# Acceptance of Pandemic 2009 Influenza A (H1N1) Vaccine in a Minority Population: Determinants and Potential Points of Intervention

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**KEY WORDS**
H1N1 vaccine, vaccine refusal, immunization coverage, minorities

**ABBREVIATIONS**
H1N1—2009 influenza A
OR—odds ratio
CI—confidence interval

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## abstract

**OBJECTIVE:** We sought to understand pandemic 2009 influenza A (H1N1) vaccine acceptance in a minority community including correlates of vaccine hesitancy and refusal. We identified intervention points to increase H1N1 vaccine coverage.

**PATIENTS AND METHODS:** Minority parents and caregivers of children ≤18 years participated in a cross-sectional survey. Statistical analyses included bivariate correlations, exploratory factor analyses, internal-consistency assessment, and logistic regressions.

**RESULTS:** The sample ($N = 223$) included mostly lower-income (71% [$n = 159$]) and black (66% [$n = 147$]) participants. Potential and actual receipt of pediatric H1N1 vaccination was low (36% [n = 80]). Pediatric H1N1 vaccine acceptance was associated with lack of insurance (odds ratio [OR]: 3.04 [95% confidence interval (CI): 1.26–7.37]), perceived H1NI pediatric susceptibility (OR: 1.66 [95% CI: 1.41–1.95]), child vaccination prioritization in family (OR: 3.34 [95% CI: 1.33–8.38]), believing that H1N1 is a greater community concern than other diseases (OR: 1.77 [95% CI: 1.01–3.09]), believing that other methods of containment (eg, hand-washing, masks) are not as effective as the H1N1 vaccine (OR: 1.73 [95% CI: 1.06–2.83]), and a desire to promote influenza vaccination in the community (OR: 2.35 [95% CI: 1.53–3.61]).

**CONCLUSIONS:** We found low acceptance of the H1N1 vaccine in our study population. Perceived influenza susceptibility, concern about H1N1 disease, and confidence in vaccinations as preventive methods were associated with vaccine acceptance. Physician support for HIN1 vaccination will aid in increasing immunization coverage for this population, and health departments are perceived as ideal community locations for vaccine administration. *Pediatrics* 2011;127:S113–S119

Children aged 6 months through 18 years and caregivers of children younger than 6 months were among the high-priority groups for the pandemic 2009 influenza A (H1N1) vaccine in the United States.[1] Federal and state governments invested in procuring and distributing the H1N1 pandemic vaccine and, after initial shortages, the vaccine supply increased. It is often assumed that a publicly funded mass-immunization program would have a lower risk of ethnic and racial disparities; however, acceptance of a pandemic vaccine cannot be taken for granted and needs to be evaluated in a variety of populations. Heterogeneity in vaccine coverage can increase the risk of infectious diseases even when high overall coverage levels are obtained.[2,3]

Non–peer-reviewed polls reported in the media have suggested that a substantial proportion of parents do not intend to vaccinate themselves and/or their children against the H1N1 pandemic virus.[4,5] However, there are few published data in the peer-reviewed literature regarding the determinants of pandemic H1N1 vaccine acceptance, particularly among minority families.

With this study we aimed to elucidate attitudes toward H1N1 vaccine acceptance among black and Hispanic parents of infants and children (aged 0–18 years) in Atlanta, Georgia, to understand correlates of vaccine hesitancy and refusal and to identify intervention points to increase vaccine coverage for H1N1 vaccination in community settings.

## PATIENTS AND METHODS

### Study Design and Sample

From September through November 2009, a venue-based sampling strategy was used for recruitment during randomly selected blocks of time. This method has proven successful in obtaining representative populations in cross-sectional survey samples.[6] Our target populations included English- and Spanish-speaking parents and caregivers of children younger than 18 years. Project assistants performed recruitment and data collection on the basis of a master schedule of monthly activities. Study settings were located throughout metropolitan Atlanta. The sampling frame included 25 locations including churches, bookstores, educational forums, community meetings, and special events such as family health fairs that revealed the potential to recruit an adequate number of participants.

