Published in final edited form as:

J Epidemiol Community Health. 2012 March ; 66(3): 204–209. doi:10.1136/jech.2009.099879.

Predictors of flu vaccination among urban Hispanic children and adults

Bevin Cohen¹, Yu-hui Ferng¹, Jennifer Wong-McLoughlin¹, Haomiao Jia^{1,2}, Stephen S. Morse³, and Elaine L. Larson^{1,3}

¹Columbia University School of Nursing, New York, USA

²Department of Biostatistics, Mailman School of Public Health, Columbia University, New York, USA

³Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, USA

Abstract

Background—Flu vaccination is effective for preventing infection, but coverage levels in the USA remain low—especially among racial/ethnic minorities. This study examines factors associated with flu vaccination in a predominantly Hispanic community in Manhattan, New York.

Methods—Households were recruited during the 2006–2007 and 2007–2008 flu seasons. Primary household respondents were interviewed to determine knowledge of flu transmission/treatment and vaccination status and demographic information for all household members.

Results—Vaccination coverage was 47.3% among children <5, 39.3% among 5–17-year-olds, 15.3% among 18–49-year-olds, 31.0% among 50–64-year-olds and 37.1% among adults ≥65 in year 1; and 53.1% among children <5, 43.6% among 5–17-year-olds, 19.5% among 18–49-year-olds, 34.1% among 50–64-year-olds and 34.3% among adults ≥65 in year 2. For children, younger age, having a chronic respiratory condition (eg, asthma), and greater primary respondent knowledge of flu were positively associated with vaccination. Among adults, female gender, older age, higher education, greater primary respondent knowledge of flu, having been born in the USA and having a chronic respiratory condition were positively associated with vaccination. The most common reasons cited for not being vaccinated were the beliefs that flu vaccination was unnecessary or ineffective.

Conclusions—Possible methods for increasing vaccination levels in urban Hispanic communities include improving health literacy, making low-cost vaccination available and encouraging providers to use other office visits as opportunities to mention vaccination to patients.

Registration number—This study is registered at <http://ClinicalTrials.gov> (NCT00448981).

INTRODUCTION

Flu is a significant cause of morbidity and mortality in the USA and internationally, particularly among older people and young children.^{1, 2} Flu-related illness can lead to

Correspondence to: Ms Bevin Cohen, Columbia University School of Nursing, 630 West 168th Street, New York, NY 10032 USA; bac2116@columbia.edu.

Competing interests None.

Patient consent Obtained.

Ethics approval Ethics approval was provided by the Institutional Review Board of Columbia University Medical Center.

Provenance and peer review Not commissioned; externally peer reviewed.

prolonged hospitalisation, onset or aggravation of comorbid conditions, and death.³ In addition, flu causes increased hospital resource utilisation and long periods of absenteeism in schools and work-places; a recent national study estimates that \$10.4 billion in direct medical costs and \$16.3 billion in lost wages can be attributed to flu, annually.^{3–8}

Vaccination is a highly effective means of preventing seasonal flu and reducing transmission.⁹ The Centers for Disease Control and Prevention (CDC) now recommends annual flu vaccination for members of priority groups, which include children aged 6 months to 18 years, adults 50 years and older, women who are pregnant and people with certain chronic medical conditions, nursing home residency, occupational proximity to the infirm or elderly (eg, healthcare workers) and people living with children too young to be vaccinated (children under 6 months).¹⁰ Still, despite CDC recommendations and the demonstrated efficacy of flu vaccination, immunisation levels remain well below the national *Healthy People 2010* targets for all priority groups.^{11, 12}

Racial and ethnic minorities consistently report lower coverage rates than non-Hispanic Caucasians, with Hispanic Americans reporting the lowest vaccination levels among adults in recent years.¹³ Specific reasons for disparities in flu vaccination between white non-Hispanic and Hispanic Americans are poorly understood. Previous research in the Medicare population suggests that access to care and provider recommendations to vaccinate for flu do not differ between minority and non-minority patients, although minority patients are less likely to visit a healthcare provider for the purpose of receiving the vaccine.^{14, 15} While black Americans may be less likely than white Americans to be vaccinated due to reasons of mistrust (eg, beliefs that the vaccine may cause illness or have negative side effects), this is not true for Hispanic Americans.^{14, 16} Although individual concern about flu increases vaccination rates in all racial/ethnic groups, one study of older adults revealed that only 54% of Hispanics who express high levels of concern were vaccinated, compared with over 90% of black individuals and Caucasians. Among children, coverage levels for all immunisations are historically lower for minorities, but these differences are likely due to limitations in access to care, not concern over vaccine safety or efficacy.^{17–19}

