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# Survey of vaccination knowledge and acceptance among adults admitted to an urban emergency department

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ABSTRACT

*Background:* Adult vaccination rates in the United States have fallen below national target levels and may be exacerbated by lack of access to a primary care physician. We assessed patient knowledge of and attitudes towards vaccines in an urban emergency department population and analyzed the feasibility of using this setting as a vaccine delivery site from a patient perspective.
*Methods:* In-person interviewers administered surveys to 250 adult patients presenting to the Detroit Receiving Hospital emergency department in Detroit, Michigan. Respondents were asked about vaccination status, preferences, and willingness to accept vaccination reminders via text messaging. Odds ratios and 95% Wald confidence intervals assessing differences between vaccinated and non-vaccinated individuals were generated with univariate logistic regression.
*Results:* Vaccinated adults were more likely to have a primary care provider than non-vaccinated adults (OR 1.94, 95% CI: 1.09–3.45). Non-vaccinated adults were significantly more likely to have unvaccinated adult relatives (OR8.64, 95% CI: 4.10–18.22). Nearly all respondents used a cell phone, and 75.8% of unvaccinated adults were willing to receive text messages reminders about vaccines.
*Conclusions:* Although less likely to have a primary care access point than vaccinated participants, non-vaccinated respondents reported interest in receiving vaccinations. Emergency departments could serve as vaccination hubs for patients and unvaccinated accompanying family members. Text message reminders offer a potential source of additional vaccine prompts and education.


## 1. Introduction

The United States Centers for Disease Control and Prevention recommends vaccination of adults aged 19 years and older for vaccine-preventable diseases, including seasonal influenza, tetanus, diphtheria, pertussis, shingles, meningitis, and human papillomavirus [1]. Recommendations are based on age, previous childhood vaccination histories, and individual factors such as immune suppression. Although national approximations of adult vaccination coverage vary, all estimates fall below vaccination target levels of 90% for persons ⩾65 years, 60% for high-risk populations 19–64 years [2,3], and 70% for influenza vaccination for persons 18 years of age and older [4]. Vaccination coverage has seen little improvement in recent years; between 2011 and 2015, adult influenza vaccination coverage ranged from a low of 38.8% in the 2011–2012 influenza season to a high of 43.6% for the 2014–2015 influenza season [5]. Challenges in achieving widespread vaccine coverage in the United States may stem from barriers in reaching adults who do not seek regular preventative care through a primary care physician.

Emergency departments in the United States were visited 136.3 million times in 2011; of those visits, 20.4 million were by adults age 65 or older [6]. In total, 10–20% of the adult population makes at least one visit to the Emergency Department (ED) annually [7,8] Previous studies have identified 69% of the patient population in EDs as high-risk for influenza and 45% as high-risk for pneumococcal disease, but less than 20% of that high-risk population has been vaccinated [7]. Despite the American College of Emergency Physicians' recommendation that EDs participate in routine immunization programs [9], 93% of vaccinations given in the ED are for tetanus [2].

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In this study, we assessed patient knowledge of and attitudes towards vaccines among adults at least 18 years of age who were attending an urban ED. We further analyzed the feasibility of utilizing this setting as a vaccine delivery site from a patient's perspective. We evaluated healthcare barriers to vaccination and explored the potential use of text messaging for delivery of vaccination reminders and education.

## 2. Methods

Recruitment occurred at the Detroit Receiving Hospital ED in Detroit, Michigan from June to September 2012. Eligibility criteria included the following: adults ⩾18 years of age, English-speaking, triaged for care to the fast-track unit of the ED, which typically sees patients with lower acuity. Prisoners and cognitively impaired/-mentally disabled individuals were excluded. The study was approved by the Wayne State University Institutional Review Board. Subjects were not compensated for their participation.

In-person interviews were conducted and recorded by trained interviewers using a standard questionnaire (Supplementary Material). Patients were asked to participate when they were in a private area and no active care was taking place. Demographic information collected included sex, age, zip code, race (American Indian/Alaskan Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, White, or Other), vaccination history, and vaccination history of other adults in the household. Fourteen questions collected information on participant's knowledge of influenza, pneumococcal disease, pertussis, tetanus, shingles, hepatitis A and meningococcal vaccinations in adults. To determine participant vaccine knowledge, respondents were asked if they had heard of the vaccine in question (yes, no, or don't know), at what age the vaccine should be administered (free response), and whether they believed vaccines for adults were safe (yes, no, or don't know).

Respondents were asked if they or a family member had been diagnosed with a chronic illness, defined as heart disease, chronic lung disease, chronic liver disease, asplenia, kidney failure/end-stage renal failure, diabetes, or having an immunocompromising condition.

