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Factors Mediating Seasonal and Influenza A (H1N1) Vaccine Acceptance among Ethnically Diverse Populations in the Urban South

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Abstract

Objective—We examined the acceptability of the influenza A (H1N1) and seasonal vaccinations immediately following government manufacture approval to gauge potential product uptake in minority communities. We studied correlates of vaccine acceptance including attitudes, beliefs, perceptions, and influenza immunization experiences, and sought to identify communication approaches to increase influenza vaccine coverage in community settings.

Methods—Adults ≥ 18 years participated in a cross-sectional survey from September through December 2009. Venue-based sampling was used to recruit participants of racial and ethnic minorities.

Results—The sample (N=503) included mostly lower income (81.9%, n=412) participants and African Americans (79.3%, n=399). Respondents expressed greater acceptability of the H1N1 vaccination compared to seasonal flu immunization (t=2.86, p=0.005) although H1N1 vaccine acceptability was moderately low (38%, n=191). Factors associated with acceptance of the H1N1 vaccine included positive attitudes about immunizations [OR=0.23, CI (0.16, 0.33)], community perceptions of H1N1 [OR=2.15, CI (1.57, 2.95)], and having had a flu shot in the past 5 years [OR=2.50, CI (1.52, 4.10). The factors associated with acceptance of the seasonal flu vaccine included positive attitudes about immunization [OR=0.43, CI (0.32, 0.59)], community perceptions of H1N1 [OR=1.53, CI (1.16, 2.01)], and having had the flu shot in the past 5 years [OR=3.53, CI (2.16, 5.78)]. Participants were most likely to be influenced to take a flu shot by physicians [OR=1.94, CI (1.31, 2.86)]. Persons who obtained influenza vaccinations indicated that Facebook (χ^2=11.7, p=.02) and Twitter (χ^2=18.1, p=.001) could be useful vaccine communication channels and that churches (χ^2=21.5, p<.001) and grocery stores (χ^2=21.5, p<.001) would be effective “flu shot stops” in their communities.

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Conclusions—In this population, positive vaccine attitudes and community perceptions, along with previous flu vaccination, were associated with H1N1 and seasonal influenza vaccine acceptance. Increased immunization coverage in this community may be achieved through physician communication to dispel vaccine conspiracy beliefs and discussion about vaccine protection via social media and in other community venues.

Keywords

H1N1 Vaccine; Acceptability; Vaccine Refusal; Immunization Coverage; Minorities

Introduction

In early April 2009, reports emerged from Mexico about a novel viral pathogen that had genetic similarity with Asian, European, and North American swine influenza A virus.[1] Shortly thereafter, the virus that became known as “2009 H1N1” also was detected in two children living approximately 130 miles from each other in California.[2-4] On June 11, 2009, the World Health Organization (WHO) declared the worldwide outbreak of 2009 influenza A (H1N1) a pandemic [5]. Following the WHO’s pandemic declaration, worldwide mobilization to develop a vaccine was expeditious [6]. The CDC Advisory Committee on Immunization Practices (ACIP) provided guidance in July 2009 on initial priority groups for vaccination including pregnant women, household contacts and caregivers of infants ≤ 6 months of age, persons in 6 months-24 years, adults ages 25-64 years of age at risk from influenza medical complications, and healthcare workers and emergency personnel.

Although the WHO subsequently declared the end of the pandemic in August 2010 [7], the virus took its toll in terms of morbidity and mortality during this short time. From April 2009 to April 2010, it is estimated that there were nearly 60.8 million cases of H1N1 in the United States, resulting in 274,304 hospitalizations and 12,469 deaths [8]. H1N1 affected healthy persons under age 65 [9]. Hospitalization and H1N1-associated deaths were most likely to occur in people with at least one underlying medical condition [10, 11]. Although H1N1 infection rates appeared to be similar among Hispanics, non-Hispanic whites, and non-Hispanic blacks [10], minority populations have been burdened by some of the underlying medical conditions which most commonly led to H1N1-related complications, such as asthma, diabetes, and immunosuppressive conditions [12-15].

Despite challenges to vaccine development and licensure in the United States, a safe and effective H1N1 vaccine was approved by the US Food and Drug Administration (FDA) and available to the public by October 2009 [6, 16]. Given that vaccination is one of the most effective methods to reduce the spread and impact of influenza [17], high rates of H1N1 vaccine uptake would likely have reduced disease burden. However, H1N1 vaccination coverage among adults in the United States remained low. From November 2009 – February 2010, the CDC estimated 20.1% coverage among adults aged ≥18 years, with wide variations by state [18].