Flu and pneumonia are the third leading cause of death in New York City.²⁰ Increasing vaccination coverage can have a positive impact on reducing flu mortality; Fiscella *et al*²¹ estimated that closing the vaccination gap between Caucasians and Hispanics would reduce the national annual flu death toll by almost 75% among older Hispanic Americans alone. The purpose of this study was to examine factors associated with flu vaccination in Washington Heights, a predominantly Hispanic community in New York City.

METHODS

Sample

Subjects in this study were part of a randomised clinical trial on flu transmission among household members in Washington Heights, a Hispanic immigrant community in northern Manhattan, New York (CDC Cooperative Agreement1 U01 CI000442, ‘Stopping URIs and Flu in the Family: The Stuffy Trial,’ <http://ClinicalTrials.gov> Registry #NCT00448981). Households were included if they contained at least three people, had at least one child of preschool or elementary school age, spoke English or Spanish, had a telephone, had no immediate plans to move from the neighbourhood and agreed to report upper-respiratory symptoms and have bimonthly home visits from the study’s research coordinators.

Procedures

This study was approved by the Columbia University Medical Center Institutional Review Board on 20 October 2006, prior to the commencement of participant recruitment.

Participants were recruited through word-of-mouth and bilingual English/Spanish advertisements in local schools, churches, Women, Infants and Children's (WIC) offices, and clinics between 2006 and 2008. Prospective participants contacted one of four bilingual research coordinators who travelled to the families' homes to describe the study and obtain written informed consent from those willing to participate. At the time of consent, the primary respondent for the household—usually the female caretaker—completed a 20 min structured interview to assess knowledge of transmission and treatment of flu and upper-respiratory infections, and to collect demographic and vaccination information for each member of the household.

Instrument

The data-collection instrument was developed based on previous community-based interview tools as described in Larson *et al.*^{22–25} The interview included 10 knowledge assessment questions that comprised a Knowledge, Attitudes and Practice (KAP) score ranging from 0 (no knowledge of flu prevention and treatment) to 10 (perfect knowledge). The primary respondents provided demographic information for each member of the household, including age, gender, ethnicity, country of birth, level of education and occupation (for adults ≥18 years only), type of school attended (for children <18 years only) and whether the participant had a chronic respiratory condition. In addition, the respondents were asked whether each household member had received a flu vaccination for the current flu season and, if so, where the vaccine was obtained. Primary respondents were asked in an open-ended question the reason(s) why, if any, household members were not vaccinated. The interview was repeated after 6 months and at the end of the 2-year study.

Statistical analysis

For univariate analyses, each study participant was classified as vaccinated if the primary respondent reported that they had been vaccinated for the current flu season during the initial, 6-month follow-up or exit interviews. We calculated the proportion vaccinated in year 1, in year 2, in both years and in either year for the total sample and within each demographic and KAP score group. KAP scores were dichotomised as low (below median) or high (at or above median) for the univariate analyses. χ^2 tests were used to assess differences in the proportion vaccinated in either year between groups. A generalised estimating equation (GEE) logistic regression model was used to determine individual- and household-level factors associated with flu vaccination for children <18 and adults ≥18 years. For children, individual-level covariates included age, gender, ethnicity, birth location (inside vs outside the USA), presence/absence of a chronic respiratory condition and attendance of a school or daycare facility outside the home; household-level covariates included the primary respondent's years living in the USA, level of education and KAP score at exit interview. For adults, age, gender, ethnicity, birth location, level of education, place of work (inside the home, including stay-at-home care givers vs outside the home) and presence/absence of a chronic respiratory condition were included on the individual level, and the primary respondent's KAP score at exit was included at the household level. Among those who were not vaccinated, we categorised the free responses given for why not and calculated the frequency with which each reason was mentioned and the percentage of participants who mentioned it. All responses were single-themed sentences which were coded by one researcher based on identification of key words. A second researcher reviewed the categories, and the inter-rater agreement was 100%. Among those who were vaccinated, we calculated the proportions vaccinated at private physician practices, hospitals or free clinics, and schools or workplaces. All analyses were performed in 2009 using SAS version 9.1.3.

