

# Components of Influenza Vaccination Programs that Predict Higher Vaccination Rates: Results of an EIN Survey



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for the members of the Infectious Diseases Society of America's Emerging Infections Network

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## Abstract

**Introduction:** To address suboptimal influenza vaccination rates among healthcare workers (HCWs), HICPAC and ACIP recently issued recommendations designed to increase the number of HCWs vaccinated against influenza. The purpose of this study was to determine how widely these recommendations have been implemented, and the most important components of successful influenza vaccine programs.

**Methods:** The IDSA's Emerging Infections Network surveyed 991 infectious disease consultants (IDCs). IDCs were asked about vaccination programs and vaccination rates at their respective institutions. Multinomial logistic regression models based on proportional odds were used to determine predictors of vaccination rate categories. All program components were significant univariable factors in predicting vaccination rates. Because the program components were highly correlated with one another, principal components analysis (PCA) was applied to find contrasts of the covariates that would serve as optimal predictors of higher vaccination rates.

**Results:** Most IDCs indicated that the vaccination rate for all HCWs in their institution ranged from 41-60%. Vaccination rates were significantly higher in institutions that required signed declination statements ( $p=0.0043$ ). In the model based on PCA for predicting institutional vaccination rates, only the first principal component warranted retention ( $p < .0001$ ). The coefficients of this component indicated that the most important covariates were: 1) offering the influenza vaccine free of charge, 2) providing adequate staff and resources, and 3) educating targeted groups of HCWs. Requiring signed declinations was not heavily weighted in this component.

**Conclusion:** Influenza vaccination rates remain suboptimal and hospitals have not completely implemented the HICPAC/ACIP recommendations to maximize vaccination rates.

## Introduction

Vaccinating healthcare workers (HCWs) against influenza is the single most effective measure to prevent transmission of influenza within healthcare facilities. Vaccination also helps to prevent absenteeism among HCWs. Yet annually, only about 40% of HCWs in the U.S. are vaccinated. To address the persistently low influenza vaccination rates among healthcare workers, the Healthcare Infection Control Practices Advisory Committee (HICPAC) and the Advisory Committee on Immunization Practices (ACIP) recently issued evidence-based recommendations to administrators responsible for influenza vaccination programs. These new recommendations outline several specific measures aimed at encouraging influenza vaccination among healthcare workers. The recommendations include: educating healthcare workers about the benefits of influenza vaccination, making the vaccine free and easy to obtain for all healthcare workers, providing feedback of vaccination rates, obtaining a signed declination from healthcare workers who refuse vaccination, and using the level of vaccination coverage as a measure of patient safety and quality of care.

Whether hospitals are implementing these recommendations is not known. We conducted this study to compare current practices to these recommendations, to determine the most important components of successful influenza vaccine programs, and to report the views of infectious disease physicians about barriers to increasing vaccination rates.

## Methods

The Infectious Diseases Society of America's Emerging Infections Network (EIN) is a provider based sentinel network of infectious disease specialists who regularly engage in clinical practice and belong to either the Infectious Diseases Society of America (IDSA) or the Pediatric Infectious Disease Society (PIDS). In June 2006, the EIN coordinating center distributed a survey via e-mail or facsimile to 991 infectious disease consultants (IDCs) in the U.S. Non-responding members received a second query two weeks later followed by a third after four weeks.

The IDCs were asked about the influenza vaccination programs and vaccination rates at their respective institutions. Frequencies were tabulated for all responses. Because vaccination rates were classified into five groups (0-20%, 20-40%, 40-60%, 60-80%, 80-100%), multinomial logistic regression models based on proportional odds were used to determine predictors of vaccination rate categories.

Univariable models were used to assess the unconditional association between each predictor and the categorized vaccination rate. Because the covariates are highly associated, traditional multivariable models were affected by problems related to multicollinearity. As a methodological alternative for identifying a meaningful set of predictors, we performed correspondence analysis, a form of principal components analysis (PCA) appropriate for frequency data.

