institutional Review Board for the University of Maryland, College Park, reviewed and approved the study.

Many factors are known to influence vaccine decisions; we focused our analysis on a set of key demographic, racial, and psychosocial variables, described in detail in a supplemental file. Demographic variables included self-reported gender, age, education level, household income, health insurance status, and access to a regular care provider. We also adapted the MacArthur Scale of Subjective Social Status [30]. Racial factors were designed to assess the lived experience of race in a healthcare setting including measures of racial consciousness, racial fairness, and both frequency and impact of racial discrimination, again influenced by PHCR Praxis. Psychosocial factors related to vaccination included self-reported flu vaccine knowledge and specific flu vaccine knowledge, knowledge of vaccine recommendations, attitude toward the flu vaccine, use of naturalism in lieu of the vaccine, trust in the flu vaccine, perceived risk of influenza, perceived risk of vaccine side effects, descriptive and subjective norms, general and flu specific vaccine hesitancy, confidence in the flu vaccine, and barriers to vaccination. We utilized exploratory factor analysis to finalize our measures. Our outcome variable was flu vaccine uptake over the past five years, with four response categories: every year, most years but not all, once or twice, and never.

GfK provided a data file with de-identified data, including census-based post-stratification weights. Sample weights reflect the composition of both non-Hispanic White and non-Hispanic African American population in the United States based on the 2014 Current Population Survey from the U.S. Census. Specific benchmarks for stratification include gender by age, census region, metropolitan status, education level, household income, and internet access. Data analysis was conducted using SPSS version 22 [IBM, Chicago, IL]. Two-sided tests yielding $p<.05$ were considered statistically significant; more stringent levels of .01 and .001 were also noted. Analyses reported are for complete case data. Individuals who completed the survey in considerably under the median time (suggesting survey item “speeding”) were excluded from analysis.

Vaccine behavior in the past five years was assessed using chi-square tests. A two-way ANOVA was used to identify differences in demographic, racial, and psychosocial factors as a function of vaccine behavior, race, and their interaction. To complement the main effect and interaction tests, Tukey’s honestly significant difference (HSD) post hoc tests were used to isolate differences between specific flu behavior categories.

Results

Of the 1,329 White adults and 1499 Black adults sampled, 838 (63.1%) and 819 (51.2%) completed the survey, respectively. Analysis was restricted to the 812 (388 White, 424 Black) adults who reported at least one condition that makes them at higher risk. Demographic distributions are presented in Table 1.

Mean scores for demographic, racial, and psychosocial factors are presented by vaccine behavior in Table 2. ANOVA confirmed that in the total high-risk sample, mean scores were significantly different by vaccine behavior for every demographic predictor except education, for all racial factors, and for every psychosocial predictor except for descriptive norms. We observed significant relations of vaccine behavior with the demographic factors of age (always takers are significantly older than all other groups), income (occasional takers have significantly lower income compared to the always takers and most years takers), access to medical care and insurance coverage (always takers had significantly more access to health care and were more likely to have insurance when compared to most years and once or twice groups), and social position (self-report social position as significantly lower for once or twice takers than for the most years and always groups).

For racial factors, we observed a significant relation between perceived racial fairness and vaccine uptake, where always takers perceived significantly more fairness than the once or twice group and the never takers. The relationship with racial consciousness was the reverse, with always takers having significantly lower consciousness than all other groups. For both discrimination measures, we observed a significant difference between the always takers and the once or twice group.

For the psychosocial predictors, we observed several significant relationships. We observed very strong linear associations between all three types of knowledge and vaccine uptake, with the always takers having significantly more specific knowledge of the flu vaccine and knowledge of vaccine recommendations than all other groups. Vaccine attitudes, trust in the flu vaccine, perceived disease risk, subjective norms, and flu vaccine confidence all had a positive association with vaccine uptake, with the always takers reporting significantly higher means than all other groups. Perceived risk of vaccine side effects, use of naturalism in lieu of the vaccine, and barriers were all negatively associated with vaccine uptake, with the never takers reporting significantly higher means. Regarding hesitancy, those getting the vaccine once or twice and most years showed significantly more hesitancy about the flu vaccine than the always and never takers.