RESULTS

A total of 2788 participants from 509 households were enrolled in the study, and 1225 (43.9%) reported being vaccinated against flu at least once during the study period, which spanned two flu seasons: 821 (29.5%) were vaccinated in year 1, 948 (34%) were vaccinated in year 2, and 544 (19.5%) were vaccinated in both years (table 1). In univariate analyses, vaccination in either year was significantly higher among those born in the USA ($p<0.001$), with chronic respiratory conditions ($p<0.001$), and, among adults, those who worked inside the home ($p=0.025$) and reported higher levels of education ($p=0.002$). A higher primary respondent KAP score was also positively associated with vaccination in either year ($p<0.001$). Children <5 years were most likely to be vaccinated in either year (66.6% vaccination rate), followed by children 5–17 years (55.9%), adults 65 years and older (48.6%), and adults 50–64 years (45.7%); only 26.2% of adults aged 18–49 were vaccinated in either year ($p<0.001$).

In the multivariable analysis for children <18 years, younger age, having a chronic respiratory condition and a better primary respondent KAP score were positively associated with flu vaccination (all $p<0.001$). Among adults 18 years, female gender ($p<0.001$), older age ($p<0.001$), higher education ($p=0.01$), better primary respondent KAP score ($p=0.01$), having been born in the USA ($p=0.03$) and having a chronic respiratory condition ($p=0.01$) were positively associated with flu vaccination (table 2).

The most common reason cited for not being vaccinated was the belief that flu is not a serious enough infection to warrant vaccination (ie, vaccination is unnecessary), with more than one-quarter of non-vaccinated participants indicating this as a reason for their decision. Over 11% chose not to be vaccinated because they believed the vaccine to be ineffective. Some participants were not vaccinated owing to practical constraints, including lack of time (10.0%) and cost (10.9%).

Of 956 vaccinated participants for whom information about where they received the vaccine was provided, 829 (86.7%) were vaccinated by a private physician, 71 (7.4%) were vaccinated at a free clinic or hospital, and 56 (5.9%) were vaccinated at school or work.

DISCUSSION

The vaccination rates we observed in children <5 years were higher than those described nationally based on self-report and physician surveys.²⁶ Even though this study took place prior to the CDC's expansion of its flu prevention and control recommendations to include healthy children 5–18 years in the 2008–2009 flu season, more than half of participants in this age group were vaccinated in either year.^{10, 27} The annual vaccination coverage levels we observed among adults 18–49 years were comparable with those self-reported nationally for all ethnicities and greater than reported by Hispanics.¹³ Nevertheless, healthy adults in this age group are not considered a 'priority group' for vaccination, and while there is evidence to suggest that immunisation can reduce flu-like illness, lost workdays and physician visits in this population, the cost-effectiveness of widespread vaccination is still debated.^{28, 29} Annual coverage levels among adults 50–64 years—for whom vaccination is recommended—were also comparable with those reported nationally for all ethnicities and Hispanics alone. Conversely, the annual vaccination rates we observed in adults 65 years and older (34% in year 1 and 37% in year 2) were about half of the national self-reported rate for all ethnicities (66%) and also lower than the rates reported by Hispanics (52%).¹³ Previous research suggests that this particular community is highly responsive to individual and public recommendations from healthcare officials (eg, public service announcements

and other mass media campaigns)—particularly for the care of their children—which may have contributed to the high coverage levels we observed for younger age groups.^{22, 25}

A recent review by Logan³⁰ suggests that barriers to vaccination for minorities can be classified into three categories: access to care (including cost and language barriers), health literacy (including misconceptions about flu risk and severity and vaccine efficacy and safety) and distrust of the medical system as a whole. While distrust does not appear to be a major barrier to vaccination in this study population (table 3), it is likely that access to care and health literacy did play a role. While this survey did not ask specifically about insurance or access to care, more than 10% of those who were not vaccinated reported prohibitive cost as a reason. Also, most participants who received the vaccine did so at a private physician's office, which may indicate that people with 'medical homes' and who visit physicians for other reasons are more likely to be vaccinated. Still, the lack of physician mention was reported as a reason for non-vaccination for nearly 10% of participants, so encouraging providers to use unrelated office visits as opportunities to vaccinate may be one way to increase coverage levels.