Persons were eligible for this study if they were 18 years of age or older and could read and speak English or Spanish. Three hundred seventeen people were invited to participate, and 223 provided written informed consent (response rate: 70%). A $10 gift card or health-promotion incentive was offered for participation. The Emory University institutional review board approved the study.

### Measurement

#### *Assessment of Intent*

Intent to accept an H1N1 vaccine was assessed by a single item in the survey: "On a scale of 0 (definitely not) to 10 (definitely so), please rank the likelihood of your child(ren) getting a swine (H1N1) flu vaccine in the next 90 days?" Similarly, seasonal influenza immunization intention was measured by 1 item: "On a scale of 0 (definitely not) to 10 (definitely so), please rank the likelihood of your child(ren) getting seasonal flu vaccine in the next 90 days?" Response alternatives were provided on a continuous scale that ranged from definitely not (0) to definitely so (10). Because our primary aim was to assess vaccine acceptance, we subsequently dichotomized these variables via median split procedure to compare persons who answered "definitely willing" or "willing" to the remainder of the sample.

#### *Assessment of Demographic and Behavioral Correlates*

Initial questions assessed basic demographic measures (ie, age, gender, race/ethnicity, education, employment status). In addition, key behavioral assessments were completed. For example, using a 12-month recall period, we asked about children's recent treatment for illness or health condition by a health care provider (0 to ≥10 times in the previous year). Questions also assessed indicators of children's influenza vaccination history and their recent seasonal and H1N1 influenza-related illness experiences. We inquired if children received seasonal vaccination within the previous 90 days. An item assessed the importance of children receiving H1N1 vaccination compared with seasonal influenza. We also included an open-ended qualitative question for parents to specify motivations to obtain the H1N1 vaccine. Finally, we examined participants' willingness to pay for their children's H1N1 vaccination by using a 5-point scale (ie, $0 [free] to $30 or more) (Fig 1).

#### *Assessment of Psychosocial Correlates*

In addition to the selected demographic and behavioral correlates, the questionnaire included items designed to measure psychosocial indicators of pediatric H1N1 and seasonal immunization intent. Variables included immunization attitudes, perceived susceptibility, and severity of H1N1-related illness, peer influences, community perceptions, and cost/benefit measures. For example, 2 items served as a proxy of perceived susceptibility to H1N1: (1) "How serious do you think it would be if your child(ren) got swine (H1N1) flu?" and (2) "Who would be first priority in your family to re-

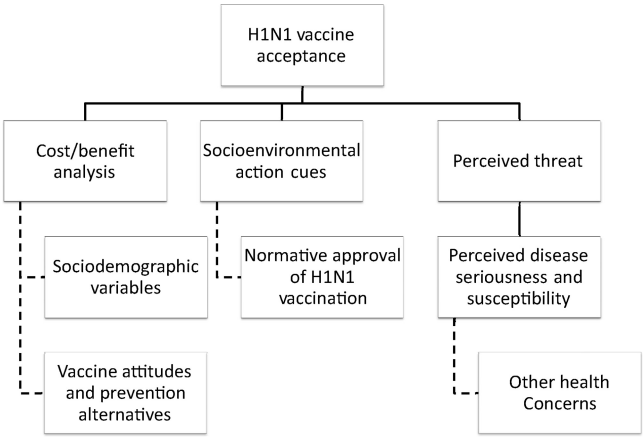


**FIGURE 1**
Conceptual model of H1N1 vaccine acceptance.

ceive swine (H1N1) flu vaccine?" New scale items were developed on the basis of previous quantitative and qualitative research findings, literature review, and vaccine clinical trial and community experience.[7–10] In addition, psychosocial items were developed for most of the domains on the basis of recommendations by behavioral theory progenitors.[11,12] A team of clinicians and behavioral researchers reviewed the instrument for adequacy of the measures.

In the following sections we briefly describe 4 scale measures developed specifically to assess H1N1 issues. A 5-point Likert scale (1 [strongly agree] to 5 [strongly disagree]) was used to assign meaningful values to an underlying continuum of ratings.[13]

*Vaccine Alternatives*

Five items measured the beliefs that nonvaccine prevention methods such as hand-washing and wearing face masks are more effective at preventing the spread of influenza than the vaccine. We first assessed whether participants thought the threat of H1N1 had been overstated. Another item measured the extent to which participants thought that swine flu was not a concern anymore. Three additional measures assessed the perceived effectiveness of hand-washing, wearing face masks, and using quarantine methods in preventing the spread of swine flu in comparison to H1N1 vaccination as a strategy.

