Factors associated with adherence to influenza vaccination among non-institutionalized elderly in São Paulo, Brazil

Fatores associados à adesão à vacinação anti-influenza em idosos não institucionalizados, São Paulo, Brasil

Factores relacionados con la adhesión a la vacunación antigripal en ancianos que viven en la comunidad, São Paulo, Brasil

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Abstract

The objectives of this study were to estimate influenza vaccination coverage in the elderly and identify factors associated with vaccination uptake. A cross-sectional population-based study was conducted with data collected in 2006 by the Health, Well-Being, and Aging study. The sample consisted of 1,399 elderly in the city of São Paulo, Brazil. The association between vaccine uptake and independent variables was assessed with prevalence ratios, estimated by Poisson regression. Self-reported vaccination was 73.8%. In the final explanatory model, influenza vaccination was associated with older age, presence of chronic diseases, and use of health care in the previous year. A negative association was observed with hospitalization during the previous year. The study concludes that it is necessary to encourage vaccination of elderly less than 70 years of age and those without chronic diseases, as well as to orient health professionals to expand coverage in groups with lower uptake during vaccination campaigns.

Human Influenza; Immunization Programs; Mass Vaccination; Immunization Coverage; Health of the Elderly

Resumo

O objetivo do estudo foi estimar a cobertura vacinal contra a influenza em idosos e identificar os fatores associados à adesão à vacinação. Foi realizado estudo transversal de base populacional, com dados coletados, em 2006, pelo estudo Saúde, Bem-estar e Envelhecimento. A amostra foi composta por 1.399 idosos do Município de São Paulo, Brasil. A associação entre a adesão à vacina e as variáveis independentes foi avaliada por meio da razão de prevalências, estimada pela regressão de Poisson. A vacinação autorreferida foi de 73,8%. No modelo explicativo final, a vacinação contra a gripe foi associada à idade mais elevada, à presença de doenças crônicas e ao atendimento à saúde no ano anterior. Foi observada associação negativa com a internação no ano anterior. Concluiu-se ser necessário incentivar a vacinação de idosos com menos de 70 anos e sem doenças crônicas, assim como orientar os profissionais de saúde para ampliar a cobertura nos grupos com menor participação nas campanhas.

Influenza Humana; Programas de Imunização; Vacinação em Massa; Cobertura Vacinal; Saúde do Idoso

Introduction

Influenza is a viral respiratory disease that can cause small outbreaks and severe epidemics or pandemics. Worldwide, an estimated 600 million persons per year present an episode of influenza. Spread of the disease leads to infectious processes with major morbidity and mortality, especially in groups with increased biological and/or socio-environmental vulnerability, like the elderly and individuals with underlying chronic conditions like heart disease and diabetes [1]. In Brazil, approximately 22 thousand persons from all age brackets die per year due to influenza in epidemic periods. The hospitalization rate from influenza and pneumonia is 6.7 per 1,000 inhabitants, increasing to 12.5 in the more elderly population [2].

Vaccination is one of the principal means of prevention, contributing to the reduction of influenza- attributable mortality in the elderly [3] and indirectly decreasing hospitalizations and expenditures on drugs for secondary infections, thereby generating better results in overall health care and primary care indicators [4,5]. The Brazilian Ministry of Health has conducted nationwide influenza vaccination campaigns since 1999, with the current target of vaccinating at least 80% of the elderly and regularizing their vaccination status to deal with situations of immunological vulnerability. However, vaccination coverage (the percentage of municipalities that reach the 80% vaccination target) still varies widely, despite the known benefits, free vaccination, and the increasing number of doses applied each year in Brazil: in 2008 only 37.6% of the country's municipalities (2,092 of 5,564) vaccinated 80% or more of their elderly residents [5,6,7].

São Paulo was the first municipality to conduct the 1st influenza vaccination campaign for persons 60 years or older, in 1998. The city reached 70% coverage that year, decreasing in subsequent years (57.1% in 1999, 58.0% in 2000, 68.8% in 2001, and 63.7% in 2002), followed by a new increase in 2003. However, this increase was not sufficient to reach the target set by the Ministry of Health for 2009 to 2012, according to Technical Reports by the São Paulo Municipal Health Secretariat for 1999-2013. In 2006 (the reference year for analyzing data in the current study), 21% of the elderly population failed to adhere to the vaccine in the city of São Paulo [8].

Several studies have shown a significant relationship between age, physical exercise, and comorbidities and influenza vaccine uptake [9,10,11,12,13,14]. However, given the variation in vaccination coverage between regions of Brazil, during each vaccination period studies on factors associated with vaccine uptake have become important tools for guiding interventions to expand coverage and improve protection for this population. The current study thus aimed to evaluate influenza vaccination coverage and investigates factors associated with vaccination in non-institutionalized elderly in the municipality of São Paulo.

