Psychosocial correlates of intention to receive an influenza vaccination among rural adolescents

Julia E. Painter1*, Jessica M. Sales1, Karen Pazol2, Gina M. Wingood1, Michael Windle1, Walter A. Orenstein3 and Ralph J. DiClemente1

1Department of Behavioral Sciences and Health Education Emory University, Rollins School of Public Health, 1518 Clifton Road NE, Room 557, Atlanta, GA 30322, USA, 2School of Medicine, Emory University, Atlanta, GA 30322, USA and 3Bill and Melinda Gates Foundation, Seattle, WA 98102, USA

*Correspondence to: J. E. Painter. E-mail: jellenb@emory.edu

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Abstract

The Centers for Disease Control and Prevention’s Advisory Committee on Immunization Practices recently expanded annual influenza vaccination recommendations to include all children 6 months through 18 years of age. Adolescent attitudes toward influenza vaccination may play a key role in reaching this newly added age group. This study examined the association between attitudes toward influenza vaccination and intention to be vaccinated among rural adolescents. Data were collected from baseline surveys distributed to adolescents in September/October 2008, prior to the H1N1 influenza pandemic, in two counties participating in a school-based influenza vaccination intervention trial in rural Georgia (N = 337). Survey items were based on constructs from the Health Belief Model and the Integrated Behavioral Model. Approximately one-third of participants (33.8%) intended to receive an influenza vaccination, 33.5% did not intend to be vaccinated and 28.8% were unsure. Controlling for background factors, intention to receive an influenza vaccination was associated with low perceived barriers [odds ratio (OR) = 0.77, P < 0.001], injunctive norms (OR = 1.23, P = 0.002) and receipt of influenza vaccination in the past year (OR = 6.21, P < 0.001). Findings suggest that perceived barriers and injunctive social norms may influence vaccination acceptance among rural adolescents. Future influenza vaccination efforts geared toward rural middle and high school students may benefit from addressing adolescent attitudes toward influenza vaccination.

Introduction

Influenza consistently ranks among the top 10 leading causes of death in the United States, with influenza-related illnesses and deaths occurring most frequently among elderly persons >65 years, people with medical complications and infants under 2 years [1–4]. However, rates of influenza are highest among school-age children, who serve as the primary transmitters of influenza to persons at high risk for complications [5–12]. Influenza vaccination is the most effective method for preventing influenza infection, and vaccination of school-age children may indirectly protect populations vulnerable to influenza infection [12, 13]. In February 2008, the Centers for Disease Control and Prevention’s Advisory Committee on Immunization Practices (ACIP) recommended that all children aged 6 months through 18 years receive an annual influenza vaccination, expanding the previous recommendation for children aged 6 months to 4 years and older children with
conditions that place them at increased risk for complications from influenza [14].

Nearly all US children attend school on a daily basis, with attendance rates ranging from 92.0 to 98.2% among students aged 10–18 years [15]. Consequently, school-based vaccination programs may provide an effective strategy to immunize large numbers of school-age children and adolescents against influenza compared with other methods, such as individually scheduled physician visits [16–18]. School-based vaccination may be an especially important strategy among rural, low-income and minority populations. Rural areas have historically experienced higher poverty than urban or metro areas [19], and lower influenza vaccination rates have been associated with living in a deprived area and minority status [19–24]. African-Americans, in particular, consistently have lower influenza vaccination rates than other racial/ethnic groups [20–23,25–29]. Although such disparities in influenza vaccination are clearly present in the elderly, it is unclear whether similar gaps persist among school-age children. There is evidence, however, clearly documenting disparities in other vaccinations among children. In 1999, The National Vaccine Advisory Committee identified poverty and its associated factors as the most ‘powerful and persistent’ barriers to immunization among children [30]. Further research has documented persistently low vaccination coverage among children living in poverty and that children living near poverty have coverage levels similar to children living below poverty [31]. Despite a decline in rural childhood poverty during the 1990s, the rural child poverty rate remains higher than the urban rate (19 versus 15%) [19]. Furthermore, in non-metro areas, African-American and Hispanic children are almost twice as likely to be poor as white children [19]. The sharp inequalities in vaccination coverage among rural, low-income and minority populations underscore the potential benefits of school-based influenza vaccination interventions.

