Ethnic and Racial Disparities in HPV Vaccination Attitudes

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ABSTRACT

There are substantial racial and ethnic disparities in the rate of vaccination for human papillomavirus (HPV), which helps protect against cervical cancer. Using data from the 2007 Health Information National Trends Survey, we explore differences in attitudes toward vaccinating adolescent daughters for HPV between Whites, Blacks, Hispanics, and Asians. The purpose of this study is to help identify ways to better target interventions. Logistic regression models were used to explore whether race-ethnic differences in attitudes toward HPV vaccinations are explained by HPV knowledge, demographic and socioeconomic status, or general distrust of the healthcare system. We include interactions to explore whether the effects of HPV knowledge and doctor distrust vary by race-ethnic group. We find that greater HPV knowledge increases willingness to vaccinate for all groups except Blacks. Our findings suggest that simply increasing knowledge is not enough, but we should also design culturally appropriate interventions that address barriers to vaccination.

KEYWORDS HPV vaccine · HPV knowledge · Health disparities · Adolescent health

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BACKGROUND

Human papillomavirus (HPV) is the most common sexually transmitted infection (STI) in the United States (US) (CDC 2014). Nearly 80 million individuals are infected with HPV, and the CDC estimates that there are over 14 million new cases each year, approximately half of which are among 15-24 year olds (CDC 2014; CDC 2012a). While the majority of HPV cases resolve without long-term effects, several strains of the virus can lead to cancer later in life; the most common type is cervical cancer, with nearly 12,000 HPV-related cases diagnosed each year. Black and Hispanic women experience disproportionately higher rates of HPV-related cervical cancer than White women. The age-adjusted incidence rate of HPV-related cervical cancer for White women is 7.4 per 100,000, while the incidence rate among Black and Hispanic women is 9.9 and 11.3 per 100,000, respectively (CDC 2012b).

There are two relatively new FDA approved vaccines that effectively protect against two HPV strains that are responsible for 70% of cervical cancer cases (CDC 2012a). However, despite the availability of these vaccines, only 50% of girls ages 13 to 17 have received at least one dose of the vaccine, and only a third have completed the three dose series (CDC 2013). Previous research indicates that there are racial and ethnic disparities in HPV vaccination rates and completion (Downs et al. 2010; Polonijo and Carpiano 2013; Lai et al. 2013). White adolescent females are more likely to complete the vaccine series than their Black and Hispanic counterparts (CDC 2013). This is especially problematic given the higher cervical cancer rates of Black and Hispanic women, as these women would benefit most from vaccination. A better understanding of race and ethnic differentials in attitudes regarding HPV vaccination might shed light on the underlying causes of ethnic differentials in vaccination. This understanding may in turn play a critical role in eliminating cervical cancer disparities.

HPV knowledge is often considered as a potential factor of HPV vaccine acceptability, as before people can decide they want a vaccine they need to be aware of the problem as well as the vaccine's potential. However, a systematic review of studies suggest inconsistent findings for the relationship between HPV knowledge and willingness to vaccinate (Brewer and Fazekas 2007). While some studies indicate that vaccine uptake is related to greater knowledge about HPV and the HPV vaccine (Gerend et al. 2009; Hughes et al. 2009), others indicate that willingness to vaccinate is not associated with HPV knowledge (Lai et al. 2013; Boehner et al. 2003; Dempsey et al. 2006). Meanwhile, sociodemographic disparities in knowledge about HPV and the HPV vaccine have been consistently noted. Whites and those with college education have greater HPV knowledge (Hughes et al. 2009; Cates et al. 2009; Gelman et al. 2011) and along with those with higher SES, have greater knowledge about the HPV vaccine (Polonijo and Carpiano 2013; Hughes et al. 2009; Gelman et al. 2011).

Since the HPV vaccine is recommended for adolescents, several studies have examined parental attitudes toward HPV vaccination. While the majority of parents support vaccinating their children for HPV (Lai et al. 2013; Brewer and Fazekas 2007) racial/ethnic differences in parental vaccine acceptability have been observed. White and Hispanic parents have more favorable attitudes toward vaccination (Lai et al. 2013; Gelman et al. 2011; Constantine and Jerman 2007) than Black parents (Cates et al. 2009; Gelman et al. 2011; Constantine and Jerman 2007). Lower willingness to vaccinate among Blacks is attributed to concerns about the safety and efficacy of the vaccine, potential side effects, and a general distrust of the healthcare system (Downs et al. 2010; Cates et al. 2009; Scarinci et al. 2007; Wilson et al. 2013).

