

# Factors associated with influenza vaccination among elderly persons in Southeastern Brazil

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## Keywords

Immunization programs, statistics & numerical data. Aging health. Influenza vaccine, therapeutic use. Socioeconomic factors. Morbidity surveys.

## Abstract

### Objective

Even though influenza vaccination is free and widely available in Brazil since 1999, coverage is still inadequate in several of the country's municipalities. The aim of the present study was to estimate vaccine coverage and to identify factors related to vaccination against influenza in the elderly population.

### Methods

A household survey was carried out using a systematic random sample (N=365) of the urban population older than 60 years from the city of Botucatu, Southeastern Brazil. A logistic regression model using vaccination in 2002 as the dependent variable was used. The following covariables were tested: sex, age, socioeconomic variables (per capita income, number of persons per dormitory, schooling, marital status, occupation, time living in the city), history of morbidity and hospital admission, smoking, respiratory symptoms in last 15 days, and community activities (voluntary work, neighborhood and church activities).

### Results

Vaccine coverage was 63.2% (95% CI: 58.3-68.2). We found a lower proportion of vaccination among the 60-64 years age group. Variables associated with vaccination in the final model were age (OR=1.09 per year; 95% CI: 1.06-1.13); arterial hypertension (OR=1.92; 95% CI: 1.18-3.13); and participation in community activities (OR=1.63; 95% CI: 1.01-2.65). With the exception of hypertension, vaccination among subjects with chronic diseases did not reach adequate levels, as expected for this high-risk group. Participation in social and community activities was associated with vaccination status.

### Conclusions

Socioeconomic conditions, habits, and age did not restrict access to vaccination campaigns. On the other hand, specific campaigns aimed at the 60-64 years age group may increase vaccination coverage.

## INTRODUCTION

The positive impact of influenza vaccination on the prevention of hospital admission and death due to respiratory diseases has been observed in many areas throughout the world. It is estimated that, in persons older than 65 years, vaccination can reduce

hospital admissions and mortality due to complications of respiratory diseases by 40-70%.<sup>8,13</sup>

Although influenza vaccination for elderly persons is free and available in Brazil since 1999, coverage is still unsatisfactory in several of the country's municipalities. In the state of São Paulo, Southeastern Bra-

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**Table 1** - Self-reported influenza vaccination among elderly subjects and age groups. Botucatu, Brazil, 2003.

Age group (years)	N	Population		Vaccine coverage* (%)	95% CI
			%		
60-64	93		25.5	40.9	35.8-45.9
65-69	84		23.1	61.9	56.9-66.9
70-74	81		22.2	67.9	63.1-72.7
75-79	53		14.6	84.9	81.2-88.6
≥80	53		14.6	75.5	75.5-79.9
Total	364		100.0	63.2	58.3-68.1

\*Vaccination in 2002

Obs: one subject of unknown age  $\chi^2=34.95$ ; Df=4;  $p<0.001$ 

zil, 84% of the population older than 65 years was vaccinated in 1999. From 2000 to 2003, coverage among persons over 60 years was 63.9%, 66.6%, 65.6%, and 75%, respectively. Even without reaching the expected levels, vaccine coverage increased throughout the period. The vast majority of municipalities still show coverage levels below 80%.<sup>1</sup>

Investigations<sup>5,6,10,14</sup> of the reasons for non-adherence to vaccination have been proposed by health-care technicians as subsidy for interventions aimed at improving the current scenario and ensuring greater protection to higher-risk populations.

Thus, the aim of the present study was to estimate the coverage of vaccination and to analyze variables related to influenza vaccination among persons over age 60 years.

## METHODS

We carried out a household survey using a systematic random sample (N=384) of the elderly population of the urban area of Botucatu, a city of 130 thousand inhabitants in the Center-West of the state of São Paulo. Sample size was calculated assuming  $\alpha=0.05$ ;  $\beta=0.2$  (0.8 statistical power); and a prevalence of the studied variables of 0.5. The sample was based on a registry of 9,000 families composed the year before data collection for a population-based study of work accidents in the municipality.<sup>4</sup> Criteria for inclusion of randomly selected subjects into the study were as follows: age 60 years or older, living in Botucatu, being found at home during one of the three attempted home visits, not being institutionalized, and agreeing to participate in the survey by providing written informed consent. We collected information on sex, age, per capita income, number of persons per dormitory, schooling, time living in the city, marital status, occupation, history of morbidity and hospital admission in the previous year, history of vaccination in the previous year, smoking, respiratory symptoms in last 15 days, and social/community activities. Of the total sample selected, five households were found closed, three were summer houses, and 11 subjects had died, totaling 365 interviewed subjects out of

the 384 selected (5% loss). Field researchers were trained and a pretest was conducted.