In light of recent research indicating the risk of future influenza pandemics still exists [19], it is important to investigate the reasons why the national H1N1 vaccination effort fell short of targeted levels. Previous studies have highlighted important factors that influenced H1N1 immunization uptake[20, 21] including those with general populations from Australia[22], France[23], Greece[24] , Hong Kong [25], Israel [26], Malaysia[27], UK[28], US[28, 29], South Korea[30], and Turkey[31] Across contexts issues such as perceived risk and disease vulnerability, attitudes toward influenza vaccination, and immunization history strongly correlated with willingness to obtain A/H1N1 vaccination during the pandemic.[21].[20]

Yet, globally immunization rates were much lower than anticipated.[32] Domestically, there were considerable disparities observed across racial and ethnic groups with respect to H1N1 exposure, healthcare access, and illness complications, as well as vaccine uptake.[33, 34] Therefore, it is particularly crucial to elucidate factors associated with vaccine acceptance among high-risk populations, including low-income and minority populations who may be at greater risk for disease complications due to a disproportionate burden of underlying medical conditions. However, there is little data on factors influencing H1N1 acceptance in minority populations.

The present study was conducted to assess factors associated with both H1N1 and seasonal influenza vaccine acceptance among a predominantly low-income, high-minority sample of adults in Atlanta, Georgia. Established health behavior theories, specifically the Health Belief Model [35], and the Integrated Behavioral Model which incorporates socioecological influences [36-38] were used as a framework to examine factors associated with H1N1 and seasonal influenza vaccine acceptance.

Patients and Methods

Study design and sample

From September through December 2009, a venue-based sampling strategy was utilized for recruitment during randomly selected blocks of time. Venue-based sampling involves identifying days and times when the target population frequents specific venues, constructing a sampling frame of venue day-time units (VDTs), and randomly selecting recruitment blocks from said sampling frame. This method has proven successful in obtaining representative populations in cross-sectional survey samples [39]. Study settings were located throughout metropolitan Atlanta, Georgia. The sampling locations included 33 locations including churches, bookstores, educational forums, community meetings, and special events such as family health fairs that demonstrated the potential to recruit an adequate number of participants.

Our target populations included English- and Spanish-speaking racial and ethnic minority (predominately African American and Hispanic) persons ages ≥18 years. We calculated an estimated needed sample size of n=460 to see an effect size of 0.03 with 6 potential predictors in the model at 80% power (alpha=.05).[40] Project assistants performed recruitment and data collection based on a master schedule of monthly activities. Persons were eligible for this study if they were ≥18 years of age and could read and speak English or Spanish. Native Spanish-speaking staff members were available during the survey administration and Spanish surveys were given to those whose first language is Spanish. Seven hundred thirty-six people were invited to participate and 604 provided written informed consent and subsequently completed self-administered paper questionnaires (response rate = 82%). A $10 gift card or health promotion incentive was offered for participation. The Emory University Institutional Review Board approved the study.

Measurement

Assessment of Acceptability—The acceptability of the H1N1 vaccine was assessed by a single item: “On a scale of 0 (definitely not) to 10 (definitely so), please rank your likelihood getting a swine (H1N1) flu vaccine in the next year?” Similarly, seasonal influenza immunization acceptability was measured by the item: “On a scale of 0 (definitely not) to 10 (definitely so), please rank your likelihood of getting yearly (seasonal) flu shot in the next 90 days (*not swine flu*)?” We subsequently split responses into two categories indicating those “willing” and “not willing” to take H1N1 or seasonal influenza vaccine in the next six months.

Assessment of demographic and behavioral correlates—Initial questions assessed basic demographic measures (e.g., age, gender, race/ethnicity, education, employment status). Age was split into three groups that represent the targeted groups for both vaccines (i.e., ages 18-24, 25-63, and 64-70). Additional items assessed recent healthcare experiences. For example, using a 12-month recall period, we asked about recent treatment for illness or health condition by a healthcare provider (0 to ≥ 10 times in the past year). Questions also assessed indicators of influenza vaccination history and recent seasonal and H1N1 influenza-related illness experiences. Finally, we examined participants' willingness-to-pay for H1N1 vaccinations (i.e., $0/free to ≥$30) using a 5-point scale.

Assessment of psychosocial correlates—In addition to the selected demographic and behavioral correlates, the questionnaire included items designed to measure psychosocial indicators of H1N1 and seasonal vaccine immunization acceptability. New scale items were developed based on previous quantitative and qualitative research findings, literature review, and vaccine clinical trial and community experience. [41-44] In addition, psychosocial items were developed for most of the domains based on recommendations by behavioral theorists, guided by the Health Belief and Integrated Behavioral Models [36-38, 45, 46]. A team of clinicians and behavioral researchers reviewed the instrument for adequacy of the measures.