School-based programs may provide an excellent opportunity to vaccinate students who may not otherwise be immunized, although such programs may face challenges in reaching adolescents. While younger children primarily depend on family members and schools for health decisions, adolescents are more likely to establish their own health-related attitudes and behaviors independently [32]. Parental provision of informed consent may be a necessary but insufficient step in ensuring that adolescents are vaccinated against influenza. Without direct parental supervision, the adolescent may opt out of vaccination in school-based programs as a result of their own attitudes toward vaccination. Thus, adolescent attitudes toward influenza vaccination may play a key role in immunization outcomes.

There is some debate in the field as to which, if any, theory is most appropriate for designing, implementing and evaluating studies regarding vaccination behaviors. Due to the Health Belief Model (HBM)’s original inception as an explanation for the failure of participation in tuberculosis screenings, it is still considered to be appropriate for use with medical service-related behaviors, such as vaccinations, where illness avoidance and perceived threat are the most salient issues [33, 34]. However, additional research indicates that alternative theories, such as the Theory of Reasoned Action (TRA), which focuses on predictors of behavioral intention [35], and the Triandis Model [36], may be most appropriate for understanding influenza vaccination behavior [36]. Based on evidence supporting the utility of multiple theories, our study incorporated constructs from two prominent behavior change theories: the HBM [37] and the Integrated Behavioral Model (IBM) [35], which incorporates constructs from both the TRA and the Triandis Model.

To date, research has shown that (i) influenza is a pressing health concern in the United States [1–4]; (ii) vaccinating school-age children against influenza may reduce the burden of influenza among children and high-risk populations [12, 13]; (iii) influenza vaccination may be especially important for low-income, rural and minority populations [19–24]; (iv) schools may be an effective location for vaccine delivery to children [16–18] and (v) attitudes and beliefs toward influenza vaccination, particularly attitudes emphasized by the HBM [37] and IBM [35], may
influence vaccination behavior among adult populations [36].

However, there is a gap in the empirical literature with respect to adolescent attitudes toward influenza vaccination and the role that attitudes play in predicting vaccination behavior. This study sought to examine theory-based attitudes and beliefs toward influenza vaccination among a sample of low-income rural adolescents to identify psychosocial factors associated with intention to receive an influenza vaccination.

**Methods**

**Study sample**

Study participants were drawn from schools participating in a non-randomized controlled trial of a school-based influenza vaccination intervention in the East Central Health District of Augusta, GA, USA, including a multicomponent school-based influenza vaccination intervention condition (County 1) and a standard-of-care condition (County 2). Data for the present study were derived from a baseline survey, completed prior to intervention implementation, among students in both County 1 and County 2. The baseline survey was completed by participants in September and October of 2008, prior to the H1N1 influenza (swine flu) pandemic. Participating counties were selected because they are relatively small (one middle and high school per county), rural, and have substantial minority populations. Eligibility criteria included (i) being enrolled in middle or high school in a participating county, (ii) providing written assent to participate in the study and (iii) providing parental written informed consent for the adolescent to participate in the study. This study was approved by the institutional review board at Emory University.

**Data collection and survey instrument**

Data were collected via self-administered paper-and-pencil surveys distributed to adolescents attending middle and high school in participating counties prior to implementing the intervention. Packets containing (i) a brief overview of the study, (ii) a parental informed consent form, (iii) a student assent form and (iv) an adolescent survey were mailed home to all enrolled students. Students were given 3 weeks to return the signed forms and completed surveys to their homeroom teachers. Ten-dollar Wal-mart gift cards were provided as incentives to students who returned all signed forms and completed surveys. At each school site, an extra gift card was offered as an incentive for all students in the homeroom that achieved the largest response rate. The survey instrument was designed to investigate demographic, behavioral and psychosocial factors associated with influenza vaccination. Based on previous research and recent theoretical development [35, 36, 38], psychosocial survey items were guided by the HBM [33, 37] and the IBM [35], which is based on the TRA [39]. Because no previous questionnaires have been developed to assess adolescent attitudes toward influenza vaccination, questions were adapted from surveys with demonstrated reliability and validity among parents, including surveys by Daley et al. [38] and Poehling et al. [40–42].

**Measures**

**Main outcome measure**

The main outcome measure, intention to receive an influenza vaccination, was measured by asking ‘Do you plan to get the flu vaccine next fall or winter?’ This was a dichotomous variable (yes/no).

**Background factors**

Participants were asked to report gender (dichotomous), race (categorical), age (continuous), middle or high school (dichotomous) and vaccination history regarding receipt of an influenza vaccination in the past year (dichotomous).