ANOVA also confirmed significant differences by race (Table 3). When compared to Whites, Blacks were significantly different in terms of gender, age, education, income, and access to medical care and insurance coverage. Blacks and Whites were also significantly different by every racial factor, with significantly higher mean scores for perceived racial consciousness, and both frequency and impact of racial discrimination, but lower mean scores for racial fairness. For psychosocial factors, there were significant racial differences in vaccine attitudes, use of naturalism, perceived risk of vaccine side effects, both descriptive

norms, and both types of vaccine hesitancy. The specific means of each of the predictors for each race are presented in Table 2.

Table 3 summarizes the main effect of vaccine behavior, the main effect of race, and indicates the significant interaction effects between flu vaccine behavior and race. The interaction effects indicated whether there were any racial differences in the predictive effects of the important factors of flu vaccine behavior. In particular, the predictive effects of socio-economic position, access to a healthcare provider, knowledge of recommendations, flu vaccine attitude, perceived risk of side effects, descriptive norm for own race, subjective norm, and flu vaccine hesitancy and confidence demonstrated statistically significant distinctions between Black and White adults.

Discussion

Influenza vaccine uptake for all high-risk adults remains low given that the recommendation is for all high-risk adults to be immunized annually. We found that in the past five years, fewer than half of high-risk adults reported yearly vaccination against influenza, and a full third report never being vaccinated. Other studies have reported similarly low levels (45%–53%) of vaccine uptake among high-risk populations using data from a single flu-season. [13, 16] Measuring vaccine behavior over the past five years allowed us to identify and isolate the quarter (25.1%) of high-risk adults who may have occasionally taken the flu vaccine, but did not get vaccinated every year. Given that past vaccine behavior is one of the strongest predictors of future vaccine behavior, isolating and identifying this critical, intermediate group, may assist in future vaccine efforts.

One of our aims was to explore a wider range of psychosocial factors related to vaccine behavior than traditionally assessed in other studies. As in other studies of high-risk populations, we were able to confirm the significance of age and access to medical care as important factors in influenza vaccination, but we also identified significance of perceived social-economic status using the MacArthur Scale of Subjective Social Status [30]. Adults who vaccinated every year and most years had higher self-assessed social status than those who vaccinated only once or twice or never. Other studies have suggested that low social status may be tied with lower vaccine uptake among a high-risk population [26]. However, this finding suggests that self-assessed social position should be considered alongside traditional objective measures of social status. This may also suggest that healthcare providers (HCPs) need to be cognizant that this dynamic of social status may require additional effort by the provider to communicate about the vaccine’s importance for high-risk individuals.

Current scholarship has been limited in its exploration of psychosocial predictors for influenza vaccine uptake among the high-risk population. Recent studies have indicated that structural level influences also need to be considered when assessing the high-risk population, particularly as they contribute to racial disparities, including neighborhood issues [31], as well as issues arising from institutional racism and medical discrimination [12, 20]. Further research is necessary to integrate these factors into a comprehensive study of high-risk immunization. This research is a promising beginning, confirming the

significance of nearly every psychosocial factor, indicating that the same dynamics that influence influenza vaccination in the general population still affect vaccine uptake in the high-risk group. Furthermore, future research should examine determinants of vaccine behavior in other racial/ethnic groups with substantial prevalence of high-risk conditions. For example, vaccine coverage of Hispanic and Native Americans/Alaska native adults lags behind Healthy People 2020 objectives, placing those populations at elevated risk of complications.