The following briefly describes six scale measures developed specifically to assess immunization issues. Each scale item was measured by a 5-point Likert scale (1-strongly disagree to 5-strongly agree), designed to assign meaningful values to an underlying continuum of ratings [47]. These scales were added to the multivariate models as scores based on the average of the component answers of the scale.

Immunization Attitudes: Ten items comprised this scale. Three items assessed the benefit of taking the vaccine to set an example and encourage others to get vaccinated, and four items measured the perceived benefit of the novel H1N1 vaccine for self, family, and community. The remaining three items assessed other positive attitudes toward vaccination including the vaccine does not seem risky, would be worth the time and trouble, and would be worth the extra immunization cost compared to seasonal flu shot expense One item assessed perceived threat of swine flu based on lifetime experience.

Vaccine Attributes: We evaluated the extent to which people considered clinical trial testing, minor side effects, long-term safety, out-of-pocket cost, and immunization recommendation from others who already obtained the H1N1 vaccine in decision-making via 5 items in this scale.

Disease Salience: This scale comprised five items. Five items assessed community perceptions regarding H1N1 compared to other health concerns, such as HIV/AIDS, substance abuse, breast cancer, and depression. One item assessed the extent of agreement with the statement, "Most people in my community do not care about swine (H1N1) flu."

Community Perceptions of H1N1: This scale measures disease conspiracy beliefs and the extent of mistrust of H1N1 information coming from the government that serve as a potential barrier to vaccination.[32] Two items state "The US government created swine (H1N1) flu" and "Swine (H1N1) flu is a government conspiracy." The scale also includes an item that measures the extent of agreement to the statement, "Swine (H1N1) flu is just like other epidemics affecting my community."

Health Status: Previous studies that have examined H1N1 vaccination attitudes highlight the relationship of perceived health threat, disease susceptibility, and immunization behavior.[21, 33] As racial and ethnic minorities share a disproportionate burden of underlying medical conditions that may place them at greater risk for H1N1-related complications [33, 48, 49], we assessed extent of agreement with the statement “I am as healthy as I can be.” We also examined if there was any perceived variance in health status in the next year with the item, “My health will not decline in the next year.”

Normative Approval: Previous studies examining vaccine acceptability have accounted for normative expectations in overall models [50, 51]. Given the extent of evidence suggesting the importance of normative approval as a vaccine decision-making facilitator [42, 44, 52], we developed four items that specifically assessed the expressed or perceived approval of doctors, family, work colleagues, and friends in deciding to get the H1N1 vaccination within six months.

Communication Assessment

Ten items salient to improving H1N1 vaccination through communication channels and venues were assessed. These included three items regarding about influential sources of vaccine information in the community including physicians/healthcare providers, friends, and media. In addition, five items inquired about desired locations to obtain influenza shots (grocery stores, churches, schools, employers, and health departments). Finally, two items assessing the relevance of social networking sites (Twitter, Facebook) in promoting vaccination.

Statistical Analysis—SAS version 9.2 was used for analyses (SAS Institute Inc, Cary, NC, USA). Descriptive statistics and cross-tabulations were generated for variables of interest. Bivariate correlations were also generated to explore key relationships. An exploratory factor analysis was conducted and resulting scale reliability estimates were generated. We determined a Cronbach alpha reliability estimate of ≥ 0.70 would support reliability of each subscale [53]. Multivariate logistic regression models were used to analyze the independent contributions of variables. Significant independent predictors of outcomes were assessed at α=0.05 levels.

Results

Subjects

Fifty-one percent of the study population were female (n=256), 43.1% were male (217), (6.0%, n=30 did not record gender) (Table 1). The mean age of the participants was 37.4 years old, with a majority of participants in the age category 25-63 [22.1% age 18-24 (n=111); 70.4% age 25-63 (n=354); 2.4% age 64-70 (n=12)]. All of the 503 participants surveyed were non-white minorities including 399 black/African Americans (79.3%), 31 Hispanics/Latino/as (6.2%), 28 persons of multiracial descent (5.6%), 12 Asians (2.4%), and 6 Native American Indians (1.2%). Five percent (n=27) of respondents did not identify their ethnicity. Respondents predominately lived in lower-income households with earnings of ≤ $40,000 per year (81.9%, n=412). Forty-nine percent (n=245) were unemployed and 42.5% (n=214) had achieved a high school or equivalent education with an additional 16.7% (n=84) achieving less than a high school education. Many participants received some form of public assistance (45.3%, n=228), with food stamps being the most utilized (36.6%, n=184). Most participants also reported renting a home (54.5%, n=274) and living in their current residence for three years or less (74.6%, n=375).