This study measured household knowledge and attitudes regarding flu and upper-respiratory illness; better primary respondent KAP scores were positively associated with vaccination for both children and adults, and higher levels of education were predictive of vaccination among adults. Since the belief that flu vaccination is unnecessary was the most frequent reason given for not being vaccinated, improving knowledge about the benefits of vaccination could help to improve coverage rates. Finally, Larson *et al*²⁵ reported that for members of the study community, provider recommendation is an influential factor for determining whether or not to be vaccinated. Therefore, encouraging providers to recommend the flu vaccine may be an important strategy for increasing coverage in this population.

Asthma and other chronic respiratory conditions put people at greater risk for flu infection and flu-related hospitalisation and death.^{10, 31} While children and adults with chronic respiratory conditions were more likely to be vaccinated than those without, still only about two-thirds were vaccinated. Special efforts to improve vaccination rates in this vulnerable population are warranted, especially in this neighbourhood of New York City, where rates of asthma are particularly high.^{32, 33}

This study has some limitations. Since data were collected as part of a larger community study of households, the sample of individuals included in these analyses is not independent, although household-level factors were controlled for in multivariable analyses. All data were obtained from a self-report survey, which can be compromised by poor recall and social desirability bias. Efforts were made to decrease the potential for these biases to occur by choosing experienced interviewers from the participants' own community and reviewing vaccination records in the home when such records were available—usually for school-aged children. Households were recruited on a rolling basis, so those recruited and interviewed in the spring and summer months may have had less accurate recall regarding flu vaccination than those recruited within the flu season. However, it is improbable that this would lead to recall bias in the results, given that the time of recruitment is not likely to be related to behaviours and beliefs about flu or demographic characteristics. Data for all participants were reported by a single household respondent who may not have known the vaccination status or demographic characteristics of all household members, particularly other adults in the household. This factor, along with small sample size (N=35), may have affected reporting of vaccination coverage for adults 65 and possibly explain why levels were so much lower than reported nationally for this group. It is also possible that cultural factors played a role in the low rates reported for older household members, since previous focus

groups with members of this community found that families put more emphasis on the well-being of children and are more likely to seek appropriate healthcare for them.²² Finally, the study population was restricted to a single community in a single USA city and therefore may not be representative of USA Hispanics in general. Similarly, study participants may have been more likely to be vaccinated than other members of the community for two reasons: families willing to enrol in a study about flu may have had greater baseline knowledge or concern about the flu and therefore had a higher tendency to be vaccinated, or study enrolment may have increased the families' awareness of flu vaccination and thus improved vaccination rates. Reported vaccination was higher in year 2 than in year 1, indicating that study participation may have increased coverage, though rates reported in year 1 were still greater than national levels.

Although the overall vaccination coverage levels observed in the study population were generally greater than those reported at the national level, the rates we observed—especially among older people—were still far below the *Healthy People 2010* targets, which are 60% coverage for healthy adults and 90% coverage for young children and adults 65 years and older.¹¹ Possible methods for increasing vaccination levels in urban Hispanic communities include improving knowledge of the risk and severity of flu infection, making vaccination available at low cost to families without health insurance and encouraging providers to use other office visits as opportunities to recommend flu vaccination to those who may benefit from it.

Acknowledgments

The authors thank research coordinators M Alvarez-Cid, A Barrett and MJ Gonzalez.

Funding This work was funded by a research Cooperative Agreement from the Centers for Disease Control and Prevention (CDC), 'Stopping URIs and Flu in the Family: The Stuffy Trial' (1 U01 CI000442-01).