These findings can be utilized by HCPs working to improve vaccination rates among high-risk populations. Several key psychosocial factors are amenable to communication between HCPs and patients. For instance, knowledge about the flu vaccine (both specific and general) and knowledge of vaccine recommendations were significantly associated with increased vaccination. Similarly, risk perception variables indicated that high-risk adults who perceived greater risk of influenza were more likely to vaccinate, and high-risk adults who perceived greater risk of vaccine side effects were less likely to vaccinate. Adults who prefer natural remedies are also less likely to vaccinate. These findings suggest that provider-patient communication should target these issues with high-risk adults. Given that one's own physician is often a highly trusted figure, these topics and areas of concern should be a focus of communication. Transparent communication about the vaccine's safety can include its annual approval process and current understanding of its risks. Such communication can reduce hesitancy about the flu vaccine and improve confidence in the vaccine itself.

This study is one of the first to explore the influence of social norms on vaccine behaviors, measuring both descriptive and subjective norms for flu vaccination. Our findings suggest that in the high-risk population, descriptive norms did not have a significant impact on vaccine decisions, but that subjective norms were very influential. High-risk adults who believed that most of the people around them wanted them to be vaccinated were more likely to be vaccinated. Both HCPs and public health professionals can reinforce positive social norms about the flu vaccine. First, if they have strong uptake among high-risk patients, HCPs can articulate the recommendation for the annual vaccine and how many of their patients take the vaccine. Secondly, HCPs themselves can provide a role model for flu vaccination. Working with community groups, culturally appropriate social media, and culturally targeted communication campaigns, public health professionals can emphasize the importance of the vaccine for high-risk adults.

We also confirmed that vaccine behavior was significantly different by race, with high-risk Black adults reporting less frequent immunization than high-risk White adults. Our findings demonstrate a racial vaccination disparity between high-risk Black and White adults. Recent studies have found racial disparities between the older adults (≥ 65) with high-risk conditions, but our findings suggest that these disparities are consistent across all age groups [16]. By including analysis of racial factors such as perceived racial fairness and racial consciousness, as well as experiences of racial discrimination, we can add depth to this discussion.

Given our significant finding of racial disparities, finding that racial consciousness and discrimination in a health care setting were associated with lower vaccine uptake, suggests

that further work is necessary to address implicit bias and cultural competence in HCPs. Recent work from Bleser and colleagues identified the negative impact of racial discrimination and pneumonia vaccine uptake among a high-risk population of Black adults [12]. We augment these findings with a broader focus on racial consciousness and racial fairness in addition to experiences of discrimination.

We also observed significant differences in psychosocial predictors by race. For example, White always takers have higher subjective social status than African Americans, but for White occasional and never takers, subjective social status is lower than African Americans. All African Americans except the always takers have lower access to medical care than Whites. Knowledge of vaccine recommendations is lower for African Americans for the most and occasional takers groups, when compared to Whites. Even African American always and most takers tend to have less positive flu vaccine attitudes than those for Whites. Most Whites (except for never group) demonstrate lower perceived risk of side effects, less hesitancy towards flu vaccine, and higher perceived descriptive norm of own race than African Americans.

No study is not without limitations. Our study was a cross sectional survey, which limits our analysis. Given that GfK's KnowledgePanel members can choose which survey to participate in, there may be some unknown bias in the sample. Data on influenza vaccination was self-reported and may reflect recall bias. However, self-reports of flu vaccine have been demonstrated to be relatively accurate among samples of older adults [27]. In our qualitative research, we found very limited understanding of the term adjuvant, therefore, we did not explore the issue of adjuvant in flu vaccine in the survey.

Conclusion

This study advances our understanding of vaccine behavior in high-risk adults in several critical ways. First, we examine vaccine uptake for a five-year period, which is a more robust measure than the typical measure of vaccine uptake one year. Secondly, our ability to examine beliefs, attitudes, vaccine hesitancy and confidence, and norms provides us with clear evidence to distinguish between high-risk patients, including the critical importance of understanding the key variables affecting Black and White adults whose health conditions demand annual vaccination. With the subtle distinctions between vaccine behavior groups by attitudes, beliefs and knowledge, health care providers and public health professionals can more effectively target both interpersonal communication between the providers and the patients, and more broadly, campaigns at the population level.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Demographic, racial, and psychosocial predictors are significant factors in flu vaccine uptake for high-risk adults.
- Predictors for vaccination are significantly different by past vaccine behavior and by race.
- Black high-risk adults are less likely to be immunized than White high-risk adults.