Most respondents (90.5%, n=455) were English-speaking with 5.2% (n=26) having Spanish as their primary household language. A small minority (2.8%, n=14) reported another primary household language. Similarly, most respondents (83.1%, n=418) were born in the

United States, with another 3.0% of respondents born in Mexico (n=15), and 7.2% born in other countries (n=36). Seven percent (n=34) of participants did not report their country of birth.

Internal Consistencies

With 29 questionnaire items, we conducted an exploratory principal components factor analysis using Varimax rotation method that resulted in a 6-factor solution (63% cumulative variance). The internal consistencies achieved on the six scales demonstrated a high level of reliability. “Immunization Attitudes” resulted in the highest alpha score of 0.92. This was followed by “Normative Approval” (α = 0.90), “Community Perceptions of H1N1” (α = 0.77), Vaccine Attributes” (α = 0.76), “Disease Salience” (α = .74), and the “Health Status” scale (α = 0.71).

Vaccine Acceptability

Respondents reported a greater likelihood of getting the H1N1 flu vaccine (χ^2=3.63) compared to the seasonal flu vaccine (χ^2=3.20) (t=-2.86, p=0.005). Respondents who were more likely to accept the seasonal vaccine were also more likely to accept the H1N1 vaccine (χ^2=95.7, $p<.001$). There was no significant difference in the number of participants who were willing to pay for either the seasonal (χ^2=2.62) or H1N1 vaccine (χ^2=2.70) (t=-1.55, p=.122).

Seasonal influenza vaccine acceptance

Fifteen percent (n=77) of respondents had been vaccinated for seasonal influenza within three months prior to survey administration. The overall seasonal influenza vaccine acceptance rate (i.e., those already vaccinated plus those who intended to get vaccinated) was 39% (n=196). In multivariate analysis, acceptance of seasonal influenza vaccination was associated with disagreement about H1N1 conspiracy beliefs (community perceptions of H1N1) [OR=1.53, CI (1.16, 2.01)] and having had the flu shot in the past 5 years [OR=3.53, CI (2.16, 5.78)]. Respondents with a general positive opinion about getting the H1N1 vaccine were more likely to accept the seasonal influenza vaccination [OR=0.43, CI (0.32, 0.59)]. Socially-perceived approval of flu shots (normative approval) [OR=1.12, CI (0.77, 1.65), health insurance status [OR=0.53, CI (0.32, 0.90), and educational level were not significantly associated with seasonal vaccine acceptance [OR=0.80, CI (0.62, 1.03).

H1N1 influenza vaccine acceptance

None of the respondents had been vaccinated against H1N1 at survey administration as the vaccine was not widely available at that time. The acceptability rate for H1N1 influenza vaccination was 38% (n=191). Acceptance was associated with favorable community perceptions of H1N1 and disagreement with vaccine conspiracy beliefs [OR=2.15, CI (1.57, 2.95)] and having had the flu shot in the past 5 years [OR=2.50, CI (1.52, 4.10)]. Respondents who had a general negative opinion about the H1N1-related benefits were less likely to accept vaccination [OR=0.23, CI (0.16, 0.33)].

Acceptance of the H1N1 influenza vaccine was associated with greater belief that the decision to take a flu shot could be influenced by physicians [OR=1.94, CI (1.31, 2.86)]. Vaccine acceptors also were more likely than vaccine rejecters to believe health departments would be an excellent place to get the vaccine [OR=2.71, CI (1.74, 4.21)]. Notably, eleven percent (n=54) of refusing respondents also said they simply did not take vaccines of any kind.

Communication Messages and Dissemination Approaches

Attitudes toward communication approaches also varied by demographic characteristics. Males were more likely to say friends (χ^2=6.65, p=.01), employers (χ^2=6.26, p=.01), schools (χ^2=6.57, p=.01), and Facebook (χ^2=4.42, p=.04) would influence members of their community to take a flu vaccine. Black/African Americans believed that churches (χ^2=4.23, p=.04) could effectively promote vaccine uptake and that grocery stores (χ^2=7.93, p=.005) would be another ideal place to obtain a flu vaccine. Those under 64 years of age were more likely to go to a health department (F=5.26, p=0.01) to obtain a flu vaccine in the future compared to those over 64 years of age. Those who previously received a seasonal influenza vaccine in the past 5 years were more likely to think that churches (χ^2=8.32, p=.004) and grocery stores (χ^2=5.18, p=.02) would be good places to obtain flu vaccines in the future. In addition, they were more likely to look at Facebook ads (χ^2=5.58, p=.02) related to flu vaccine and Twitter posts (χ^2=5.37, p=.02).

