



Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

Persistent racial and ethnic disparities in flu vaccination coverage: Results from a population-based study

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Key Words:

Flu vaccination
preventive care
racial and ethnic disparities

Background: The Advisory Committee on Immunization Practices recommends annual flu vaccination for all adults. We aimed to identify predictors of receiving a flu vaccination, with an emphasis on the impact of race and ethnicity.

Methods: We used data from the 2011-2012 California Health Interview Survey and included all individuals aged ≥ 18 years. We performed a survey-weighted logistic regression on receipt of flu vaccination within the last year, adjusted by demographic and socioeconomic variables, and calculated odds ratios (ORs) and 95% confidence intervals (CIs).

Results: Our study included a population-weighted sample of 27,796,484 individuals. Overall, 35.8% received a flu vaccination within the last year. Blacks were 33% less likely (95% CI, 21%-43%) to have been vaccinated than whites. Conversely, Koreans (OR, 1.77; 95% CI, 1.35-2.33) and Vietnamese (OR, 1.57; 95% CI, 1.19-2.07) were more likely than whites to have been vaccinated. No differences were seen between whites and the remaining racial and ethnic groups (Latino, Japanese, Chinese, Filipino, South Asian, Asian other, and other).

Conclusions: Racial and ethnic disparities in flu vaccination uptake exist in California. Namely, blacks have lower vaccination rates than whites, and there are disparate vaccination rates among the Asian-American subgroups. Efforts to increase vaccination rates among these groups are needed.

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Influenza (flu) is a significant cause of morbidity and mortality among adults in the United States.^{1,2} Although the Advisory Committee on Immunization Practices (ACIP) recommends annual flu vaccination for all individuals ≥ 6 months of age,³ prior research has noted evidence of racial and ethnic disparities in flu vaccination coverage.⁴⁻¹⁶ Namely, there is robust evidence that blacks^{4-12,15,16} and Latinos^{4-9,11,13-15} are less likely to receive the flu vaccination than whites. However, there are limited data for Asian Americans, a growing part of the U.S. population.¹⁷ Limited previous research found

that Asian Americans have comparable vaccination rates with whites.^{7,16,18,19} However, these studies included Asian Americans in aggregate. Because Asian Americans comprise a diverse number of subgroups, it is unclear whether these findings can be extended to all cohorts or whether they are isolated to only a few subgroups. Prior studies outside of the realm of flu vaccination suggest the latter is true because there is evidence of marked heterogeneity among the Asian-American subgroups with respect to clinical outcomes, health care utilization, knowledge and uptake of preventive services, and access to care.²⁰⁻²⁸

Based on the known heterogeneity seen among Asian-American subgroups and prior reports showing disparate rates of vaccination among blacks and Latinos, we theorized that there would be continued disparate rates in flu vaccination coverage among the various racial and ethnic minority groups compared with whites.

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Conflicts of Interest: None to report.

To test this hypothesis, we performed a survey-weighted logistic regression using data from the California Health Interview Survey (CHIS) because it is the largest state health survey and captures the rich racial and ethnic diversity of California.

METHODS

Study design and data source

We performed a retrospective cross-sectional study using the publicly available CHIS 2011-2012 data, the latest 2-year data cycle.²⁹ The CHIS is a population-based telephone survey of California's population, and it has been conducted by the UCLA Center for Health Policy Research biennially since 2001. It is the largest state health survey and one of the largest health surveys nationwide and is funded by a network of public agencies and private organizations, including the California Department of Public Health, California Department of Health Care Services, Centers for Disease Control and Prevention, among many others.³⁰ The CHIS collects data for all age groups on health status, health conditions, preventive care, insurance status, and access to health care.²⁹ The CHIS sample provides estimates for most counties and groups of counties with small populations. It also provides estimates of California's overall population and major and smaller racial and ethnic groups.

The 2011-2012 CHIS used a multistage sample design and random-digit-dial to landline and cellular services to contact potential participants. Those living in group quarters (ie, persons living with ≥ 9 unrelated persons), such as nursing homes, prisons, and dormitories, were not eligible to participate. Data collection occurred from June 2011-January 2013. Interviews were conducted in English, Spanish, Mandarin, Cantonese, Vietnamese, or Korean. During this cycle, the landline and cell phone household response rates were 17.0% and 18.3%, respectively.²⁹ This study was institutional review board exempt because it was an analysis of publicly available, deidentified data.