Table 1

Sample Demographics for the High-Risk Population

	Overall U.S. Sample (N=812)	Black Non-Hispanic (N=424)	White Non-Hispanic (N=388)	Chi-Square Test
	n(%)	n(%)	n(%)	(Sig.)
Gender				
Male	404(49.8)	195(46.0)	209(53.9)	**.025**
Female	408(50.2)	229(54.0)	179(46.1)	
Age				
18–29	46(5.7)	25(5.9)	21(5.4)	**.006**
30–44	78(9.6)	46(10.8)	32(8.2)	
45–59	258(31.8)	153(36.1)	105(27.1)	
60+	430(53.0)	200(47.2)	230(59.3)	
Income				
Less than $25,000	215(26.5)	139(32.8)	76(19.6)	<**.001**
$25,000 to $49,999	203(25.0)	115(27.1)	88(22.7)	
$50,000 to $74,999	148(18.2)	69(16.3)	79(20.4)	
$75,000 or more	246(30.3)	101(23.8)	145(37.4)	
Vaccine Behavior				
Every year	383(47.3)	179(42.5)	204(52.6)	**.019**
Most years but not all	99(12.2)	54(12.8)	45(11.6)	
Once or twice	104(12.9)	65(15.4)	39(10.1)	
Never	223(27.6)	123(29.2)	100(25.8)	

Note. Boldface indicates statistical significance (p<.05). All numbers and percentages are unweighted. The significant levels are measuring the mean differences between Whites and Blacks.

Table 2

Means of Potential Important Predictors of Vaccine Behavior across Levels of Vaccine Uptake Frequency

	Overall					White				Black			
Potential Predictors of Flu Vaccine Behavior	**Every year**	**Most years**	**Once/ twice**	**Never**	**Homogeneous Subsets**	**Every year**	**Most years**	**Once/ twice**	**Never**	**Every year**	**Most years**	**Once/ twice**	**Never**
Gender	1.51	1.67	1.62	1.44	41<13<32	1.47	1.56	1.53	1.39	1.55	1.77	1.69	1.48
Age	3.46	2.85	2.84	3.01	324<1	3.58	2.94	3.13	3.20	3.29	2.77	2.61	2.85
Education	2.62	2.58	2.56	2.57	3421	2.80	2.96	2.60	2.71	2.38	2.21	2.53	2.45
Income	2.73	2.67	2.27	2.58	34<421	2.85	2.83	2.45	2.71	2.57	2.50	2.14	2.46
MacArthur Scale of Subjective Social Status[25]	3.19	3.26	2.88	3.03	34<412	3.31	3.26	2.83	2.98	3.02	3.27	2.93	3.07
Medical care	.98	.90	.88	.91	324<41	.98	.96	.95	.93	.98	.83	.82	.89
Insurance coverage	.96	.90	.85	.85	342<21	.98	.92	.93	.84	.95	.88	.78	.86
Racial fairness	3.81	3.61	3.40	3.43	342<21	4.20	4.17	3.76	3.84	3.27	3.06	3.10	3.08
Racial consciousness	1.93	2.25	2.24	2.22	1<432	1.82	2.01	1.93	2.10	2.09	2.49	2.50	2.32
Frequency of discrimination	1.15	1.26	1.29	1.18	142<423	1.06	1.11	1.08	1.08	1.28	1.42	1.47	1.28
Impact of discrimination	1.16	1.35	1.39	1.31	142<423	1.03	1.19	1.10	1.19	1.35	1.50	1.64	1.42
Self-reported vaccine knowledge	3.66	3.44	3.19	2.86	4<32<21	3.73	3.38	3.05	2.85	3.56	3.50	3.29	2.87
Specific vaccine knowledge	6.11	5.54	5.52	5.21	432<1	6.32	6.00	5.98	5.46	5.83	5.08	5.16	4.99
Knowledge of recommendations	4.07	3.35	3.04	2.38	4<32<1	3.95	3.77	3.30	2.37	4.24	2.94	2.84	2.39
Flu vaccine attitude	4.60	3.77	3.58	2.81	4<32<1	4.73	4.04	3.60	2.79	4.43	3.50	3.57	2.83
Naturalism	1.11	1.35	1.70	1.75	1<2<34	1.04	1.17	1.53	1.71	1.21	1.52	1.85	1.78
Trust in flu vaccine	4.01	3.49	2.92	2.16	4<3<2<1	4.12	3.63	2.85	2.13	3.86	3.35	2.98	2.19
Perceived risk of disease	2.71	2.33	2.07	1.53	4<3<2<1	2.75	2.26	1.98	1.57	2.65	2.40	2.15	1.49
Perceived risk of side effects	1.46	1.79	2.08	2.39	1<2<3<4	1.34	1.63	1.94	2.43	1.63	1.94	2.19	2.35
Descriptive norm (general pop.)	2.98	3.00	2.79	2.94	3412	2.88	2.75	2.62	2.67	3.13	3.26	2.94	3.17
Descriptive norm (own race)	2.96	2.90	2.74	2.66	432<321	3.24	2.98	2.79	2.66	2.56	2.82	2.69	2.66
Subjective norms	3.96	3.04	2.49	1.86	4<3<2<1	4.22	3.10	2.50	1.64	3.57	2.98	2.48	2.07
General vaccine hesitancy	1.30	1.64	1.90	2.52	1<2<3<4	1.22	1.52	1.80	2.44	1.41	1.75	1.98	2.59
Flu vaccine hesitancy	1.56	1.96	2.11	1.68	14<23	1.38	1.93	1.86	1.75	1.82	2.00	2.31	1.61
Barriers	1.44	1.75	2.02	2.32	1<2<3<4	1.41	1.67	2.18	2.34	1.50	1.83	1.90	2.30
Flu vaccine confidence	3.65	3.29	3.00	2.57	4<3<2<1	3.68	3.29	2.90	2.40	3.60	3.28	3.09	2.72