**Attitudes and beliefs toward influenza and influenza vaccination**

The items comprising each psychosocial measure are detailed in Table I. All psychosocial constructs were measured by questions based on five-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree). The range for each construct
represents the addition of the responses to each item within that measure. For example, ‘perceived barriers’ included five questions, meaning responses could range from 5 (an answer of 1 to each question), to 25 (an answer of 5 to each question).

Psychosocial measures guided by the HBM included (i) perceived severity of influenza (two-item

Table 1. HBM- and IBM-based psychosocial factors and intention to receive an influenza vaccination next year (N = 324)

<table>
<thead>
<tr>
<th>Psychosocial variables</th>
<th>Range</th>
<th>Mean scores among respondents by intention to receive an influenza vaccination next year</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes (n = 114), mean (SD)</td>
<td>No/don’t know (n = 210), mean (SD)</td>
</tr>
<tr>
<td>Perceived severity of influenza (HBM)</td>
<td>2–10</td>
<td>7.85 (1.73)</td>
<td>7.45 (1.98)</td>
</tr>
<tr>
<td>The flu is a serious disease</td>
<td></td>
<td>4.13 (0.91)</td>
<td>3.94 (1.07)</td>
</tr>
<tr>
<td>The flu is a serious disease for teenagers</td>
<td></td>
<td>3.73 (0.98)</td>
<td>3.51 (1.08)</td>
</tr>
<tr>
<td>Perceived susceptibility to influenza (HBM)</td>
<td>1–5</td>
<td>2.43 (1.12)</td>
<td>2.85 (1.13)</td>
</tr>
<tr>
<td>I am not very likely to get the flu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived benefits to influenza vaccination (HBM)</td>
<td>5–20</td>
<td>14.18 (3.4)</td>
<td>12.58 (3.74)</td>
</tr>
<tr>
<td>The flu vaccine will prevent me from getting sick with the flu</td>
<td></td>
<td>3.61 (1.00)</td>
<td>3.13 (1.06)</td>
</tr>
<tr>
<td>If I get the flu vaccine, it will help protect my friends and family from getting the flu</td>
<td></td>
<td>3.24 (1.16)</td>
<td>2.89 (1.15)</td>
</tr>
<tr>
<td>The flu vaccine will prevent me from missing school because of the flu</td>
<td></td>
<td>3.68 (1.04)</td>
<td>3.26 (1.18)</td>
</tr>
<tr>
<td>If I get the flu vaccine, it will prevent my parent/guardian from missing work to take care of me</td>
<td></td>
<td>3.67 (1.08)</td>
<td>3.31 (1.22)</td>
</tr>
<tr>
<td>Perceived barriers to influenza vaccination (HBM)</td>
<td>5–25</td>
<td>12.93 (2.92)</td>
<td>15.01 (3.17)</td>
</tr>
<tr>
<td>The flu vaccine will make me sick</td>
<td></td>
<td>2.54 (1.07)</td>
<td>3.02 (1.13)</td>
</tr>
<tr>
<td>The flu vaccine does not prevent the flu</td>
<td></td>
<td>2.57 (0.96)</td>
<td>3.05 (1.04)</td>
</tr>
<tr>
<td>Getting a flu vaccine costs too much money</td>
<td></td>
<td>2.18 (0.92)</td>
<td>2.67 (0.95)</td>
</tr>
<tr>
<td>Getting the flu vaccine is painful or uncomfortable</td>
<td></td>
<td>2.63 (1.11)</td>
<td>3.09 (1.04)</td>
</tr>
<tr>
<td>I would feel sore the day after a flu vaccine</td>
<td></td>
<td>3.06 (1.14)</td>
<td>3.23 (0.97)</td>
</tr>
<tr>
<td>Self-efficacy for influenza vaccination (HBM)</td>
<td>2–10</td>
<td>7.61 (1.75)</td>
<td>6.43 (1.99)</td>
</tr>
<tr>
<td>I feel comfortable getting the flu vaccine</td>
<td></td>
<td>3.69 (1.14)</td>
<td>2.93 (1.21)</td>
</tr>
<tr>
<td>I would feel comfortable asking my parent/guardian to take me to get a flu vaccine</td>
<td></td>
<td>3.89 (1.01)</td>
<td>3.51 (1.14)</td>
</tr>
<tr>
<td>Perceived behavioral control (IBM)</td>
<td>1–5</td>
<td>3.03 (1.24)</td>
<td>3.15 (1.25)</td>
</tr>
<tr>
<td>I have control over whether or not I get a flu vaccine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social norms for influenza vaccination (injunctive) (IBM)</td>
<td>4–20</td>
<td>15.69 (3.19)</td>
<td>11.99 (3.75)</td>
</tr>
<tr>
<td>Most people important to me think I should get a flu vaccine</td>
<td></td>
<td>3.99 (0.97)</td>
<td>3.01 (1.12)</td>
</tr>
<tr>
<td>My doctor thinks I should get a flu vaccine</td>
<td></td>
<td>4.15 (0.94)</td>
<td>3.26 (1.10)</td>
</tr>
<tr>
<td>My parent/guardian thinks I should get a flu vaccine</td>
<td></td>
<td>4.12 (0.91)</td>
<td>2.98 (1.17)</td>
</tr>
<tr>
<td>My friends think I should get a flu vaccine</td>
<td></td>
<td>3.41 (0.99)</td>
<td>2.70 (1.04)</td>
</tr>
<tr>
<td>Social norms for influenza vaccination (descriptive) (IBM)</td>
<td>2–10</td>
<td>7.07 (1.72)</td>
<td>5.86 (1.90)</td>
</tr>
<tr>
<td>Most of my friends my age who got the flu vaccine</td>
<td></td>
<td>3.67 (0.99)</td>
<td>3.21 (1.19)</td>
</tr>
<tr>
<td>Most of my friends get the flu vaccine</td>
<td></td>
<td>3.40 (0.93)</td>
<td>2.65 (0.98)</td>
</tr>
<tr>
<td>Habit (IBM)</td>
<td>0–1</td>
<td>50.88%</td>
<td>7.65%</td>
</tr>
<tr>
<td>Did you get a flu vaccine last fall or winter?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
scale, \( \alpha = 0.80 \), (ii) perceived susceptibility to influenza (one item), (iii) perceived barriers to influenza vaccination (five-item index, \( \alpha = 0.58 \)), (iv) perceived benefits of influenza vaccination (four-item scale, \( \alpha = 0.83 \)) and (v) perceived self-efficacy to get vaccinated against influenza (two-item scale, \( \alpha = 0.58 \)). The perceived barriers variable was treated as an index, as opposed to a scale, because each item represented a different reason for not getting an influenza vaccination. Consequently, the reliability for perceived barriers was relatively low, as is typical for an index.