*Other Health Concerns*

Five items assessed other health concerns that are perceived as a greater threat to the community than influenza. We asked participants the extent to which other health problems such as substance abuse, heart disease, breast cancer, HIV/AIDS, and depression were greater health concerns in their community compared with influenza.

*Attitudes Toward H1N1 Vaccination*

Three items comprised this scale. Two items measured the perceived benefit of the novel H1N1 vaccine for community and self. Another item assessed the benefit of taking the vaccine to set an example for others in the community.

*Normative Approval of H1N1 Vaccination*

Given the extent of evidence that suggests the importance of normative approval in vaccine decision-making,[8,10,14] we developed 4 items that specifically assessed the perceived approval of doctors, work colleagues, immediate family, and friends in deciding to get the H1N1 vaccination within 6 months.

### Statistical Analysis

SPSS 17.0 (SPSS Inc, Chicago, IL) and SAS 9.2 (SAS Institute, Inc, Cary, NC) were used for analyses. 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 that a Cronbach's $\alpha$ reliability estimate of $\geq$0.70 would support reliability of each subscale.[15] Multivariate logistic regression models were used to analyze the independent contributions of variables. Significant independent predictors of outcomes were assessed at $P < .05$ levels. In addition, we assessed multicollinearity by using a macro developed by the Centers for Disease Control and Prevention. The resulting condition indices fell below the $\geq$30 threshold, and the corresponding variance-decomposition proportions were $<$0.5, which indicates no potential for multicollinearity in the models tested.

## RESULTS

### Subjects

A majority of the 223 parents surveyed were black (66% [$n = 147$]) and lived in lower-income households with earnings of $40 000 or less per year (71% [$n = 159$]). Thirty-seven percent ($n = 83$) were unemployed, and 60% ($n = 133$) had achieved a high school or equivalent education. Most respondents (88% [$n = 196$]) were English-speaking; 8% ($n = 17$) used Spanish as their primary language. A small minority (4% [$n = 6$]) reported another primary household language. Fifty-two percent of the participants were female ($n = 115$), 42% were male ($n = 94$), and 2% were transgendered ($n =$

**TABLE 1** Selected Study-Participant Characteristics

| Characteristic | *n* (%) (*N* = 223) |
|---|---|
| Gender (missing = 9) | |
| Male | 94 (42.2) |
| Female | 115 (51.6) |
| Transgendered | 5 (2.2) |
| Highest level of school (missing = 10) | |
| Kindergarten through 8th grade | 3 (1.3) |
| 9th–11th grade | 32 (14.3) |
| High school graduate/GED | 98 (43.9) |
| Technical/vocational/associate's degree | 40 (17.9) |
| Bachelor's degree | 27 (12.1) |
| Master's degree | 9 (4.0) |
| Doctorate degree | 4 (1.8) |
| Race (missing = 16) | |
| White | 39 (17.5) |
| Nonwhite | 168 (73.5) |
| Ethnic background (missing = 13) | |
| Asian/Asian American/Pacific Islander | 4 (1.8) |
| Hispanic/Latino/Chicano | 16 (7.2) |
| African American/black | 147 (69.5) |
| Caucasian/white | 28 (12.6) |
| Native American/American Indian/Alaskan Native | 4 (1.8) |
| Multiracial/multicultural | 11 (4.9) |
| Employment status (missing = 4) | |
| Employed full-time | 59 (26.5) |
| Employed part-time | 59 (26.5) |
| Unemployed | 83 (37.2) |
| Other | 18 (8.1) |
| Annual household income (missing = 8) | |
| Less than $20 000 | 111 (49.8) |
| $20 000–$40 000 | 48 (21.5) |
| $40 001–$60 000 | 26 (11.7) |
| $60 001–$80 000 | 12 (5.4) |
| $80 001–$100 000 | 7 (3.1) |
| More than $100 000 | 11 (4.9) |
| Language primarily spoken at home (missing = 4) | |
| English | 196 (87.9) |
| Spanish | 17 (7.6) |
| Other | 6 (2.7) |

GED indicates general equivalency degree.