Although numerous studies to date have assessed sociodemographic disparities in HPV knowledge, HPV vaccine knowledge, and vaccine acceptability, many of these studies have

limited study samples to include only women and parents (Polonijo and Carpiano 2013; Lai et al. 2013; Gerend et al. 2009; Constantine and Jerman 2007). Considering that social networks, such as peers, partners, and husbands, influence HPV vaccine awareness and willingness to vaccinate (Brewer and Fazekas 2007; Hughes et al. 2009; Boehner et al. 2003; Dempsey et al. 2006), it is important to take them into account. Moreover, while several studies have examined racial and ethnic differences in HPV knowledge and vaccination attitudes (Lai et al. 2013; Hughes et al. 2009; Cates et al. 2009; Gelman et al. 2011), to our knowledge, no studies have examined whether the effect of HPV knowledge on willingness to vaccinate differs between all four major race/ethnic groups.

In order to address these gaps in research, our study focuses on the following research questions: (1) are there differences in attitudes toward vaccinating adolescent daughters for HPV between Whites, Blacks, Hispanics, and Asian/Pacific Islanders (A/PI); (2) do attitudes differ by HPV knowledge; (3) do attitudes differ by doctor trust; and (4) do the effects of knowledge and doctor distrust differ by race/ethnic groups. The main purpose of this study is to provide a better understanding of the barriers to vaccination and to help identify culturally sensitive ways to target interventions.

METHODS

SAMPLE

This analysis utilizes data from the 2007 Health Information National Trends Survey (HINTS). HINTS is a nationally representative sample of 7,674 adults collected using both RDD and addressed based sampling and the address based sample includes an oversample of minorities. The survey was developed by the Health Communication and Informatics Research

Branch (HCIRB) of the Division of Cancer Control and Population Sciences (DCCPS). For additional details see HINTS 2007 Final Report (Cantor et al. 2009).

The analytic sample for this study included self-identified Whites, Blacks, Hispanics, and Asian/Pacific Islander adults who responded to questions related to HPV and doctor trust. From the total survey sample of 7,674 adults, 5,588 matched our sample criterion. Thus, the total analytic sample size is 5,588.

MEASURES

The dependent variable is a dummy variable for willingness to vaccinate daughter for HPV. This was evaluated using the question "A vaccine or shot that protects against HPV, a virus that can cause cervical cancer, was recently recommended for girls ages 11-12. If you had a daughter that age, would you have her get it?" and the response was dichotomized as Yes vs. No/Not sure. (Note that the question asks only about daughters because the vaccine had not yet been approved for boys at the time of the survey).

The key independent variables are race/ethnicity (White, Black, Hispanic, A/PI), HPV knowledge, and doctor trust. Similar to a previously published composite scoring system used to measure HPV knowledge level (Lai et al. 2013), a HPV knowledge index was created using five HPV knowledge-related survey questions. Table 1 presents the five HPV-related questions used to determine HPV knowledge. Responses to these questions were dichotomous (Yes/No). For each question, a *yes* response received a score of 1, while a *no* response received a score of 0. Respondents who had never heard of HPV were not asked the subsequent HPV-related survey questions and were given the minimum total score of 0. The HPV knowledge index was categorized as none (score of 0), low (scores of 1-2), moderate (score of 3), and high (scores of

4-5). Doctor trust is operationalized using the question "In general, how much would you trust information about health or medical topics from a doctor or other health care?" and the response was dichotomized (Trust vs. Distrust). The survey used a four-point response scale with options of *a lot, some, a little,* and *not at all*. We use the response *a lot* to indicate doctor *trust* (69%) and the remaining responses as indicators of at least some doctor *distrust* (31%).

We also included controls for demographic characteristics including age and sex. Age is operationalized as a set of age categories (18 to 34, 35 to 54, 55 and older). In addition, we included measures of achieved characteristics, such as highest education level attained (< high school, High school graduate, Some college, College graduate), marital status (Married, Previously married, Single), and presence of children in household by gender (No kids, Males only, At least one female).