Psychosocial measures guided by the IBM included (i) injunctive social norms for influenza vaccination (four-item scale, \( \alpha = 0.89 \)), (ii) descriptive social norms for influenza vaccination (two-item scale, \( \alpha = 0.74 \)) and (iii) perceived behavioral control (one item).

Data analysis

All analyses were conducted using SPSS version 15.0. Descriptive statistics were used to assess the distributions of background, psychosocial and outcome variables among survey respondents. \( T \)-tests were used to compare mean scores for Likert items measuring psychosocial constructs across participants by intention to receive an influenza vaccination. Questions assessing psychosocial constructs were combined into scales, and Cronbach’s alphas were calculated for each scale to assess its internal consistency. Bivariate analyses were used to assess associations between background factors, psychosocial constructs and the outcome variable. Only control variables (gender, race, age and receipt of an influenza vaccination in the past year) and psychosocial variables that demonstrated significant bivariate associations at the \( P = 0.10 \) level were included in multivariate logistic regression analyses. Age was used instead of middle or high school level because it is a continuous variable and therefore provides more detailed information. Controlling for background factors, Model 1 assessed the association between HBM-based psychosocial variables and intention to receive an influenza vaccination and Model 2 assessed the association between IBM-based psychosocial variables and intention to receive an influenza vaccination. Model 3 was built on the logistic regression equations in Models 1 and 2 by including both HBM- and IBM-based variables.

Results

Demographics and characteristics results

Out of 1199 eligible students, 337 participated in the study (28.1% response rate). In total, 45.7% of respondents were from County 1 (\( n = 154 \), 42.3% response rate) and 54.3% of respondents were from County 2 (\( n = 183 \), 22.0% response rate). Respondents were mostly female (56.0%), black (75.1%) and in middle school (56.9%). Mean age of respondents was 14 (SD = 3). Comparisons with the full eligible population indicated that the study sample included a higher representation of female, black and middle school participants (respectively, 47.9, 68.0 and 44.7% in the full eligible sample).