Participants were classified as 'vaccinated' if they reported receiving at least one of the following vaccines at any time as an adult: seasonal influenza, pneumococcal, pertussis, tetanus, shingles, hepatitis A, meningitis. For inference, logistic regression analysis was applied to all demographics and access to healthcare variables to generate univariate odds ratios and 95% confidence intervals. A pooled student's T-test was used for the continuous age variable. A multivariate logistic regression model was created using backward selection to determine the best-fit predictors of vaccine uptake. Analyses were performed in SAS software version 9.4 (Cary, NC) and R 3.3.2 using the caret package for model fitting and performance assessment.

## 3. Results

A total of 250 participants completed the survey, seventy-five percent of who reported living in a zip code within Detroit, MI. Sixty-six respondents (26.4%) self-reported that they had never received a vaccination as an adult (Table 1). Of the 184 adults who reported receipt of at least one vaccination as an adult, vaccination uptake varied by vaccine type, ranging from a high of 78.8% (n = 145) for the tetanus vaccine to a low of 12.5% (n = 23) for the meningococcal vaccine (Table 1).

Non-vaccinated participants (n = 66) were less likely to have a primary care physician than vaccinated participants (OR: 0.52 95% CI: 0.29–0.91) were less likely to go to a doctor's office for primary healthcare visits (OR 0.53, 95% CI: 0.28–0.98) and less likely to identify with any primary source of healthcare (OR 0.33, 95% CI: 0.12–0.92) (Table 2). However, non-vaccinated participants did not display a clear preference when asked where they would prefer to receive a vaccine. Of those without vaccination as an adult, 36.4% (n = 24) said they would prefer to receive vaccinations in the emergency room, 34.9% (n = 23) preferred a doctor's office or clinic, and 24.2% (n = 16) did not have a preference. There was no difference in the likelihood of having received a vaccine between individuals living with a chronic disease and those without (OR 1.29, 95% CI: 0.70–2.36).

Participants reporting past receipt of at least one adult vaccine were more likely than unvaccinated participants to have heard of

**Table 1**
Vaccine coverage by vaccination type.

| Vaccine | Percentage of respondents self-reporting vaccination (n = 250) | Percentage of respondents' family members (n = 250) |
|---|---|---|
| Influenza | 46.8 (117) | 45.2 (112) |
| Pneumococcal disease | 15.2 (38) | 24.7 (160) |
| Pertussis | 5.20 (13) | 12.2 (30) |
| Tetanus | 58.0 (145) | 42.5 (105) |
| Shingles | 4.00 (10) | 14.2 (35) |
| Hepatitis A | 20.8 (52) | 23.9 (29) |
| Meningitis | 9.20 (23) | 17.0 (42) |

Note. Data are% (no.).

**Table 2**
Population demographics and access to healthcare among vaccinated adults compared to unvaccinated adults.

| Characteristics | | Study participants | | |
|---|---|---|---|---|
| | | Vaccinated (n = 184)[a] | Unvaccinated (n = 66) | OR (95% CI) |
| Gender | Male | 87 (47.3) | 33 (52.7) | 0.90 (0.51, 1.57) |
| Race | Black | 156 (84.8) | 59 (89.4) | 0.66 (0.27, 1.60) |
| | White | 15 (8.2) | 4 (6.1) | 1.37 (0.44, 4.30) |
| | Other | 13 (7.1) | 3 (4.6) | 1.60 (0.44, 5.78) |
| Age, years | Mean (SD) | 38.3 (13.7) | 36.0 (13.2) | 1.01 (0.99, 1.04) |
| Has a primary care physician | Yes | 101 (55.8) | 26 (39.4) | 1.94 (1.09, 3.45) |
| Principal healthcare access point | Doctor's office | 88 (50.0) | 20 (34.5) | 1.90 (1.03, 3.52) |
| | Urgent care | 18 (10.2) | 9 (15.5) | 0.62 (0.26, 1.47) |
| | Hospital | 70 (3.8) | 29 (50.0) | 0.66 (0.36, 1.20) |
| | Don't know | 8 (4.4) | 8 (12.1) | 0.33 (0.12, 0.92) |
| At least one other vaccinated adult family member | Yes | 128 (86.5) | 20 (42.6) | 8.64 (4.10, 18.22) |
| Diagnosed with chronic disease[b] | Yes | 66 (35.9) | 20 (30.33) | 1.29 (0.70, 2.36) |

Note. Data are no. (%), unless otherwise indicated. All% represent the proportion excluding missing values.
[a] Vaccinated defined as having received at least one adult vaccine at the time of study participation.
[b] Chronic disease includes: heart disease, lung disease, liver disease, asplenia, kidney failure, diabetes, or immunocompromising condition.