5) (4% [*n* = 9] did not record gender) (Table 1).

## Internal Consistencies

The internal consistencies achieved on the 4 scales achieved excellent reliability. "Normative approval on influenza vaccination" resulted in the highest $\alpha$ score of 0.906, which was followed by "attitudes toward H1N1 vaccine" ($\alpha$ = 0.778), "other health concerns" ($\alpha$ = 0.770), and the "vaccine alternatives" scale ($\alpha$ = 0.751).

## Vaccine Acceptability

Twenty-two percent (*n* = 50) of the parents had had their children vaccinated for seasonal influenza in the previous 3 months. The overall seasonal influenza vaccine-acceptance rate for children was 40.8% (*n* = 91). In multivariate analysis, acceptance of pediatric seasonal influenza vaccination was associated with parents who were younger than the median age (≤36 years of age) (odds ratio [OR]: 1.06 [95% confidence interval (CI): 1.02–1.11]), attributed importance of seasonal influenza vaccine compared with other childhood vaccinations such as those against measles-mumps-rubella or polio (OR: 1.22 [95% CI: 1.05–1.41]), perceived child susceptibility to influenza as higher (OR: 1.56 [95% CI: 1.31–1.87]), and had confidence in the effectiveness of the influenza vaccine (OR: 1.02 [95% CI: 1.00–1.04]).

Factors that were not significant predictors of seasonal influenza vaccination included importance of the H1N1 vaccine compared with the seasonal influenza vaccine (OR: 1.01 [95% CI: 0.87–1.16]), normative approval of the vaccine (OR: 0.817 [95% CI: 0.495–1.35]), likelihood of H1N1 pediatric immunization (OR: 1.16 [95% CI: 1.00–1.37]), and perceived risks of the vaccine (OR: 2.02 [95% CI: 0.49–8.18]). Although the results of bivariate analysis indicated that parents with concerns about influenza vaccination safety were less likely to accept seasonal vaccination for their children ($r$ = 0.444, $P$ < .001), these concerns were not significant in the overall model (OR: 1.14 [95% CI: 0.765–1.69]).

**TABLE 2** Factors Associated With Likelihood of Pediatric H1N1 Influenza Immunization

| Correlate | OR (95% CI) | *P* |
|---|---|---|
| Perceived child susceptibility to influenza | 1.66 (1.41–1.95) | <.001 |
| Lack of insurance | 3.04 (1.26–7.37) | .0137 |
| Prioritizing children over other family members for vaccine | 3.34 (1.33–8.38) | .0101 |
| Belief that H1N1 is a greater community concern than other diseases | 1.77 (1.01–3.09) | .0456 |
| Belief that other methods of containment are as effective as vaccine | 1.73 (1.06–2.83) | .0283 |
| Wants to promote influenza vaccination in community | 2.353 (1.530–3.610) | <.001 |

The overall acceptance rate of obtaining H1N1 vaccine within 90 days for children was low (35.9% [*n* = 80]). In multivariate analysis, significant factors that predicted H1N1 vaccine acceptance for children included lack of insurance (OR: 3.04 [95% CI: 1.26–7.37]), higher perceived child susceptibility to H1N1 (OR: 1.66 [95% CI: 1.41–1.95]), prioritizing children over other family members for vaccination (OR: 3.34 [95% CI: 1.33–8.38]), and having the belief that H1N1 is a greater community concern than other diseases (OR: 1.77 [95% CI: 1.01–3.09]) (Table 2). In addition, other factors that contributed to vaccination acceptance included lack of confidence in the effectiveness of other methods of containment (eg, hand-washing, wearing masks, or using quarantine approaches) over the H1N1 vaccine (OR: 1.73 [95% CI: 1.06–2.83]) and having a desire to promote influenza vaccination in the community (OR: 2.353 [95% CI: 1.53–3.61]). Parents who were more likely to vaccinate their children against H1N1 believed that their communities would listen to a doctor's immunization advice (OR: 1.35 [95% CI: 1.01–1.79]) and agreed that members of their communities were influenced by their friends' views on vaccination (OR: 1.38 [95% CI: 1.01–1.88]).

