ANNALS OF FAMILY MEDICINE

Online Supplementary Material

Zimmerman RK, Nowalk MP, Tabbarah M, Hart J, Fox D, Raymund M. Understanding adult vaccination in urban, lower-socioeconomic settings: influence of the physician and prevention systems. *Ann Fam Med.* 2009;7(6):534-541.

Supplemental Appendix 1. Data Collection Survey Variables

- "Minority" physicians were African American, Indo-Asian, and East Asian.
- "Physician education" was a combined variable from the following items: Where physician received medical degree (US or foreign), whether and what type of medical literature physician reads, board certification or not, and frequency of attendance at national medical meetings.
- "Higher knowledge/more supportive of PPV (pneumococcal polysaccharide vaccine) vaccination" indicates that the physician is aware of current recommendations for vaccination and agrees with them.
- "Better adaptability to office change" is a combination of ratings of ability of office to change policy and practice to increase immunizations.
- "Greater office stability" is a combination of ratings of financial status of practice and frequency that staff feels overwhelmed by work.
- "Enhanced immunization documentation" is recording immunization in the electronic medical record (EMR) or health maintenance flow sheet vs vaccine log, sticker in chart or chart notes.
- "Reported time spent for well visits" is the response given by physicians to the question, "How much time, on average, do you spend with your adult patients when they come to this office for annual physicals, wellness or preventive visits?" Responses for males and females were combined and averaged.

Medical Record Review

The honest broker scheduled visits to review medical records and sign a confidentiality agreement with those practices requesting one. Using the randomized list generated by the sampling scheme above, the honest broker first reviewed charts to confirm eligibility that the patient had a least 1 visit in 2001 and in 2005, to ensure continuity of care at that practice. If eligible, the patient's PPV vaccination status, annual influenza vaccination for each of the 5 years, and demographic information including race and address (to determine census tract, which was used to determine neighborhood per capita income) were extracted from the complete medical record including flow sheets, paper charts, and EMR. The data were entered into an electronic spreadsheet on a laptop computer.

Supplemental Appendix 2. Statistical Methods Data Reduction

Because of the complexity and effort involved in hierarchical analyses, 28 priority variables from the survey and 2 variables from directly observed timing (examination room time and total visit time) were selected for analyses in hierarchical linear modeling (HLM). Some of these variables were combined scores from several questions centered on a topic. For example, knowledge and attitudes toward PPV (pneumococcal polysaccharide vaccine) vaccination of older adults were combined, as were the physician's view of the office's ability to change policies to increase immunizations. From preliminary analyses, 8 questions with missing data, collinearity concerns, or limited response variability, were eliminated, leaving 22 questions for HLM analyses.

Weighting

For each physician's panel, a sampling fraction was calculated, namely, the number of randomly selected charts that met the inclusion/exclusion criteria divided by the number of patients assigned to that physician. This fraction was used to create a weight (ie, reciprocal of sampling fraction) for further SAS (SAS Institute, Cary, North Carolina) and HLM analyses.

HLM Methods

The level-1 variables in HLM were patient vaccination status, patient race, and patient age. The level-2 variables were the survey variables; these items were considered fixed effects. The following depicts the HLM analyses for a dichotomous variable (vaccinated or not) with a single level-2 predictor.

Level 1 model
$\text{Prob}(\gamma = 1\beta) = P$
$\log[P/(1-P)] = \beta_0 + \beta_1 * (\text{age}) + \beta_2 * (\text{patient race})$

Level 2 model
$\beta_0 = \gamma_{00} + \gamma_{01} * (\text{physician survey variable}) + \mu_0$
$\beta_1 = \gamma_{10} + \mu_1$
$\beta_2 = \gamma_{20}$

The reliability estimate for the weighted model without any independent variables was .869 for PPV and .770 for influenza, which showed good to high reliability. Unit-specific HLM models with robust standard errors were selected among output options.

The error term (μ_1) was significant ($P < .001$) for age but not for race, so the error term for age was retained.

Estimated (predicted) vaccination rates (probability) were calculated using the formula: rate = $1/[1 + \text{exponent} (-\text{logit})]$. A spreadsheet was used to calculate incremental impact.