Discussion

Although participants were more likely to accept an H1N1 influenza vaccine than a seasonal influenza vaccine, acceptance for both seasonal (31.4%) and H1N1 influenza (38.0%) vaccines were low among our study population. This finding is consistent with other studies that have found minority populations may be less likely to accept immunizations in general, as well as influenza vaccination specifically [54-57]. This phenomenon may result from negative vaccine attitudes in the community and poor experiences with healthcare providers along with general concerns about vaccination safety and side effects [55, 56]. Simulation studies have demonstrated that addressing vaccine “skeptics” in communities has critical epidemiologic implications for decreasing vulnerability to vaccine-preventable disease [58, 59]. However, reaching and effectively communicating with lower-income minority community members on vaccine issues can be challenging [60]. Health promotion studies have identified interpersonal communication routes combined with the role of social networks as interventional opportunities that can be harnessed [61]. Therefore, identifying and mobilizing opinion leaders (“information mavens”) from marginalized communities may be useful in this context as this approach has been effective with similar populations [61, 62].

Targeting community opinion leaders with previous influenza vaccination history may be an optimal strategy to increase vaccine uptake in the future [21]. Our findings demonstrate that participants who would accept a seasonal influenza vaccine were also more likely to accept an H1N1 influenza vaccine, indicating less mistrust of vaccines in general. Moreover, those who had a flu shot in the past five years were most likely to obtain both seasonal and H1N1 immunizations in the future. This behavioral correlate has also been highlighted as a robust factor in predicting H1N1 vaccine intention across diverse populations [63]. With an 11% general vaccine refusal rate, we recognize that enormous opportunity exists to push a substantial proportion of vaccine “fence sitters” who are unsure about immunization necessity to adopters [64]. We therefore argue for the prioritization of effective messaging about influenza vaccination to not only sustain the willingness of persons to annually obtain flu shots but also to serve as effective health behavior models to others [65]. Such “tipping point” efforts have enormous longer term potential for impacting social norms among those who may not necessarily perceive themselves to be at risk for infection or in need of a flu vaccine [65].

This study focused on salient government conspiracy and vaccine-related issues which are important considerations in promoting vaccine acceptance among minority populations [66]. Participants that expressed a greater sense of trust in the U.S. government, as demonstrated by their disagreement with conspiracy belief items on the “Community Perceptions” scale, were more likely to accept both vaccines. This factor has been positively associated with influenza vaccine intention across cultural contexts [67]. Thus, it is critical for governmental bodies to provide clear and timely information to citizens in pandemic situations as well as during normal influenza epidemic cycles [66, 68, 69]. This is especially important for black/African Americans whose government mistrust is still widespread as a result of the Tuskegee experiment and similar events [70].

Some hypothesized factors thought to be associated with vaccine acceptance did not materialize in our study. Social norms, a well-studied predictor of behavior posited by the Theory of Reasoned Action, Theory of Planned Behavior, and Integrated Behavioral Model [71], was not influential of vaccine intention in this study. This was of interest to us as mean values on items measuring approval of taking a flu shot resulted in moderate agreement with a correspondingly strong scale alpha level (0.90). We therefore interpret the finding to mean that referent opinion is subsumed in our attitudinal measure, also significantly associated with obtaining both types of immunizations. In that scale we explore whether taking a flu shot will set an example to the community, that obtaining the immunization would protect the health of a family, and if taking it would encourage others to do the same. Cross-cultural influenza vaccination studies have demonstrated the independent effect of normative appraisal in shaping vaccine intention [72]. However, this effect is realized in contexts where social norms have been shaped that favor influenza vaccination [72]. With overall lower levels of community acceptance of influenza vaccination, we assert that positive normative consideration operates differently as a component of attitude formation to reconcile negative cultural norms around vaccines.

Disease salience, or the consideration of influenza as an equal or greater threat to the community compared to other health concerns, also did not impact H1N1 acceptance. Perceived threat of disease, originally discussed in the Health Belief Model as a combination of perceived susceptibility and perceived severity of disease [35], is a well-known correlate of acceptance for a plethora of vaccines [72-75]. Our inventory of comparative health concerns included leading causes of morbidity and mortality among black/African Americans such as breast cancer, HIV/AIDS, depression, and substance abuse. Consideration of these health problems did not result in greater H1N1 threat appraisal. In other words, our participants were neutral in their view of their own H1N1 susceptibility and its severity. As a consequence this did not impact their vaccine decision-making in contrast to other studies that have examined threat appraisal [21].