References

- Centers for Disease Control and Prevention. Influenza activity—United States and worldwide, 2007–2008 season. *Morb Mortal Wkly Rep*. 2008; 57:692–7.
- Bhat N, Wright JG, Broder KR, et al. Influenza-associated deaths among children in the United States, 2003–2004. *N Engl J Med*. 2005; 353:2559–67. [PubMed: 16354892]
- Ampofo K, Gesteland PH, Bender J, et al. Epidemiology, complications, and cost of hospitalization in children with laboratory-confirmed influenza infection. *Pediatrics*. 2006; 118:2409–17. [PubMed: 17142526]
- Coffin SE, Zaoutis TE, Rosenquist AB, et al. Incidence, complications, and risk factors for prolonged stay in children hospitalized with community-acquired influenza. *Pediatrics*. 2007; 119:740–8. [PubMed: 17403845]
- Keren R, Zaoutis TE, Saddlemire S, et al. Direct medical cost of influenza-related hospitalizations in children. *Pediatrics*. 2006; 118:e1321–7. [PubMed: 17079533]
- Keech M, Beardsworth P. The impact of influenza on working days lost: a review of the literature. *Pharmacoeconomics*. 2008; 26:911–24. [PubMed: 18850761]
- Li S, Leader S. Economic burden and absenteeism from influenza-like illness in healthy households with children (5–17 years) in the US. *Respir Med*. 2007; 101:1244–50. [PubMed: 17156991]
- Molinari NM, Ortega-Sanchez IR, Messonnier ML, et al. The annual impact of seasonal influenza in the US: measuring disease burden and costs. *Vaccine*. 2007; 25:5086–96. [PubMed: 17544181]
- Nichol KL. Efficacy and effectiveness of influenza vaccination. *Vaccine*. 2008; 26:D17–22. [PubMed: 19230153]
- Fiore AE, Shay DK, Broder K, et al. Prevention and control of influenza: recommendations of the Advisory Committee on Immunisation Practices (ACIP), 2008. *MMWR Recomm Rep*. 2008; 57:1–60. [PubMed: 18685555]

11. US Department of Health and Human Services. Understanding and Improving Health. 2. Washington, DC: US Government Printing Office; 2000. Healthy People 2010.
12. Lu P, Bridges CB, Euler GL, et al. Influenza vaccination of recommended adult populations, US, 1989–2005. *Vaccine*. 2008; 26:1786–93. [PubMed: 18336965]
13. Centers for Disease Control and Prevention. Self-reported vaccination coverage trends 1989–2007 among adults by age group, risk group, race/ethnicity, health-care worker status, and pregnancy status. United States: National Health Interview Survey (NHIS); http://www.cdc.gov/flu/professionals/vaccination/pdf/NHIS89_07fluvaxtrendtab.pdf [accessed Jul 2009]
14. Winston CA, Wortley PM, Lees KA. Factors associated with vaccination of Medicare beneficiaries in five US communities: results from the Racial and Ethnic Adult Disparities in Immunization Initiative Survey, 2003. *J Am Geriatr Soc*. 2006; 54:303–10. [PubMed: 16460383]
15. Hebert PL, Frick KD, Kane RL, et al. The causes of racial and ethnic differences in influenza vaccination rates among elderly Medicare beneficiaries. *Health Serv Res*. 2005; 40:517–37. [PubMed: 15762905]
16. Chen JY, Fox SA, Cantrell CH, et al. Health disparities and prevention: racial/ethnic barriers to flu vaccinations. *J Community Health*. 2007; 32:5–20. [PubMed: 17269310]
17. Chu SY, Barker LE, Smith PJ. Racial/ethnic disparities in preschool immunizations: United States, 1996–2001. *Am J Public Health*. 2004; 94:973–7. [PubMed: 15249301]
18. Wooten KG, Janssen A, Smith PJ, et al. Associations between childhood vaccination status and medical practice characteristics among white, black and Hispanic children. *J Natl Med Assoc*. 2009; 101:299–35.
19. Strobino D, Keane V, Holt E, et al. Parental attitudes do not explain underimmunization. *Pediatrics*. 1996; 98:1076–83. [PubMed: 8951256]
20. Bureau of Vital Statistics, New York City Department of Health and Mental Hygiene. [accessed Jul 2009] Summary of vital statistics 2007: the City of New York. <http://www.nyc.gov/html/doh/downloads/pdf/vs/2007sum.pdf>
21. Fiscella K, Dressler R, Meldrum S, et al. Impact of influenza vaccination disparities on elderly mortality in the United States. *Prev Med*. 2007; 45:83–7. [PubMed: 17481720]
22. Larson EL, Dilone J, Garcia M, et al. Factors which influence Latino community members to self-prescribe antibiotics. *Nurs Res*. 2006; 55:94–102. [PubMed: 16601621]
23. Lee GM, Friedman JF, Ross-Degnan D, et al. Misconceptions about colds and predictors of health service utilization. *Pediatrics*. 2003; 111:231–6. [PubMed: 12563044]
24. Trepka MJ, Belongia EA, Chyou PH, et al. The effect of a community intervention trial on parental knowledge and awareness of antibiotic resistance and appropriate antibiotic use in children. *Pediatrics*. 2001; 107:E6. [PubMed: 11134470]
25. Larson E, Ferng Y, Wong J, et al. Knowledge and misconceptions regarding upper respiratory infections and influenza among urban Hispanic households: Need for targeted messaging. *J Immigrant Minority Health*. 2008; 11:71–82.
26. Centers for Disease Control and Prevention. Influenza vaccination coverage among children aged 6–59 months—eight immunization information system sentinel sites, United States, 2007–2008 influenza season. *Morb Mortal Wkly Rep*. 2008; 57:1043–6.
27. Fiore AE, Shay DK, Haber P, et al. Prevention and control of influenza: recommendations of the Advisory Committee on Immunization Practices (ACIP), 2007. *MMWR Recomm Rep*. 2007; 56:1–54. [PubMed: 17625497]
28. Nichol KL. Cost-benefit analysis of a strategy to vaccinate healthy working adults against influenza. *Arch Intern Med*. 2001; 161:749–59. [PubMed: 11231710]
29. Bridges CB, Thompson WW, Meltzer MI, et al. Effectiveness and cost–benefit of influenza vaccination of healthy working adults. *JAMA*. 2000; 284:1655–63. [PubMed: 11015795]
30. Logan JL. Disparities in influenza immunization among US adults. *J Natl Med Assoc*. 2009; 101:161–6. [PubMed: 19378634]
31. Hassan F, Lewis TC, Davis MM, et al. Hospital utilization and costs among children with influenza, 2003. *Am J Prev Med*. 2009; 36:292–6. [PubMed: 19201147]
32. Ford ES, Mannino DM, Williams SG. Asthma and influenza vaccination: Findings from the 1999–2001 National Health Interview Surveys. *Chest*. 2003; 144:83–9.