[Insert Table 1 About Here]

ANALYTIC APPROACH

A nested logistic regression model was used to explore whether race-ethnic differences in attitudes toward HPV vaccinations are explained by HPV knowledge, demographic and socioeconomic status, or more general distrust of the healthcare system. Interactions were computed to examine whether the effects of HPV knowledge and doctor distrust vary by race-ethnic group. Model 1 includes HPV knowledge index and race-ethnicity. Model 2 adds controls for demographics, achieved characteristics, and doctor trust. Model 3 adds interactions between race-ethnicity and HPV knowledge. Model 4 adds interactions between race-ethnicity and doctor trust to Model 2. Model 5 incorporates significant effects for both sets of interaction terms from Model 3 and 4. All statistical analyses were performed using SPSS version 21 (SPSS, Inc.).

RESULTS

DESCRIPTIVE STATISTICS

Weighted descriptive statistics for the study sample are presented in Table 2. Overall, 58% of the sample indicated willingness to vaccinate a daughter for HPV. It appears that HPV knowledge is rather polarized; the majority of participants either had high knowledge (38%) or had never heard of HPV (29%). Almost 70% of respondents reported that they trust information about health or medical topics from a doctor or other health care.

The majority of the sample is White (70%), female (51%), married (57%), and have no children living in the household (61%). Seventy-two percent of the sample is aged 54 or younger, with 35 to 54 (40%) being the largest age group. Approximately 60% have at least some college education, while 25% report a high school diploma or GED.

[Insert Table 2 About Here]

LOGISTIC REGRESSION RESULTS

Weighted logistic regression results for five nested models examining the predictors of willingness to vaccinate a daughter for HPV are presented in Table 3. The first model includes HPV knowledge index and race/ethnicity. As expected, having any knowledge of HPV significantly increases willingness to vaccinate. The effect of HPV knowledge remains significant across all models. Willingness to vaccinate also differs significantly by race/ethnic group. Hispanics are approximately 30% more likely than Whites to indicate willingness to vaccinate (β=0.256, OR=1.292, $p<.01$). Meanwhile, Blacks are almost 20% less likely than Whites to be willing to vaccinate (β=-0.209, OR=0.812, $p<.02$). Whites and Asian/Pacific Islanders do not differ significantly in their willingness to vaccinate.

[Insert Table 3 About Here]

The second model adds selected demographic and achieved characteristics, as well as doctor trust. Sex, age, education, marital status, and doctor trust are all significant predictors of willingness to vaccinate a daughter for HPV. Females are approximately 27% less likely than males to express willingness to vaccinate (β=-0.317, OR=0.728, p<.000). Compared to 35 to 54 age group, younger respondents (aged 18 to 34) are about 23% more likely to be willing to vaccinate (β=0.204, OR=1.227, p<.01). Those with less than a high school diploma are 30% more likely than those with a high school diploma to indicate willingness to vaccinate (β=0.262, OR=1.299, p<.01). Meanwhile, those with some college education (β=-0.118, OR=0.888, p<.10) and college graduates (β=-0.144, OR=0.866, p<.10) were less likely to be willing to vaccinate compared to those with a high school diploma. Both single and those previously married are more likely than those married to be willing to vaccinate (β=0.309, OR=1.363, p<.000 and (β=0.239, OR=1.270, p<.01, respectively). Those that distrust doctor are about 32% less likely than those that trust doctor to express willingness to vaccinate (β=-0.386, OR=0.679, p<.000). The effect of race/ethnicity in this model remains similar to the previous model for Blacks, however, the effect is no longer significant for Hispanics net of other characteristics.

Model 3 explores whether the relationship between HPV knowledge and willingness to vaccinate differs by race/ethnic group. This model shows that the effect of low, moderate, and high knowledge for Blacks differs significantly from that for other race-ethnic groups (the interactions for other groups were not significant). In general, HPV knowledge increases willingness to vaccinate (main effects) and greater knowledge increases willingness to vaccinate (β=0.399, OR=1.490, p<.001 for low, β=0.753, OR=2.123, p<.001 for moderate, and β=0.824, OR=2.279, p<.001 for high knowledge, respectively). In contrast, the interaction shows that for Blacks, any knowledge of HPV actually decreases willingness to vaccinate compared to having

no knowledge (β=-0.774, OR=0.461, p<.001 for low, β=-0.704, OR=0.494, p<.01 for moderate, and β=-0.400, OR=0.670, p<.10 for high knowledge, respectively), though the negative effect decreases with greater knowledge. The effects for all other variables remain very similar to the previous model, except for college graduates, where the effect is no longer significant.