When asked ‘Do you plan to get the flu vaccine next fall or winter?’, 33.8% (\( n = 114 \)) of students responded ‘yes’, 33.5% (\( n = 113 \)) responded ‘no’, 28.8% (\( n = 97 \)) responded ‘don’t know’ and 3.9% (\( n = 13 \)) did not respond. Because students who responded ‘no’ and ‘don’t know’ did not demonstrate a clear intention to receive an influenza vaccination, they were combined for analyses, totaling 62.3% (\( n = 210 \)) (Table I). (Supplementary analyses indicated some differences between the students who responded ‘no’ and ‘don’t know’ with respect to certain theoretical constructs. However, there were no substantive changes to the main results when the ‘don’t know’ group was excluded from the analyses.) Compared with participants who did not plan to receive an influenza vaccination, participants who did intend to receive an influenza vaccine had lower mean scores on perceived barriers to influenza vaccination and higher mean scores of perceived benefits, self-efficacy, injunctive social norms and descriptive social norms supportive of influenza vaccination. The majority of participants who reported intention to receive an influenza vaccination also reported receiving an influenza vaccination in the previous year (50.9%), compared
with only 7.7% of participants who did not plan to receive an influenza vaccination.

**Bivariate and multivariate analyses**

Bivariate and multivariate logistic regression analyses are presented in Table II. In bivariate analyses, the only background factors significantly associated with intention to receive an influenza vaccination were female gender ($P = 0.02$) and receipt of an influenza vaccination in the past year ($P < 0.001$). HBM constructs associated with intention to receive an influenza vaccination were perceived susceptibility ($P = 0.002$), perceived benefits ($P < 0.001$), perceived barriers ($P < 0.001$) and self-efficacy ($P < 0.001$). IBM constructs associated with intention to receive an influenza vaccination were injunctive social norms ($P < 0.001$) and descriptive social norms ($P < 0.001$). Intention to receive an influenza vaccination was not associated with race, age, middle or high school level, perceived severity of influenza or control beliefs.

In Model 1, the odds of reporting intention to receive an influenza vaccination were 1.28 times larger among adolescents reporting higher self-efficacy for getting an influenza vaccination ($P = 0.015$) and 8.40 times larger among adolescents who received an influenza vaccination in the past year ($P < 0.001$). Adolescents who reported more perceived barriers toward influenza vaccination were significantly less likely to report intention to receive an influenza vaccination ($P < 0.001$). Although perceived susceptibility to influenza, perceived benefits of influenza vaccination and female gender were significantly associated with intention to receive an influenza vaccination in bivariate analyses, these associations were not significant when background factors and other HBM constructs were included in the model (Table II).

Several variables that were significantly associated with intention to receive an influenza vaccination in Models 1 and 2 remained significant in Model 3, including receipt of an influenza vaccination in the past year [odds ratio (OR) = 6.21, $P < 0.001$], the HBM construct of perceived barriers to influenza vaccination (OR = 0.77, $P < 0.001$) and the IBM construct of injunctive social norms supportive of influenza vaccination (OR = 1.23, $P = 0.002$) (Table II). Although self-efficacy for influenza vaccination was significant in Model 1, this association was no longer statistically significant when controlling for background, HBM and IBM variables (Table II).

**Discussion**

This study demonstrates an association between theory-driven measures of attitudes and beliefs toward influenza vaccination and intention to receive an influenza vaccination among a sample of primarily minority, rural adolescents. Findings from this study indicate that constructs from multiple theories, including the HBM and IBM, may be useful in explaining intention to receive an influenza vaccination among rural adolescents.

In bivariate analyses, both background factors (female gender and receipt of an influenza vaccination in the past year) and key theoretical constructs from the HBM and IBM demonstrated significant associations with intention to receive an influenza vaccination. From the HBM, the constructs of perceived susceptibility to influenza, perceived benefits of influenza vaccination, perceived barriers to influenza vaccination and self-efficacy for influenza vaccination demonstrated significant associations. From the IBM, injunctive and descriptive social norms emerged as significant variables associated with intention to receive an influenza vaccination.