Two sociodemographic factors, higher educational attainment and personal health insurance coverage, were not associated with acceptance of either vaccine. Previous research has demonstrated a link between influenza vaccination coverage and insurance status [76]. However this link is more tenuous among minorities from lower income communities who have insurance as vaccine coverage rates remain suboptimal [76]. It has been posited that issues such as lack of transportation may preclude those who have insurance from receiving care including preventive health services. Additionally, educational attainment was not associated with vaccine acceptance. This finding again suggests that affective concerns such as cultural norms and beliefs may trump knowledge in vaccine appraisal. Thus, exploration of the role of health literacy may be warranted [77]. Finally, we found no difference with respect to cost considerations to obtain seasonal or H1N1 vaccine. This indicates that payment and subsidies for influenza vaccination, particularly for those groups recommended by Advisory Committee on Immunization Practices (ACIP), need to be maintained in the future to achieve increased population coverage [78].

Communication analyses by groups revealed differences by race/ethnicity, age, gender, and previous vaccination behavior on promotional strategies that may be effective in increasing future influenza vaccine acceptance. Most of our population (≤63 years of age) pointed to health departments as places to obtain future influenza immunizations. This finding relates to cost considerations among this population for whom vaccinations are offered for free or a significantly reduced cost at these locations for pediatric and adult clients. Men also identified institutional entities such as schools and employers as critical partners in promoting influenza vaccination in their communities. Thus, future policies may focus on facilitating employer- and school-based immunization delivery in these locations. Men also indicated that friends are important sources of influenza vaccine information [61, 62]. This finding suggests the importance of identifying men in communities who can serve as immunization role models and who can effectively mobilize their friends to alter negative social norms around vaccination [61, 62].

Black/African Americans and those who had obtained flu shots in the past five years also cited grocery stores as places to obtain vaccines in the future. With the rise of retail clinics that are often situated within grocery stores and pharmacies in urban community settings, these venues are now viewed as acceptable alternatives to emergency departments and urgent care centers [79, 80]. Indeed, previous studies have shown that retail clinics are effectively delivering immunization services at a reduced cost compared to private offices, clinics, and hospitals. Moreover, many of these locales accept Medicaid thereby ensuring that lower income persons in urban areas are able to obtain flu shots in these convenient places [81, 82].

It is important to highlight the important role faith institutions have as a potential intervention point in future immunization campaigns. Consistent with other studies that have found churches are critical partners in health message dissemination on novel vaccines given their trusted status in the community [83], black/African Americans and those who received flu shots in the past five years also indicated their potential as an ally in driving flu shot campaigns. Finally, the influence of social media is underscored in our findings. Facebook and Twitter are viewed as important sources of health information for those who have previously received flu shots (vaccine “acceptors”) and men.

Overall we found that physician recommendation of vaccination and promotion of immunization by health departments are associated with vaccine acceptance. This is consistent with other studies that have examined the role of providers and clinics to increase vaccine coverage in minority communities [84]. It has been suggested that public health practitioners can do a better job to incorporate social media into health campaigns, especially with involvement of providers and health departments in message delivery [85, 86]. As social media are widely accessible on a number of platforms including smartphones and cellular devices that are carried by community members, diffusion of credible public health information in this culturally-congruent manner holds great promise for reaching this audience [87, 88]. With trusted community physicians as message deliverers using Facebook, Twitter, and other social media such as YouTube, cultural norms related to vaccine refusal could be more effectively addressed in a new “informal learning environment” [88, 89]. An integrated marketing communication campaign strategy for influenza vaccination therefore would greatly benefit from the ironic “social contagion” power of viral messaging [90, 91].

Limitations

This study had several limitations including its serial cross-sectional design. Cross-sectional studies limit the conclusions that can be made regarding temporality, but this is not as important as determining the interplay of perceptions of feelings about vaccine acceptability at the time of the outbreak. Second, our primary outcome was vaccine acceptance, rather than documented receipt of vaccination. It is likely that not everyone who reported vaccine acceptance would actually get vaccinated [20-21, 28-29]. Social desirability bias may also have increased the degree of vaccine acceptance as participants may have indicated that they would accept a vaccine in order to potentially please the interviewer. In the future, computer-assisted questionnaires may be utilized to avoid this phenomenon. In addition, there is potential for systematic and selection bias in the venue-based recruitment. Finally, the sample comprised a small, predominantly minority group of adults in a Southeastern city. Thus, the results may not be generalizable to other populations.

Conclusions

This study is one of the first to examine racial and ethnic minorities' acceptance of both seasonal and H1N1 vaccination. Overall, vaccine acceptance was low in this population. Factors associated with acceptance of both influenza vaccines indicate that immunization attitudes, disagreement with conspiracy beliefs, and past obtainment of flu shots are associated with vaccine acceptance. Future interventions geared towards enhancing seasonal and pandemic influenza vaccinations may benefit from emphasizing the benefits of vaccine protection to self and others, reducing mistrust of health messages from the government, and capitalizing on "culture-centered" communication approaches that include accessible, trusted institutions and social networks in "viral" campaigns.