Study population

We included all surveyed individuals ≥ 18 years old because ACIP recommends that all adults receive an annual flu vaccine.³ Of note, we were unable to exclude those with a contraindication (severe allergic reaction to any component of the vaccine, including egg protein, or after previous dose of any flu vaccine) or precaution (moderate to severe illness with or without fever or history of Guillain-Barré syndrome) to the flu vaccine³ because the CHIS did not collect such data.

Outcomes

Our primary outcome measure was flu vaccination within the last year. The 1-year limit was chosen because the ACIP recommends annual flu vaccination.³ Each CHIS participant was asked: "During the last 12 months, did you get a flu shot or the nasal flu vaccine, called Flumist?" Those who said yes were also asked the following: "Did you have the flu shot or the nasal flu vaccine?" To serve as a comparator, we determined California's flu vaccination rate in 2005 using CHIS data; the 2005 dataset was chosen because it was the earliest cycle where all adults were asked whether they received the flu vaccine.³¹

In California, the flu vaccine is widely available in medical (ie, physician office, community health center) and nonmedical settings (ie, commercial drugstore, senior center). For adults, the cost and insurance coverage for the vaccine varies, but many California local health departments and clinics provide free or low-cost vaccines.³²

Because the inactivated flu vaccine (ie, flu shot) and live attenuated version (ie, nasal flu vaccine) have similar efficacy in adults, the ACIP recommends administering the preparation that is readily available.³ However, adults ≥ 50 years old, pregnant women, immunosuppressed persons, and those who have taken flu antiviral medications within the last 48 hours should not receive the live attenuated version.³

Covariates

Drawing on the Andersen behavioral model of access to health services,³³ we identified predisposing factors (personal demographics and socioeconomic status) and enabling factors that may have influenced uptake of flu vaccination. Race and ethnicity was defined according to the UCLA Center for Health Policy Research classification of mutually exclusive racial and ethnic categories³⁴: white, black, Latino, Japanese, Chinese, Korean, Filipino, Vietnamese, South Asian, Asian other (Cambodian, Pacific Islander, other single Asian type, and multi-Asian), and other (American Indian, Alaska Native, and multiracial). Other demographic variables included age, sex, self-reported health status, presence of a chronic condition (asthma, diabetes type I or II, hypertension, coronary artery disease, congestive heart failure, stroke, gout, arthritis, or lupus), smoking status, marital status, number of years in the United States, English proficiency, and urbanicity. Socioeconomic status variables included employment status and highest level of education. Enabling variables included federal poverty level, insurance status, usual source of care other than the emergency department, and having seen a physician in the last year.

Statistical analysis

All statistical analyses were performed in Stata 13.1 (StataCorp, College Station, TX). To produce estimates for California's noninstitutionalized population, we applied survey weights supplied by the CHIS to the sample data to compensate for the probability of selection and other factors.^{29,35} Categorical and continuous variables were compared using the χ^2 test and adjusted Wald test, respectively. A 2-tailed *P* value $< .05$ was considered statistically significant.

We performed a survey-weighted multivariable logistic regression model to adjust for potentially confounding factors and to calculate odds ratios (ORs) and 95% confidence intervals (CIs). This regression model was performed on our primary outcome of receipt of flu vaccination within the last year, adjusted by all demographic, socioeconomic, and enabling factors previously described. We included all covariates in the regression because we used a direct model building strategy and made no a priori assumptions about which variables have greater importance than others.³⁶

RESULTS

Study population

In 2011-2012, the CHIS collected data from 42,935 individuals, and survey weighting yielded a sample of 27,796,484 individuals. [Table 1](#) depicts the characteristics of the population. Interviews were conducted either in English (85.9%), Spanish (10.3%), Vietnamese (1.5%), Korean (1.2%), Mandarin (0.6%), or Cantonese (0.5%).

Flu vaccination uptake

Overall, 35.8% of the weighted sample in 2011-2012 reported having had a flu vaccination within the last year. In 2005, 26.4% of Californians were vaccinated. [Appendix Table A1](#) shows where the

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