In separate multivariate analyses, the HBM constructs of perceived barriers to influenza vaccination...
<table>
<thead>
<tr>
<th>Factor</th>
<th>Bivariate/unadjusted, OR (95% CI)</th>
<th>P-value</th>
<th>Model 1 (HBM) multivariate/adjusted, OR (95% CI)</th>
<th>P-value</th>
<th>Model 2 (IBM) multivariate/adjusted, OR (95% CI)</th>
<th>P-value</th>
<th>Model 3 (HBM + IBM) multivariate/adjusted, OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>Reference</td>
<td>—</td>
<td>Reference</td>
<td>0.02</td>
<td>1.87 (0.96, 3.62)</td>
<td>0.06</td>
<td>Reference</td>
<td>0.10</td>
</tr>
<tr>
<td>Female</td>
<td>1.73 (1.10, 2.74)</td>
<td></td>
<td>1.69 (0.90, 3.14)</td>
<td></td>
<td>1.69 (0.90, 3.14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>Reference</td>
<td>—</td>
<td>Reference</td>
<td>0.97</td>
<td>1.02 (0.14, 7.28)</td>
<td>0.98</td>
<td>Reference</td>
<td>0.47</td>
</tr>
<tr>
<td>Black</td>
<td>1.03 (0.25, 4.26)</td>
<td></td>
<td>1.90 (0.31, 11.50)</td>
<td></td>
<td>1.90 (0.31, 11.50)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1.62 (0.42, 6.27)</td>
<td></td>
<td>2.93 (0.53, 16.05)</td>
<td></td>
<td>2.93 (0.53, 16.05)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increasing age, in years</td>
<td>0.95 (0.87, 1.03)</td>
<td>0.17</td>
<td>0.99 (0.89, 1.10)</td>
<td>0.95</td>
<td>0.99 (0.89, 1.10)</td>
<td>0.82</td>
<td></td>
<td>1.02</td>
</tr>
<tr>
<td>School level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle school</td>
<td>Reference</td>
<td>—</td>
<td>Reference</td>
<td>0.20</td>
<td>1.00 (0.88, 1.13)</td>
<td>0.95</td>
<td>Reference</td>
<td>0.22</td>
</tr>
<tr>
<td>High school</td>
<td>1.35 (0.85, 2.15)</td>
<td></td>
<td>0.99 (0.89, 1.10)</td>
<td></td>
<td>0.99 (0.89, 1.10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receipt of influenza vaccination in the past year</td>
<td>No</td>
<td>12.62 (6.68, 23.84)</td>
<td>&lt;0.001</td>
<td>8.40 (3.91, 18.02)</td>
<td>&lt;0.001</td>
<td>7.13 (3.48, 14.60)</td>
<td>&lt;0.001</td>
<td>6.21 (2.78, 13.90)</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>7.34 (4.04, 13.36)</td>
<td></td>
<td>1.07 (0.88, 1.30)</td>
<td></td>
<td>1.02 (0.97, 1.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBM constructs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>0.71 (0.58, 0.88)</td>
<td>0.002</td>
<td>0.80 (0.59, 1.08)</td>
<td>0.15</td>
<td>0.80 (0.59, 1.08)</td>
<td>0.15</td>
<td>0.85 (0.61, 1.18)</td>
<td>0.33</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>1.12 (0.99, 1.28)</td>
<td>0.08</td>
<td>1.07 (0.88, 1.30)</td>
<td>0.52</td>
<td>1.07 (0.88, 1.30)</td>
<td>0.52</td>
<td>1.00 (0.79, 1.27)</td>
<td>0.99</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>1.14 (1.06, 1.22)</td>
<td>&lt;0.001</td>
<td>1.02 (0.92, 1.13)</td>
<td>0.71</td>
<td>1.02 (0.92, 1.13)</td>
<td>0.71</td>
<td>0.97 (0.86, 1.09)</td>
<td>0.59</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>0.80 (0.73, 0.87)</td>
<td>&lt;0.001</td>
<td>0.78 (0.69, 0.87)</td>
<td>&lt;0.001</td>
<td>0.78 (0.69, 0.87)</td>
<td>&lt;0.001</td>
<td>0.77 (0.68, 0.88)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>1.41 (1.23, 1.62)</td>
<td>&lt;0.001</td>
<td>1.28 (1.05, 1.58)</td>
<td>0.015</td>
<td>1.28 (1.05, 1.58)</td>
<td>0.015</td>
<td>1.14 (0.90, 1.44)</td>
<td>0.27</td>
</tr>
<tr>
<td>IBM model constructs</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Injunctive social norms</td>
<td>1.37 (1.26, 1.49)</td>
<td>&lt;0.001</td>
<td>1.27 (1.15, 1.41)</td>
<td>&lt;0.001</td>
<td>1.27 (1.15, 1.41)</td>
<td>&lt;0.001</td>
<td>1.23 (1.08, 1.40)</td>
<td>0.002</td>
</tr>
<tr>
<td>Descriptive social norms</td>
<td>1.44 (1.26, 1.66)</td>
<td>&lt;0.001</td>
<td>1.18 (0.97, 1.43)</td>
<td>0.011</td>
<td>1.18 (0.97, 1.43)</td>
<td>0.011</td>
<td>1.11 (0.89, 1.39)</td>
<td>0.35</td>
</tr>
<tr>
<td>Control beliefs</td>
<td>0.92 (0.77, 1.11)</td>
<td>0.40</td>
<td></td>
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</table>