Demographics such as race, income level, and education did not correlate with vaccine acceptance. Factors that

were not significant predictors of H1N1 influenza vaccine acceptance included frequency of annual pediatric seasonal influenza immunizations in the preceding 5-year period (OR: 0.894 [95% CI: 0.628–1.272]), perceived level of protectiveness (OR: 1.01 [95% CI: 0.995–1.03]), history of H1N1 in the family in the previous year (OR: 0.694 [95% CI: 0.277–1.735]), concern that the vaccine would give them H1N1 influenza (OR: 1.37 [95% CI: 0.964–1.94]), vaccine attitudes (OR: 0.702 [95% CI: 0.353–1.40]), and perceived normative approval of H1N1 immunization (OR: 0.833 [95% CI: 0.474–1.46]).

In bivariate analysis, perceived lack of vaccine safety was negatively associated with pediatric immunization acceptance ($r = -0.17$, $P = .016$). However, similar to the seasonal influenza findings, safety concerns were not significant in the overall H1N1-acceptance model. In qualitative analysis, parents who prioritized their children for H1N1 vaccination over others explained their motivations for H1N1 pediatric immunization. Statements such as "I love my child" and "My children come first" represented 43% of the responses. Parents were also concerned about the greater risk of exposure for this group as indicated by comments such as "Children are school age—lots of exposure" and "Children are at greater risk" (27%). Parents highlighted the perceived susceptibility of children to H1N1 disease as well. Some offered that children have "weaker immune systems" and are "vulnerable, [do] not [have] the same immunity." One stated, "they are young, [they] can't fight illness" (16%). It is notable that none of the respondents mentioned vaccine safety as a motivator for getting the vaccine.

Prioritizing H1N1 vaccination over seasonal influenza immunization was not significantly associated with the influence of media ($r = 0.112$, $P = .15$), schools ($r = -0.065$, $P = .40$), or friends ($r = 0.077$, $P = .32$). It was associated with parents agreeing that their communities would listen to a doctor's advice about taking influenza shots ($r = 0.205$, $P = .007$). Answers to the questions about community locations for potential H1N1 vaccine administration indicated that health departments were more appealing ($r = 0.205$, $P = .008$) compared with other community-based venues such as churches ($r = 0.139$, $P = .07$), grocery stores ($r = 0.049$, $P = .53$), and malls ($r = 0.05$, $P = .53$).

## DISCUSSION

Our results indicate low pediatric influenza vaccination-acceptance rates for both seasonal (40.8%) and H1N1 (35.9%) influenza among this group of minority adults. This finding is consistent with that of other studies that found that minority populations may be less likely to accept immunizations in general.[16–18] Moreover, previous studies have found that black and Spanish-speaking Hispanic patients are less likely than non-Hispanic white patients to receive influenza vaccination.[19] This phenomenon may result from negative vaccine attitudes in the community and poor experiences with health care providers along with general concerns about vaccination.[17,18]

Although income did not correspond with vaccine acceptance, parents without health insurance indicated that they were more likely to vaccinate their children against H1N1 than parents with health insurance. The respondents in our sample may be concerned about the extra costs associated with caring for a sick child with H1N1-related illness, whereas parents with insurance may be less concerned about the treatment costs.[20]

Vaccine coverage and on-time adherence to routine scheduled immunization are linked to insurance status.[21,22] A recent study found that children with private insurance were more likely to be up-to-date with immunizations compared with those with public insurance or no insurance.[22] With an estimated 1 of 8 children lacking insurance, H1N1 immunization coverage, similar to other types of pediatric vaccination rates, may remain suboptimal without reduction of the financial burden on lower-income families. Addressing this issue will also likely reduce other racial and ethnic disparities tied to household income status of at or near poverty.[21,23]