Note. 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 for the overall high-risk sample: 1 = Every year, 2 = Most years, 3 = Once or twice, 4 = Never

Table 3

Effect Sizes and Statistical Significance of Mean Differences across Levels of Vaccine Behavior, Race, and the Interaction Effects

Potential Predictors of Flu Vaccine Behavior	Flu Vaccine Behavior	Race	Interaction (Flu Vaccine Behavior * Race)
Gender	.013***	.013***	.002
Age	.073***	.025***	.003
Education	.000	.027***	.009
Income	.012*	.011**	.000
MacArthur Scale of Subjective Social Status[30]	.017**	.000	.011*
Medical care	.028***	.018***	.010*
Insurance coverage	.030***	.005*	.007
Racial fairness	.023***	.158***	.006
Racial consciousness	.025***	.038***	.005
Frequency of discrimination	.011*	.081***	.006
Impact of discrimination	.014*	.058***	.006
Self-reported vaccine knowledge	.097***	.001	.005
Specific vaccine knowledge	.086***	.054***	.005
Knowledge or recommendation	.185***	.005	.016**
Attitude	.422***	.010**	.013*
Naturalism	.124***	.017***	.005
Trust in flu vaccine	.453***	.002	.009
Perceived risk of disease	.368***	.000	.007
Perceived risk of side effects	.242***	.014***	.014*
Descriptive norm (general population)	.007	.036***	.005
Descriptive norm (own race)	.013*	.011**	.026***
Subjective norms	.314***	.011	.031***
General vaccine hesitancy	.285***	.010**	.000
Flu vaccine hesitancy	.045***	.012**	.025***
Barriers	.213***	.000	.008
Flu vaccine confidence	.363***	.005	.020**

Note.

Effect sizes indicated with partial eta squared,

* $p<.05$;

** $p<.01$;

*** $p<.001$.