CI, confidence interval.
and self-efficacy for influenza vaccination (Model 1) and the IBM construct of injunctive social norms supportive of influenza vaccination (Model 2) emerged as significant psychosocial correlates of intention to receive an influenza vaccination. Models 1 and 2 demonstrated that, controlling for background factors, constructs from both the HBM and the IBM were significantly associated with intention to receive an influenza vaccination. Model 3 illustrated that certain constructs from both the HBM (perceived barriers to influenza vaccination) and the IBM (injunctive norms supportive of influenza vaccination) persisted as significant predictors of intention to receive an influenza vaccination while controlling for background factors and constructs from both theories. However, the HBM construct of self-efficacy for influenza vaccination was no longer significant when IBM variables were added in Model 3. Taken together, Models 1, 2 and 3 indicate that it may be important to incorporate constructs from multiple theories when addressing vaccination behaviors.

Although there is a dearth of research detailing adolescent attitudes toward influenza vaccination, these results are consistent with findings from previous studies that report associations between similar constructs and influenza vaccination uptake among non-adolescent populations such as elderly adults, health care workers and parents of young children [38,43–45]. A review article by Ward et al. [45] found that beliefs about vaccine safety, effectiveness and side effects; perceived risks and consequences of contracting influenza; and perceived health status were key determinants of influenza vaccination among older adults. Further research suggests that access to care [23, 46], lack of provider recommendation [22], attitudes toward vaccination [22, 47], mistrust of the vaccine and believing that the vaccine causes influenza [48] play a role in influenza vaccination outcomes among African-American adults. In a literature review of influenza vaccination among health care workers, Hofman et al. [44] found that fear of adverse effects, the misconception that vaccine causes influenza, low perceived risk, inconvenient vaccination schedules, perception that influenza is not a serious disease, beliefs about vaccine ineffectiveness and fear of injections were barriers to vaccine uptake. A study of parental attitudes toward child immunization found that anticipating immunization barriers and perceiving that influenza vaccination is the social norm may impact vaccination [38].

To our knowledge, this is the first study to demonstrate a significant association between attitudes toward influenza vaccination and intention to receive an influenza vaccination among an adolescent population. Whether rural adolescents’ attitudes and beliefs toward influenza vaccination, including intention to receive an influenza vaccination, impact vaccine uptake remains to be seen. Because parental consent is a necessary factor in influenza vaccination for this population, the degree to which adolescent attitudes impact vaccine uptake may vary across families. Yet in general, compared with younger children, adolescents are more likely to take control of their own health-related attitudes and behaviors [32]. Adolescent attitudes have been demonstrated to differ from parental attitudes with regard to several health behaviors, including vaccination [49–53]. For example, Zimet et al. found that parent–adolescent pairs were not likely to agree on who would be the primary decision maker regarding adolescent sexually transmitted disease (STD) vaccination. While 42% of parents reported they would be the primary decision maker, only 12% of adolescents saw their parents in this role. On the contrary, 36% of adolescents reported that they would be the primary decision maker, yet only 10% of parents saw their children in this role [53]. Other studies have shown that determinants of human papillomavirus (HPV) vaccination acceptance differ among parents and adolescents [52] and that while adolescents may look to their parents for guidance concerning STD vaccination acceptance, their personal experiences may also be influential [54]. Attitudes regarding vaccines for sexually transmitted infections such as HPV may be different than attitudes regarding vaccines for non-sexually transmitted infectious diseases such as influenza. However, the large majority of published research to date examining parental and adolescent
attitudes toward vaccination focuses on HPV vacc-
cination. More research on adolescent attitudes to-
ward other vaccinations, including influenza vaccina-
tion, is warranted.