The gamma statistic was used to evaluate the general (unconditional) relationship between the vaccination rate and how well hospitals comply with the HICPAC/ACIP recommendations.

## RESULTS

- The overall response rate was 47.3%.
- Most IDCs stated that the vaccination rate for all HCWs in their institution was 41-60%.
- Vaccination rates were significantly higher for those institutions that required signed declination statements ( $p=0.0043$ ).
- The PCA indicated that the most important covariates in predicting the institutional vaccination rates were: 1) whether the influenza vaccine is free of charge, 2) whether the hospital has adequate staff and resources, and 3) whether the hospital educates targeted groups of HCWs. Requiring signed declinations was not one of the most influential covariates in predicting vaccination rates.

**Table 1. Implementation of HICPAC and ACIP recommendations as reported by ID consultants, Num. (row %).**

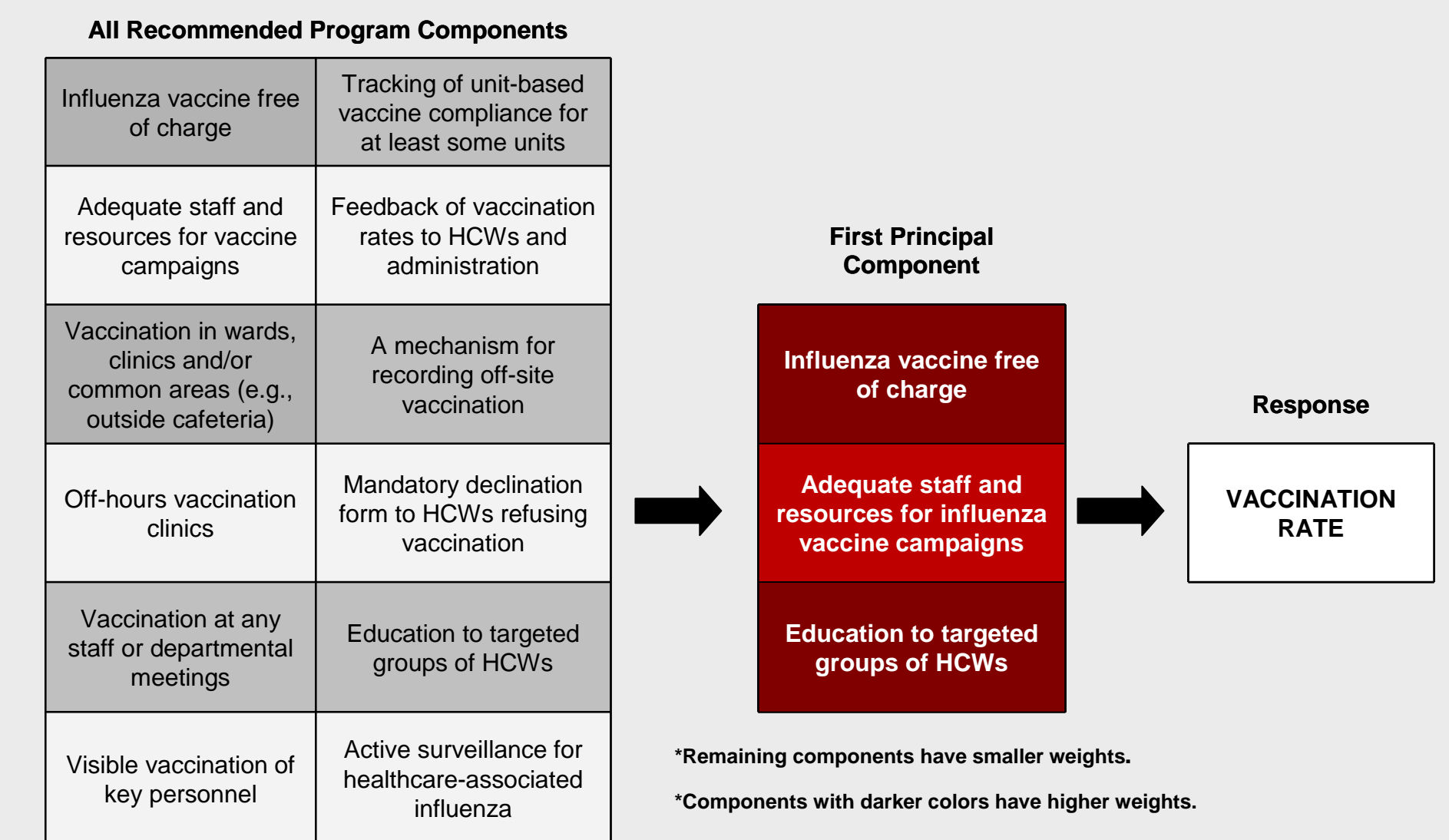
Does your hospital provide:	Yes	p-value†
Influenza vaccine free of charge to all HCWs with direct patient care?	410 (98)	0.0171
Influenza vaccine free of charge to all HCWs?	376 (91)	0.0002
Influenza vaccine free of charge to all volunteers?	342 (86)	0.0189
Adequate staff and resources for influenza vaccine campaigns?	354 (85)	0.0083
Vaccination in wards, clinics and/or common areas (outside cafeteria)?	365 (87)	0.0154
Off-hours vaccination clinics?	236 (57)	0.0179
Vaccination at any staff and departmental meetings?	193 (47)	0.0106
Visible vaccination of key personnel?	208 (51)	0.0035
Tracking unit-based vaccine compliance for at least some units?	237 (59)	<0.0001
Feeding back of vaccination rates to HCWs and administration?	285 (72)	<0.0001
A mechanism for recording off-site vaccination?	115 (29)	0.0013
A mandatory declination form to HCWs refusing influenza vaccination?	93 (23)	0.0043
Education to targeted groups of HCWs?	257 (84)	<0.0001
Active surveillance for healthcare-associated influenza?	67 (22)	0.0023