33. Karpati AM, Matte T, Kass D, et al. Asthma can be controlled. *NYC Vital Signs*. 2003; 2:1–4.

What is already known on this subject

Flu is a significant cause of morbidity, mortality and healthcare-resource utilisation in the USA and internationally. Vaccination is effective for preventing flu, and increasing coverage rates could reduce the burden of flu-associated illness. Vaccination coverage levels in the USA are lowest among racial and ethnic minorities, but specific reasons for this disparity are not well understood, particularly for Hispanic Americans.

What this paper adds

Our study found that vaccination rates in a New York City Hispanic neighbourhood were higher than those reported nationally, except among older people, who are at highest risk; only 34–37% of adults over 65 were vaccinated in our sample, compared with 66% nationally. For children, younger age, having a chronic respiratory condition (eg, asthma) and greater respondent knowledge of flu were positively associated with vaccination. Among adults, female gender, older age, higher education, greater respondent knowledge of flu, having been born in the USA, and having a chronic respiratory condition were positively associated with vaccination. Of those who were not vaccinated, 27% reported the belief that vaccination was unnecessary as a reason for their decision; 12% cited that they thought the vaccine was ineffective as a reason. Eighty-seven per cent of those who were vaccinated received the vaccine from a private physician, suggesting that patients with ‘medical homes’ may be more likely to get vaccinated than those who use clinics and hospitals as their primary sources of care.

Table 1

Characteristics and immunisation status of study participants

	n (%)	Percentage vaccinated in year 1	Percentage vaccinated in year 2	Percentage vaccinated in both years	Percentage vaccinated in any year	p Value *
Sex						
Male	1342 (48.1)	27.5	33.5	18.3	42.7	0.20
Female	1446 (51.9)	31.3	34.4	20.6	45.1	
Age (years)						
<5	704 (25.3)	47.3	53.1	33.8	66.6	<0.001
5–17	603 (21.6)	39.3	43.6	27.0	55.9	
18–49	1292 (46.3)	15.3	19.5	8.5	26.2	
50–64	129 (4.6)	31.0	34.1	19.4	45.7	
65	35 (1.3)	37.1	34.3	22.9	48.6	
Ethnicity						
Hispanic	2682 (96.7)	29.6	34.8	19.6	44.1	0.46
Other	92 (3.3)	28.3	31.5	19.6	40.2	
Place of birth						
Inside USA	1276 (46.0)	42.6	47.8	29.8	60.1	<0.001
Outside USA	1500 (54.0)	18.5	22.4	10.9	29.9	
Level of education †						
Less than high school	666 (47.4)	15.3	18.3	8.1	25.5	0.002
High school diploma/ general educational development	395 (28.1)	15.2	19.5	8.4	26.3	
Some college	239 (17.0)	23.4	25.5	13.8	35.1	
College diploma	106 (7.5)	27.4	30.2	18.9	38.7	
Primary respondent Knowledge, Attitudes and Practice score						
Low (1–6)	1162 (47.8)	25.2	32.2	16.2	41.2	<0.001
High (7–10)	1270 (52.2)	33.8	45.1	28.0	50.9	
School attended ‡						
Home care only	398 (30.7)	43.5	49.5	30.4	62.6	0.82
Outside home	900 (69.3)	44.0	48.9	31.0	61.9	