The findings of this study may be particularly use-
ful for developing interventions seeking to increase
the acceptance of influenza vaccination among ado-
lescents. First, students with higher scores on the
perceived barriers index were significantly less likely
to plan on receiving an influenza vaccination. Inter-
ventions to increase influenza vaccination uptake
among adolescent populations should identify and
debunk key barriers relevant to the target adolescent
population. Potential barriers of importance may in-
clude beliefs that the influenza vaccine causes people
to get sick, does not prevent influenza, costs too
much money or is painful and uncomfortable. Sec-
ond, injunctive norms, or the perception that most
people would approve of getting an influenza vac-
cine, was significantly associated with intention to
receive an influenza vaccination. Based on this find-
ing, interventions may benefit from emphasizing that
doctors highly recommend getting an influenza vac-
cination. This finding also underscores the impor-
tance of intervening on multiple levels, including
parents, providers, school administrators, peers and
teachers. Finally, adolescents who reported receiving
an influenza vaccine in the past year are highly likely
to plan on getting the vaccine in the next year. Thus,
if interventions are successful in persuading adoles-
cents to be vaccinated at least one time, adolescents
may continue receiving an influenza vaccination in
the future.

Limitations

This study has several limitations. First, this is
a cross-sectional study. Thus, a causal link between
attitudes toward vaccination and intention to re-
ceive an influenza vaccination cannot be estab-
lished. Second, the outcome is intention to receive
an influenza vaccination, not actual influenza vac-
cination. Although the IBM asserts that the most
important determinant of a behavior is behavioral
intention, the correlation may be imperfect [35].
While 34% of participants in our study reported
an intention to receive an influenza vaccination,
data from eight sentinel sites in 2008–09 indicated
that only 5–15% of adolescents aged 13–18 actually
received an influenza vaccination [55]. Self-
reported intention to receive an influenza vaccina-
tion may be prone to social desirability bias, where
participants may indicate that they intend to receive
an influenza vaccination because they believe that
this will please the researchers. Third, the study
population comprises predominantly African-
American adolescents in a low-socioeconomic sta-
tus, rural setting in a Southeastern state. Thus, the
results of this study may not be generalizable to
adolescents of other ethnicities or those residing in
urban areas and other geographic locations. Ad-
ditionally, the survey did not collect information
regarding whether respondents had a high-risk con-
dition that would have caused them to be recom-
mended for annual vaccination prior to the
expansion of the ACIP’s recommendation to annu-
ally vaccinate all children and adolescents. Finally,
the response rate was relatively low (28.1%), indi-
cating the possibility of response bias among stu-
dents who are more interested in influenza vaccina-
tion, compared with students who may not have
a vested interest. However, research suggests
that low response rates are a consistent challenge
for school-based studies requiring active parental
consent [56–58]. Unfortunately, this may have
challenging implications for obtaining parental con-
sent for school-based medical interventions, such as
vaccination. Also, the response rate varied from
22.0% in the standard-of-care county to 42.3% in
the intervention county. This difference indicates
a response bias among students in the intervention
county and is likely because the study team had
increased contact with school staff, including teach-
ers and administrators, in the intervention county.
Thus, staff in the intervention county may have
been more likely to remind students to return their
study materials.

Conclusions

The findings from this study, taken with the literature
regarding (i) attitudes toward influenza vaccination

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among non-adolescent age groups and (ii) uniqueness of adolescents with respect to vaccination decision making, highlight the importance of understanding the role that adolescent attitudes toward influenza vaccination play in impacting vaccine uptake. Findings from this study also underscore the importance of using constructs from multiple theories, including the HBM and the IBM, to inform studies investigating adolescent attitudes toward influenza vaccination. Future influenza vaccination efforts geared toward rural middle and high school students may benefit from addressing adolescents’ attitudes toward influenza vaccination. The HBM construct of perceived barriers to influenza vaccination and the IBM construct of injunctive social norms supportive of influenza vaccination may be particularly important to address. However, as with developing any intervention, formative research should be conducted with potential study populations to ensure that these constructs are relevant. Future research is necessary to determine the relationship between intention to receive an influenza vaccination and vaccine uptake and to explore which psychosocial factors are most salient to influenza vaccination among non-rural adolescent populations. Future studies should also investigate whether interventions targeting perceived barriers to influenza vaccination and injunctive social norms supportive of influenza vaccination impact adolescents’ intention to receive an influenza vaccination and influenza vaccine uptake.

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**Conflict of interest statement**

None declared.

**References**

Predictors of intention to get a flu vaccine in rural teens