†P values are based on univariable multinomial logistic regression models.

**Table 2. Institutional vaccination rates as reported by ID consultants.**

Rate / response category	Number (%) respondents
0-20%	1 (0.2)
21-40%	67 (16)
41-60%	120 (29)
61-80%	89 (21)
81-100%	29 (7)
I do not know	89 (21)
Cannot be determined	22 (5)

**Figure 1. Principal components analysis of influenza vaccination program components.**



## Discussion

The IDCs responding to this survey indicate not only that vaccination rates remain unacceptably low, but also that most healthcare institutions have not implemented the current HICPAC/ACIP recommendations for such programs. Our results indicate that institutions with high vaccination rates are in the minority, as only 7% of respondents report vaccination rates of more than 80%.

By using principal components, we were able consider the experiences of hundreds of institutions to determine the most effective components of a successful campaign: making the vaccine free of charge, devoting adequate resources to vaccination efforts (as judged by the infectious disease consultant in that institution), and educating targeted groups of HCWs. These results are consistent with the literature and confirm the observation that making the influenza vaccine available to HCWs is not sufficient to increase vaccination rates.

We are discouraged that most healthcare institutions have yet to implement recommendations that have been shown to increase vaccination rates or at least have strong theoretical rationale for doing so. However, the good news is that the widespread full implementation of these recommendations may boost vaccination rates significantly. Not surprisingly, all of the recommendations suggested by HICPAC/ACIP are associated with higher vaccination levels in our study. Institutions that had adopted all measures had, on average, rates between 60% and 80%, far exceeding the national average.

Declination forms were not commonly used during the 2005-06 season, and, interestingly, were one of the least implemented HICPAC/ACIP recommendations. Nonetheless, infectious disease physicians strongly support this measure and, given their influence within hospitals, they could be key advocates for the implementation of declination forms. Infectious disease physicians also generally support public reporting of HCW vaccination rates at the facility level.