Model 4 adds a different set of interactions to model two, this time exploring whether the effect of doctor trust varies by race and ethnicity. As expected, Whites (main effect) and Blacks (interaction) who distrust doctors are significantly less willing to vaccinate than those who trust doctors. Somewhat surprisingly, the effect for Hispanics is the opposite, with doctor distrust significantly increasing the likelihood of vaccination (β=0.562, OR=1.754, p<.001). Once we include the effect of distrust, the main effects for Hispanic are no longer significant, suggesting that some of the race-ethnic difference between Hispanics and the other groups has to do with the differential effect of doctor distrust.

The fifth and final model includes both sets of interactions. This model shows that both interactions are significant predictors of willingness to vaccinate a daughter for HPV. The effects of these interactions remain very similar to those discussed above. The effects for all other variables in the final model remain very similar to the previous model, except for college graduates, where the effect is no longer significant.

For ease of interpretation of the effect sizes, we summarize the interaction effect of HPV knowledge and race/ethnicity on willingness to vaccinate in Figure 1, which provides the predicted probabilities of willingness to vaccinate a daughter for HPV. These probabilities are calculated based on the coefficients in Model 5 and take into account all the control variables in that model. As noted above, HPV knowledge generally increases the likelihood of willingness to vaccinate. For example, just 47% of Whites with no HPV knowledge are willing to vaccinate

compared to 64% of those with high knowledge. The trend for Hispanics and Asian Pacific Islanders is very similar, albeit at slightly higher rates. However, as Figure 1 shows, HPV knowledge works differently for Blacks. Blacks with no HPV knowledge are the most likely to vaccinate at 53%, this figure drops to 41% for those with low knowledge of HPV. After that, increased knowledge increases willingness to vaccinate so that 50% of those with moderate knowledge are willing to vaccinate, a percentage still below that of those with no knowledge. Among Blacks with high knowledge, they are just slightly more likely than those with no knowledge to vaccinate at 57%.

[Insert Figure 1 About Here]

DISCUSSION

This study's findings were somewhat consistent with other studies that examined racial and ethnic differences in HPV vaccination uptake and attitudes (Polonijo and Carpiano 2013; Cates et al. 2009; Gelman et al. 2011; Constantine and Jerman 2007). Although our results show that a majority of Americans were willing to vaccinate a daughter for HPV, racial and ethnic disparities in attitudes toward vaccination were observed. Blacks were significantly less willing to vaccinate than Whites, even after controlling for sociodemographic factors. Meanwhile, Hispanics were significantly more willing to vaccinate than Whites. However, after controlling for sociodemographic factors, no difference was detected between Whites and Hispanics. Furthermore, in contrast to a prior qualitative study which suggest lower willingness to vaccinate among Black and Asian-American parents in California (Constantine and Jerman 2007), our results suggest that there is no significant difference in attitudes toward vaccination between Whites and Asian-Pacific Islanders. Our sample is representative of a large number of different Asian and Pacific Islander groups in the United States and includes both parents and non-parents.

So the differential findings may reflect differences between California and other areas, the particular Asian groups studied in California, or differences in parents and non-parents.

Our measurement of HPV knowledge is similar to that used by Lai, Tinker, and Cheung (2013), who examined willingness to vaccinate among mothers using data from HINTS. Contrary to their findings, we found HPV knowledge to be a significant predictor of willingness to vaccinate. Our results indicate that greater HPV knowledge increases one's willingness to vaccinate. Moreover, the effect of knowledge slightly increases after adding sociodemographic factors. The discrepancy in findings among our study and Lai et al. (2013) is likely due to differences in study populations, in that their study sample was restricted to mothers who answered all of the HPV-related survey questions. Since respondents who answered *no* to having heard of HPV were not asked the subsequent HPV-related questions, their study sample excludes respondents who have no knowledge of HPV. Consequently, HPV knowledge in their sample was higher and less variable. Our sample, on the other hand, includes fathers and non-parents as well as respondents who did not receive all of the HPV-related questions.