	n (%)	Percentage vaccinated in year 1	Percentage vaccinated in year 2	Percentage vaccinated in both years	Percentage vaccinated in any year	p Value [*]
Place of work [†]						
Inside home	488 (33.4)	20.5	24.4	12.5	32.4	0.03
Outside home	975 (66.6)	15.6	19.7	8.5	26.8	
Respiratory illness						
Yes	260 (9.6)	53.1	50.0	37.7	65.4	<0.001
No	2448 (90.4)	27.5	33.2	18.2	42.5	
Total	2788 (100.0)	29.5	34.0	19.5	43.9	

^{*} Differences between groups assed for percentage vaccinated in any year using the Pearson χ^2 .

[†]For adults 18 years only.

[‡]For children <18 years only.

Table 2

Effect of demographic variables on vaccination status of children <18 and adults 18 years

	Estimate	OR	95% CI	p Value
Effect on vaccination of children <18 years *				
Intercept	-1.522	NA	NA	<0.001
Age	-0.052	0.95	0.92, 0.98	<0.001
Gender				
Male	-0.077	0.93	0.76, 1.13	0.46
Female †				
Ethnicity				
Other	-0.198	0.82	0.43, 1.55	0.55
Hispanic/Latino †				
Place of birth				
Outside USA	-0.291	0.75	0.53, 1.06	0.11
Inside USA †				
Primary respondent's years in USA	0.008	1.01	0.99, 1.02	0.21
Primary respondent's education	0.054	1.06	0.95, 1.17	0.31
Primary respondent's Knowledge, Attitudes and Practice score	0.224	1.25	1.17, 1.33	<0.001
School/day care				
Outside home	0.251	1.29	0.98, 1.68	0.07
Home care only †				
Respiratory illness				
Yes	0.6637	1.94	1.40, 2.70	<0.001
No †				
Effect on vaccination of adults 18 years *				
Intercept	-2.709	NA	NA	<0.001
Age	0.028	1.03	1.02, 1.04	<0.001
Gender				
Male	-0.615	0.54	0.40, 0.73	<0.001
Female †				
Ethnicity				
Other	-0.301	0.74	0.29, 1.87	0.51
Hispanic/Latino †				
Birth location				
Outside USA	-0.543	0.58	0.37, 0.91	0.03
Inside USA †				
Education	0.182	1.20	1.05, 1.37	0.01
Primary respondent's Knowledge, Attitudes and Practice score	0.112	1.19	1.03, 1.21	0.01
Occupation				
Inside home	0.013	1.01	0.75, 1.36	0.93

	Estimate	OR	95% CI	p Value
Outside home [†]				
Respiratory illness				
Yes	0.710	2.03	1.25, 3.31	0.01
No [†]				

* Results of generalised estimating equation logistic regression.

[†] Reference group.

Table 3

Reasons reported by primary respondents for household members not receiving flu vaccination (N=1271) *

Reason	Percentage (n)
Thinks flu vaccination is unnecessary	27.4 (348)
Does not think vaccine is effective	11.8 (150)
Does not have insurance/had to pay fee	10.9 (138)
Did not have time to be vaccinated	10.0 (127)
Physician did not mention vaccine	8.4 (107)
Usually does not get sick	8.0 (102)
Does not like/avoids physicians	6.0 (76)
Does not like injections	4.4 (56)
Fear of negative side effects	3.6 (46)
Physician advised against vaccine	3.3 (42)
Clinic/practice ran out of vaccine	3.1 (39)
Too young to be vaccinated (<6 months)	2.1 (27)
Only visits physician when sick	0.9 (11)
Allergic to vaccine	0.8 (10)
Thought vaccine was only for very young, older or sick people	0.5 (6)

* Primary respondents provided free-response answers which were subsequently categorised by investigators. Respondents could provide multiple answers or none at all.