We analyzed the homogeneity of vaccine coverage and respiratory symptoms in the different age groups using the Chi-square test. We used bivariate analysis to study the association between influenza vaccination in 2002 and covariables of interest, using odds ratios and their respective confidence intervals as estimates of association.<sup>15</sup> Covariables showing p-values below 0.20 were selected and tested using a multiple logistic model, which included into the final model variables with p-values below 0.05.

The present study was approved by the Research Ethics Committee of the Faculdade de Medicina de Botucatu/UNESP.

## RESULTS

We found that 63.2% (95%CI: 58.3-68.2) of elderly subjects reported vaccination in 2002. Table 1 presents vaccine coverage in the different age groups. Subjects aged 60-64 years showed the lowest coverage in the period. Exploratory analysis showed that age distribution according to sex was similar in the sample and in the population of the entire municipality.

Table 2 shows a similar distribution of respiratory symptoms across the different age groups ( $\chi^2=3.18$ ; Df=4;  $p=0.53$ ). Major symptoms are presented in Table 3. Of the 55 subjects with flu-like symptoms in the 15 days preceding the interview, 30 (54.6%) reported more than one symptom, including coughing and nose discharge (10 cases, 18.2%), coughing and

**Table 2** - Respiratory symptoms and age group in elderly subjects. Botucatu, Brazil, 2003.

Age group (years)	Symptoms*	%	Total
60-64	9	9.7	93
65-69	14	16.7	84
70-74	15	18.5	81
75-79	8	15.1	53
≥80	9	17.0	53
Total	55	15.1	364

\*Reported respiratory symptoms in last 15 days

Obs: one subject of unknown age  $\chi^2=3.18$ ; Df=4;  $p=0.53$

chest mucus (7 cases, 12.7%), and sore throat and malaise (5 cases, 9.1%).

Of the 365 subjects interviewed, 15.4% reported diabetes, 7.4% lung conditions, 23.1% heart disease, and 47.5% hypertension. With the exception of hypertensive subjects, individuals with chronic diseases showed vaccine coverage similar to those without such conditions.

Socioeconomic variables (per capita income, number of persons per dormitory, schooling) were not associated with vaccination. However, the subject's insertion into the community (voluntary work, meetings, neighborhood activities) was significantly associated with reported vaccination in 2002.

Table 4 shows the statistics obtained in bivariate and multivariate analyses. Variables showing association to reported vaccination were age (OR=1.09 for each 1-year variation; 95%CI: 1.06-1.13); arterial hypertension (OR=1.92; 95%CI: 1.18-3.13); insertion in community activities (OR=1.63; 95%CI: 1.01-2.65).

## DISCUSSION

The coverage of influenza vaccination detected in 2002 (63.2%; 95%CI: 58.3%-68.2%) was close to that registered by the municipality's Epidemiological Surveillance System (ESS) - 58.3%.

We found a smaller percentage of vaccinated subjects in the 60-64 years age group. Coverage in this age group in our sample (40.9%; 95%CI: 35.8-45.9) was even lower than that reported by the ESS (52.9%). The probability of being vaccinated increases with

**Table 3** - Respiratory symptoms in last 15 days reported by elderly subjects. Botucatu, Brazil, 2003.

Symptom	N (55)	%
Nose discharge	23	41.8
Cough	19	34.6
Sore throat	15	27.3
Malaise	8	14.6
Chest mucus	7	12.7
Fever	6	10.9
Earache	4	7.3
Wheezing	2	3.6
Hoarseness	1	1.8

age according to a number of authors.<sup>5,14,16</sup> This is confirmed in the present analysis.

Reported respiratory symptoms in the 15 days preceding the interview was not associated with vaccination in the final logistic model. A great variety of etiological agents may be associated with viral respiratory conditions. The most relevant virus types include respiratory syncytial viruses, parainfluenza viruses, rhinoviruses, and adenoviruses, among others.<sup>7,12</sup> Thus, vaccination would not protect the population against any airways infection, but only against cases of influenza infection by viruses that are part of the vaccine used in that season.<sup>2</sup>

Regarding specific symptoms, fever was rarely reported by subjects, even in the presence of other more frequent respiratory symptoms such as coughing, nose discharge, and sore throat.

Although vaccination was self-reported rather than documented, the sensitivity and specificity of self-report have been considered high (0.98) and moderate (0.71), respectively, in a study carried out among elderly subjects.<sup>9</sup>

**Table 4** - Statistics for the logistic model of association between influenza vaccination and covariables in the elderly population. Botucatu, Brazil, 2003.