One notable finding is that the effect of HPV knowledge on willingness to vaccinate differs by race/ethnicity. Greater HPV knowledge increases willingness to vaccinate for all groups except Blacks. In contrast, HPV knowledge for Blacks had a negative effect on willingness to vaccinate. In other words, Blacks with no HPV knowledge were more likely to vaccinate than those with some HPV knowledge. This finding is key for future education and health policy campaigns as it suggests that although the lower rates of vaccination among Blacks are reflected in lower willingness to vaccinate, this is not because of a lack of knowledge. In fact, among Blacks HPV knowledge decreases willingness to vaccinate. The question remains why increased HPV knowledge deters willingness to vaccinate.

One possible explanation is that distrust of doctors and the medical profession in general, which is higher among African Americans (Downs et al. 2010; Cates et al.2009; Scarinci et al. 2007; Wilson et al. 2013; Gamble 2007), plays a role in lowering willingness to vaccinate even among those with knowledge of HPV. To our knowledge, this is the first study to examine whether attitudes toward vaccination differ by doctor trust and if the effect of doctor distrust varies by race and ethnicity. Our findings show distrust of doctors generally decreases willingness to vaccinate, but the effect of doctor distrust on willingness to vaccinate differs by race/ethnic groups. Doctor distrust actually increased willingness to vaccinate among Hispanics, but significantly reduced it among African American respondents. Thus, this may suggest that lower willingness to vaccinate among Blacks is due in part to their greater distrust of doctors and or the healthcare system, which in turn reduces their confidence in vaccinations. In contrast, Hispanics with distrust of doctors seem to respond by being more willing to vaccinate. It is also possible that some of the negative effect of HPV knowledge on willingness to vaccinate is related to concerns about not wanting to seem to approve of adolescent sexual activity (Constantine and Jerman 2007; Kaplan 1997) especially among Black adults.

Concerns about trust and about sexual activity may combine to create ambivalence about vaccination among Blacks. In addition to the binary logistic regression models described above, we also conducted multinomial logistic regressions to model three possible outcomes: yes, no, and not sure/it depends. One notable difference was detected between the two analyses. We found that Blacks were more likely to be not sure about their willingness to vaccinate. In other words, although our results suggest that Blacks were less likely to be willing to vaccinate, this is due in part to the fact that they were more likely to be ambivalent or unsure of their feelings

regarding HPV vaccination for girls. Again this ambivalence among Blacks may reflect distrust of doctors, concerns about vaccinations and concerns about sexual activity.

Large disparities in HPV vaccination by race and ethnicity still exist. Additional targeted interventions are required in order to improve HPV vaccination, particularly among African Americans. As our findings suggest, interventions aimed simply at increasing HPV knowledge alone are not enough. And they may in fact reduce vaccination rates among this population if knowledge dissemination is the sole focus. Our findings suggest a need for culturally appropriate interventions aimed at building physician trust and addressing concerns about vaccination.

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TABLE 1 HPV Knowledge-related Survey Questions

Questions	Proportion
Have you ever heard of HPV?	
Yes	0.63
No	0.37
Have you ever heard about a vaccine or shot to prevent cervical cancer?	
Yes	0.65
No	0.35
Do you think HPV can cause cervical cancer?	
Yes	0.55
No	0.45
Do you think you can get HPV through sexual contact?	
Yes	0.44
No	0.56
Do you think HPV can go away on its own, without treatment?	
Yes	0.04
No	0.96

TABLE 2 Weighted Descriptives for Study Sample

	Proportion
Willing to vaccinate daughter against HPV	
Yes	0.58
No	0.42
HPV knowledge index	
None	0.29
Low	0.16
Moderate	0.17
High	0.38
Race/ethnicity	
White	0.70
Hispanic	0.13
Black	0.12
Asian and Pacific Islander	0.05
Sex	
Male	0.49
Female	0.51
Age	
18 to 34	0.32
35 to 54	0.40
55 and older	0.28
Education	
Less than high school	0.13
High school graduate	0.25
Some college	0.35
College graduate	0.26
Marital Status	
Married	0.57
Previously married	0.16
Single	0.26
Kids in household gender	
No kids	0.61
Males only	0.13
At least one female	0.26
Trust doctor	
Trust	0.69
Distrust	0.31

Analytic N = 5,588

Weighted N = 176, 380,639

Source: Authors tabulation of HINTS 2007 data.