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Highlights

- We examined H1N1 and seasonal vaccine acceptance among minorities.
- We report low H1N1 and seasonal vaccine acceptance in this population.
- Three key factors are associated with vaccine acceptance.
- Providers have an instrumental role in promoting vaccine acceptance via social media.
- Churches, grocery stores, and health departments are important intervention sites.

Table 1

Participant Characteristics (N=503)

Characteristic	Number	Percentage
Gender (missing=30)		6.0
Male	217	43.1
Female	256	50.9
Age (missing=26)		5.2
18 – 24	111	22.1
25 – 63	354	70.4
64 – 70	12	2.4
Educational Attainment (missing=24)		4.8
K-8 grade	9	1.8
9-11 grade	75	14.9
HS graduate/GED	214	42.5
Tech/Voc/Associate’s degree	105	20.9
Bachelor’s degree	58	11.5
Master’s degree	13	2.6
Doctorate	5	1.0
Racial/Ethnic Background (missing=27)		5.4
Hispanic/Latino/Chicano	31	6.2
Non-Hispanic: African American/Black	399	79.3
Non-Hispanic: Multiracial/Multicultural	28	5.6
Asian/Asian American/Pacific Islander	12	2.4
Native American/American Indian/Alaskan	6	1.2
Employment Status (missing=5)		1.0
Employed (full time)	117	23.3
Employed (part time)	94	18.7
Unemployed	245	48.7
Other	42	8.3
Annual Household Income (missing=16)		3.2
Less than $20k	298	59.2
$20,001-40,000	114	22.7
$40,001-60,000	52	10.3
$60,001-80,000	23	4.6
Language primarily spoken at home		1.6
English	455	90.5
Spanish	26	5.2
Other	14	2.8

Table 2

Descriptive Statistics for Factor Scales, Factor Loadings, Alpha Reliability Estimates, and Subscale Items for Immunization Intention, Atlanta, Georgia, 2009 (n = 503)

Factor	Mean	SD	Min	Max	Factor Loading
Immunization Attitudes (α = 0.92, n=10 items)					
I will take a swine (H1N1) flu vaccine to set an example in my community	2.80	1.29	1	5	0.86
I would get the swine (H1N1) flu vaccine to encourage others to take it	2.72	1.33	1	5	0.86
I will benefit from getting a swine (H1N1) flu vaccine in the next six months	2.63	1.23	1	5	0.76
It is worth the extra time and trouble to get a swine (H1N1) flu vaccine	2.73	1.30	1	5	0.74
I will get a swine (H1N1) flu vaccine to protect the health of my family	2.24	1.25	1	5	0.67
I would pay 10% more than my annual flu shot to get a swine (H1N1) flu vaccine	3.17	1.29	1	5	0.77
My community would really benefit from a swine (H1N1) flu vaccine	2.15	1.15	1	5	0.63
Getting a swine (H1N1) flu vaccine does not seem risky	3.01	1.28	1	5	0.67
If I get a swine (H1N1) flu shot, others will too	2.67	1.19	1	5	0.61
Swine flu is a much greater threat to the world’s populations than anything I have seen in my lifetime	2.92	1.12	1	5	0.59
Disease Salience (α = 0.74, n=5 items)					
Most people in my community do not care about swine (H1N1) flu	2.90	1.15	1	5	0.51
My community is more concerned about depression than influenza	2.90	1.11	1	5	0.65
Substance abuse is a greater concern in my community than any type of influenza	2.48	1.12	1	5	0.75
HIV/AIDS is a greater concern in my community compared to swine (H1N1) flu	2.28	1.18	1	5	0.69
Breast cancer is a greater concern in my community than influenza.	2.70	1.13	1	5	0.64
Community Perceptions of H1N1 (α = 0.77,					