Vaccine safety was not seen as a major contributor to H1N1 vaccine acceptance for this population. This result stands unique in comparison to other studies that examined barriers to pediatric vaccination decision-making.[24] Those who believed that their children were susceptible to influenza and prioritized their H1N1 immunization over other family members were more accepting of H1N1 vaccination. In addition, the respondents did not comment on any safety issues in the qualitative portion of the survey. Instead, they explained that their motivation for getting the vaccine was prioritization of child(ren) in the household for vaccine receipt, children's greater perceived risk of exposure to H1N1, and children's susceptibility and vulnerability to H1N1. Given the emergent nature of H1N1 and the well-publicized morbidity and mortality rates among children and younger persons, the advent of a preventive H1N1 vaccine may have marked a substantial turning point in parental concern attributed to vaccine safety during a pandemic, which is also evidenced by acceptors' perception that H1N1 is a greater concern than other diseases in the community. In this context, safety concerns may be trumped by other psychosocial factors that exert greater influence on taking "protective risks" in view of disease susceptibility and severity.

Thus, more comprehensive education of minority parents with regard to childhood risk of influenza morbidity and mortality may provide an intervention option. Similarly, parents who had more confidence in other prevention methods such as hand-washing were less likely to intend to vaccine their children against H1N1. Those who create prevention messages should be careful not to overemphasize the effectiveness of hand-washing at the expense of vaccinations.

Our study highlights the importance of health care providers' advice and influences of other persons in social networks toward H1N1 decision-making. Those who were willing to vaccinate their children were also motivated to counter any peer resistance by serving as H1N1 promoters in the community. Recognition of these network- and community-level influences among racial and ethnic populations has important epidemiologic implications for immunization uptake.[25] For example, other investigations have revealed that black children living in urban and suburban areas were routinely vaccinated less often than white and Hispanic children living in similar areas.[23] Although sociodemographic factors may partially explain this phenomenon, psychosocial considerations must also be addressed.[23]

Among the black population, negative vaccination attitudes shared by community members may stem from a collective lack of information, misconceptions about immunizations, and a history of unsatisfying health system encounters.[17,18], [26] Therefore, as other studies have demonstrated, our respondents similarly showed that physicians have a central community leadership role in educating parents about the importance of H1N1 vaccination to mitigate any circulating misinformation in communities that leads to negative immunization intent and H1N1 coverage disparities.[10] Moreover, our study results show parental confidence in the health departments to provide H1N1 vaccination compared with other community-based venues. It is important that these entities work closely with state and federal supply chains to ensure that sufficient numbers of doses are procured in a timely manner to maintain community confidence and sustain intention to access vaccination services once the product is available.

## LIMITATIONS

Our findings are limited by several factors including the inherent limitations of a cross-sectional study design that does not allow for causal conclusions to be drawn. The study was concerned with relational modeling of various theoretical constructs and thereby only allowed for covariant evaluation. In this study, intentions were evaluated. A body of research has demonstrated that intentions are moderately good predictors of future behavior.[11,27] However, it would be highly beneficial to the field to examine the role of intentions in behavior through longitudinal analysis of vaccine uptake, which would offer additional insight on the factors that are truly motivating to pediatric H1N1 immunization. The use of a small sample that consisted of primarily lower-income black parents within specific venues may also not be representative of the broader Atlanta population.

It should also be noted that participation bias in a study of H1N1 vaccines and health behaviors is particularly likely (ie, it is conceivable that people who have strong negative beliefs and attitudes about vaccines may be the least inclined to complete the study questionnaire). Thus, although the study achieved a response rate of ~70%, participation bias may have affected our findings. Nonparticipation of low-literacy or non–English-speaking black and Hispanic populations may have also biased the results. As with any self-administered questionnaire, self-reported data may not be entirely accurate and, therefore, should be viewed with caution. However, it is not anticipated that any of these limitations resulted in large or systematic errors in data collection.

## CONCLUSIONS

This study is one of the first of its kind to examine racial and ethnic minorities' acceptance of the H1N1 vaccine for pediatric administration. The low level of vaccine acceptance highlights the importance of accounting for individual- and community-level concerns to understand the factors that influence parental decision-making on children's vaccination.

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