TABLE 3 Logistic regression model for willingness to vaccinate

	Model 1			Model 2			Model 3			Model 4			Model 5		
	β	S.E.	OR	β	S.E.	OR	β	S.E.	OR	β	S.E.	OR	β	S.E.	OR
HPV Knowledge															
Low (Ref: No knowledge)	0.20	0.09	1.22 **	0.28	0.09	1.32 ***	0.40	0.10	1.49 ***	0.29	0.09	1.33 ***	0.41	0.10	1.50 ***
Moderate	0.57	0.08	1.78 ***	0.66	0.09	1.93 ***	0.75	0.10	2.12 ***	0.65	0.09	1.92 ***	0.75	0.10	2.12 ***
High	0.63	0.07	1.87 ***	0.77	0.08	2.15 ***	0.82	0.08	2.28 ***	0.77	0.08	2.17 ***	0.83	0.08	2.30 ***
Race/Ethnicity															
Hispanic (Ref: White)	0.26	0.08	1.29 *	0.14	0.09	1.15	0.16	0.09	1.17 *	-0.09	0.11	0.91	-0.08	0.11	0.93
Black	-0.21	0.09	0.81 **	-0.27	0.09	0.76 ***	0.11	0.15	1.12	-0.12	0.11	0.89	0.30	0.16	1.34 *
API	0.13	0.13	1.14	0.10	0.14	1.11	0.12	0.14	1.13	0.13	0.16	1.14	0.15	0.16	1.16
Demographic Characteristics															
Female (Ref: Male)				-0.32	0.06	0.73 ***	-0.31	0.06	0.73 ***	-0.31	0.06	0.73 ***	-0.31	0.06	0.74 ***
18 to 34 (Ref: 35 to 54)				0.20	0.08	1.23 ***	0.22	0.08	1.24 ***	0.21	0.08	1.23 ***	0.22	0.08	1.25 ***
55 and older				0.03	0.08	1.03	0.04	0.08	1.04	0.04	0.08	1.04	0.04	0.08	1.04
Education															
Less than HS (Ref: HS)				0.26	0.09	1.30 ***	0.27	0.09	1.30 ***	0.26	0.09	1.29 ***	0.26	0.09	1.30 ***
Some College				-0.12	0.07	0.89 *	-0.11	0.07	0.89 *	-0.12	0.07	0.89 *	-0.11	0.07	0.89 *
College grad				-0.14	0.08	0.87 *	-0.13	0.08	0.88	-0.14	0.08	0.87 *	-0.12	0.08	0.88
Family Status															
Single (Ref: Married)				0.31	0.08	1.36 ***	0.30	0.08	1.35 ***	0.32	0.08	1.38 ***	0.31	0.08	1.36 ***
Prev. married				0.24	0.08	1.27 ***	0.24	0.08	1.27 ***	0.25	0.08	1.29 ***	0.25	0.08	1.28 ***
Male kids (Ref: No kids)				0.14	0.09	1.15	0.13	0.09	1.14	0.15	0.09	1.16	0.14	0.09	1.15
Female kids				0.08	0.08	1.08	0.08	0.08	1.09	0.08	0.08	1.09	0.09	0.08	1.09
Distrust doctor				-0.39	0.06	0.68 ***	-0.39	0.06	0.68 ***	-0.41	0.07	0.67 ***	-0.41	0.07	0.67 ***
Interaction: Black and Knowledge															
Black-Low							-0.77	0.24	0.46 ***	---	---	---	-0.80	0.24	0.45 ***
Black-Moderate							-0.70	0.25	0.49 ***	---	---	---	-0.77	0.25	0.46 ***
Black-High							-0.40	0.22	0.67 *	---	---	---	-0.40	0.23	0.67 *
Interaction: Race and Distrust															
Hispanic -Distrust										0.56	0.17	1.75 ***	0.57	0.17	1.76 ***
Black-Distrust										-0.45	0.19	0.64 **	-0.48	0.19	0.62 ***
API-Distrust										-0.12	0.32	0.89	-0.11	0.32	0.89
Constant	-0.05	0.95	0.38	-0.02	0.98	0.83	-0.09	0.91	0.33	-0.03	0.97	0.77	-0.10	0.90	0.28
-2 log-likelihood			7479.9			7346.9			7333			7326.9			7311.9

NOTES: N = 5,698. ***denotes p<.01; **denotes p≤.05; *denotes p≤.10. β denotes regression coefficient. S.E. denotes standard error. OR denotes odds ratio.

FIGURE 1 Predicted probabilities of willingness to vaccinate by HPV knowledge and race/ethnicity