Factor	Mean	SD	Min	Max	Factor Loading
n = 3 items)					
The US government created swine (H1N1) flu	3.13	1.16	1	5	0.85
Swine (H1N1) flu is a government conspiracy	3.19	1.19	1	5	0.84
Swine (H1N1) flu is just like other epidemics affecting my community	2.77	1.14	1	5	0.66
Perceived Health Status (α = 0.71, n=2 items)					
I am as healthy as I can be	2.48	1.15	1	5	0.81
My health will not decline in the next year	2.58	1.10	1	5	0.81
Normative Flu Shot Approval (α = 0.90, n=4 items)					
I think my doctor would approve of my getting a swine flu shot in the next six months	2.22	1.12	1	5	0.63
I think my work colleagues would approve of my getting a swine flu shot in the next six months	2.45	1.10	1	5	0.58
My immediate family would support my decision to get a swine (H1N1) shot in the next six months	2.40	1.15	1	5	0.73
My friends would approve of my decision to get a swine (H1N1) shot in the next 6 months	2.49	1.09	1	5	0.71
Vaccine Attributes (α = 0.76, n=5 items)					
I would want to know what type of testing was done using human subjects before the swine (H1N1) flu vaccine was approved	2.01	1.22	1	5	0.64
I would be less likely to take a flu shot if it had any minor side effects such as fatigue or fever	2.63	1.29	1	5	0.69
I would want to be assured that a flu vaccine was safe (that is, major side effects such as long term illness would not occur)	1.93	1.18	1	5	0.78
I would be less likely to take the swine (H1N1) flu vaccine if it cost me more than $30	2.45	1.36	1	5	0.71
I would be more likely to take the swine (H1N1) flu vaccine if people I know had it first and then recommended it to me	2.39	1.27	1	5	0.63

Table 3

Factors Associated with Influenza Vaccine Acceptability

Influential Factors	Model 1 – Odds Ratio (95% CI)	Model 2 – Odds Ratio (95% CI)
H1N1		
Immunization Attitudes	0.29 (0.18, 0.48)	0.23 (0.16, 0.33)
Community Perceptions of H1N1	1.63 (1.13, 2.35)	2.15 (1.57, 2.95)
Had flu shot in past 5 years	2.67 (1.57, 4.55)	2.50 (1.52, 4.10)
Normative Flu Shot Approval	0.70 (0.46, 1.05)	
Disease Salience	1.62 (1.06, 2.47)	
Education	1.05 (0.81, 1.36)	
Income	0.82 (0.59, 1.14)	
Seasonal		
Immunization Attitudes	0.40 (0.26, 0.64)	0.43 (0.32, 0.59)
Community Perceptions of H1N1	1.64 (1.23, 2.19)	1.53 (1.16, 2.01)
Had flu shot in past 5 years	3.24 (1.92, 5.48)	3.53 (2.16, 5.78)
Normative Flu Shot Approval	1.12 (0.77, 1.65)	
Education	0.80 (0.62, 1.03)	
Health Insurance	0.53 (0.32, 0.90)	

Table 4

Promotional Strategies to Increase Influenza Vaccination by Subgroups (N=503)

Participants	Friends N (%)	Employers N (%)	Providers N (%)	Media N(%)	Schools N (%)	Churches N (%)	Grocery N (%)	Health Dept N (%)	Facebook N (%)	Twitter N (%)
Ethnicity										
Black/African American	115 (84.6)	132 (84.1)	201 (85.5)	192 (81.4)	103 (79.8)	**212 (87.2)**	**174 (89.2)** *	258 (85.2)	120 (85.1)	257 (83.4)
Other	21 (15.4)	25 (15.9)	34 (14.5)	44 (18.6)	26 (20.2)	31 (12.8)	21 (10.8)	45 (14.9)	21 (14.9)	18 (13.1)
Age Group										
18-24	28 (20.4)	29 (18.4)	49 (20.8)	53 (22.2)	30 (22.6)	51 (21.0)	47 (24.2)	61 (20.1)	30 (21.1)	34 (24.5)
25-63	107 (78.1)	126 (79.8)	181 (76.7)	181 (75.7)	102 (76.7)	188 (77.4)	144 (74.2)	237 (78.2) *	110 (77.5)	103 (74.1)
64-70	2 (1.5)	3 (1.9)	6 (2.5)	5 (2.1)	1 (0.8)	4 (1.7)	3 (1.6)	5 (1.7)	2 (1.4)	2 (1.4)
Gender										
Male	74 (54.8) *	83 (53.9) *	103 (44.6)	116 (49.8)	72 (55.0) *	116 (47.7)	95 (48.5)	142 (47.3)	75 (52.8) *	63 (46.0)
Female	61 (45.2)	71 (46.1)	128 (55.4)	117 (50.2)	59 (45.0)	127 (52.3)	101 (51.5)	158 (52.7)	67 (47.2)	74 (54.0)
Influenza Vaccination (Past 5 Years)										
>1	56 (43.1)	80 (53.0)	116 (52.0)	117 (52.2)	65 (51.2)	124 (55.1) *	104 (54.7) *	144 (49.5)	75 (57.3) *	73 (57.0) *
None	74 (56.9)	71 (47.0)	107 (48.0)	107 (47.8)	62 (48.8)	101 (44.9)	86 (45.3)	147 (50.5)	56 (42.8)	55 (43.0)

* Significant difference between groups at α=.05