	OR	95%CI	p	OR <sub>adj</sub>	95% CI	p
Age*	1.09	1.05-1.13	0.00001	1.094	1.05-1.13	0.0001
Sex (male)	0.87	0.56-1.33	0.52			
Schooling (years)						
< 2	1.13	0.66-1.91	0.67			
2-7	1.08	0.64-1.81	0.78			
8-11	1.81	0.70-4.68	0.22			
>12	0.659	0.30-1.47	0.31			
Per capita income	0.81	0.46-1.42	0.46			
Other incomes	1.73	0.88-3.39	0.11			
No. persons per dormitory	0.86	0.51-1.44	0.56			
Alone**	1.68	1.06-2.66	0.02			
Less than 10 years in town	1.76	0.18-17.01	0.63			
Smoking	0.85	0.44-1.66	0.73			
Hospital admiss./last year	0.86	0.40-1.85	0.71			
Diabetes Mellitus	1.92	1.00-3.66	0.05			
Hypertension	2.13	1.38-3.31	0.0007	1.92	1.18-3.13	0.008
Lung disease	1.18	0.51-2.71	0.69			
Heart disease	1.62	0.95-2.75	0.08			
Respiratory symptoms	1.51	0.77-2.97	0.26			
Community activities	1.48	0.94-2.33	0.09	1.63	1.01-2.65	0.046

OR: Crude odds ratio in bivariate analysis; OR<sub>adj</sub>: Adjusted odds ratio in multiple logistic model.

\*OR relative to variation for one year increase in age.

\*\*Alone: without marital support, widow(er), single, separated.

Time living in the city was not associated with vaccination. Most subjects lived in the municipality for over 10 years, which prevented us from analyzing the group recently arrived in town. Greater time of residence may facilitate integration with and adaptation to life in the city, as well as contact with information regarding vaccination campaigns.

We found no difference in vaccine coverage according to schooling, per capita income, or number of persons per dormitory; however, the value of schooling information among the elderly population in Brazil is limited. Some authors<sup>3,6</sup> have identified ethnic, social, and schooling-related variations in vaccination levels. In the United States, white subjects are more adherent to vaccination than African-Americans are, even among higher-risk populations, although potential biases involved in these findings were not discussed.

With the exception of hypertensive subjects, vaccine coverage was similar between subjects who reported chronic diseases such as Diabetes Mellitus, heart disease, and/or lung chronic conditions and those who did not, in contrast to what has been described in other studies.<sup>5,11</sup> The benefits of influenza vaccination for patients with chronic disease formally indicate immunization.<sup>2</sup>

Coverage was higher among subjects reporting hypertension, although there is no information in the present study to validate self-reported hypertension in these subjects. A possible explanation would be that the greater proximity of hypertensive subjects with public healthcare services may promote greater access to vaccination campaigns. On the other hand, some studies<sup>5,6,9</sup> call attention to the infrequent indication of vaccination by healthcare teams, although the authors did find an association between vaccination and medical recommendation. Moura & Silva<sup>10</sup> (2004), found that healthcare professionals rarely in-

dicate the vaccine, even for patients for whom formal indication is required.

Influenza vaccination was not restricted by age or socioeconomic level among the elderly population of Botucatu. Other explanations may be related to adherence to vaccination campaigns. Some authors identify as causes of refusal to be vaccinated the disbelief in the efficacy of the vaccine, the fear of adverse reactions, and the belief that influenza is an unimportant disease.<sup>5,10,14,16</sup> Prejudice, insecurity, misconceptions, lack of knowledge of the disease, and, especially, the lack of indication by healthcare teams are likely factors in preventing the vaccination of a large number of patients that could otherwise benefit from the vaccine.

Although providing an in-depth analysis of the nature of the participation of elderly persons in the community is beyond the scope of the present study, some suggestions may be indicated. For instance, subjects who participate in neighborhood, church, and community center activities are more likely to receive information on influenza and vaccination. It is also likely that such activities facilitate the contact of healthcare teams with this segment of the population, promoting greater divulgation and discussion of the benefits of the vaccine, in addition to clarification concerning its indications and risks.

It is possible that the greatest determinant of non-adherence to vaccination is not lack of access. We suggest that increasing divulgation of the vaccine among healthcare professionals, as well as by specific campaigns aimed at persons with chronic diseases, may increase coverage among groups at higher risk of developing complications of respiratory infections. Likewise, adherence of subjects older than 65 years may be increased by means of divulgation campaigns aimed at specific age groups.

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