Methods

A cross-sectional population-based epidemiological study was performed. Data were obtained from the longitudinal study called Health, Well-Being, and Aging (SABE), with three waves of data collection (2000, 2006, and 2010), coordinated by a research team from the University of São Paulo School of Public Health. Since an outbreak of pandemic type A influenza in 2009 [15] may have modified uptake of the vaccine in 2010, the current study analyzed the data from the year 2006.

Population and sample

This was a cross-sectional population-based epidemiological study. Participants were selected by stratified sampling, representative of the non-institutionalized elderly (≥ 60 years) living in the city of São Paulo. The data were originally collected for the second wave of the SABE study, which began in 2000 under the auspices of the Pan-American Health Organization. The original sample included random selection of 72 census tracts (out of a total de 263 included in the Brazilian National Household Sample Survey conducted by the Brazilian Institute of Geography and statistics – IBGE in 1995) as the primary sampling units. Households were the survey's secondary sampling units; they were also randomly selected, and all individuals 60 years or older living in these households were invited to participate, totaling 2,145 participants. Each questionnaire was assigned a sampling weight, calculated as the inverse of the sample fraction in each census tract.

The 2006 sample consisted of individuals originally included in the 2000 wave that survived, were located, and agreed to participate again. The sample also received an additional new cohort of 298 elderly 60 to 64 years of age to replace the aging in the study's population base and maintain its representativeness for the entire age range (60 years or older). Of the 2,143 participants in 2000, 1,115 elderly were interviewed again in 2006. Sampling losses were due to 649 deaths, 178 refusals, 139 elderly that were not located, 51 who had moved to other municipalities, and 11 who had been institutionalized in the interim. Considering the participants that

remained in the cohort and the elderly that entered the 2006 wave, a total of 1,413 elderly were interviewed. The sampling weights assigned in 2000 were recalculated to guarantee the representativeness of the 2006 sample in relation to the population 60 years or older living in the city of São Paulo. The sampling technique used in the SABE study has been described in full detail elsewhere [16].

Variables

All participants were interviewed in their own homes by health professionals specifically trained to apply a comprehensive questionnaire on socio-demographic and behavioral characteristics, lifestyle, quality of life, use of health services, and clinical information, in addition to applying some physical tests. Details on the methodology and questionnaire are available at http://www.fsp.usp.br/sabe/.

The dependent variable was the direct response to the question on whether the subject had received the influenza vaccine in 2006. Individuals not vaccinated in 2006 were also asked about the reason.

To evaluate factors associated with influenza vaccination in the elderly, the independent variables were: demographics [sex (male, female), nationality (Brazilian, foreign), age (60-69 years, 70-79, 80 or older), marital status (with or without spouse), living alone (yes versus no), skin color (white, brown, black, other)], socioeconomic [schooling (fewer than 4 years of formal education, 4 to 7, 8 or more) current work (yes versus no)], behavioral conditions [alcohol consumption, smoking], health conditions [self-rated health, number of self-reported chronic diseases (hypertension, diabetes, chronic pulmonary disease, heart disease, musculoskeletal disease), falls in previous year, depression, and bedridden status], and use of and access to health services (health care in previous year, place of care, and hospitalization in previous year).

Ethical aspects

The second wave of the SABE study (2006) was approved by the Ethics Research Committee of the University of São Paulo, School of Public Health, under research protocol number 1345. Specific authorization for the current study was obtained from the coordinators of the SABE study and the Ethics Research Committee of the University of São Paulo, School of Public Health under research protocol number 48.308.

Statistical analysis

Crude associations were analyzed using the Rao-Scott chi-square test, which tests the significance of the association in double-entry tables, adjusting for the sampling design, which is recommended in studies with complex samples. Evaluation of multiple variables used prevalence ratios as the measure of association between the variables, as estimated by Poisson regression. Inclusion of variables in the multivariate model followed criteria of pertinence to the statistical analysis (significant association). Data analysis used Stata 12.0 2011 (StataCorp LP, College Station, USA), survey module, which allows incorporating aspects pertaining to the complex sample design: non-proportional stratification of the primary and secondary sampling units, cluster selection, and weighting. The weighting factor was defined as the inverse of the sample fraction and adjusted in order for the sample not to present distortions in the distribution by age group and sex.

Results

A total of 1,413 elderly were interviewed, of which 14 were excluded because they did not know (eight) or did not answer (six) whether they had been vaccinated for influenza. The final sample thus consisted of 1,399 individuals, representing 1,017,588 elderly in the municipality of São Paulo.

Vaccination coverage was 73.8%. Of the non-vaccinated elderly, 68.2% could not or did not state the reason for their non-adherence. The principal argument by those who answered this question was that they did not believe in the vaccine (8.3%).

Table 1 shows the distribution of demographic and socioeconomic variables according to influenza vaccine uptake in the elderly in 2006. Only two variables in this section (age and current work status) were associated with influenza vaccination. Vaccination rate was lower in the younger elderly ($p < 0.001$). Some 80% of the elderly 70 years or older were vaccinated, while the proportion was less than 70% among elderly 60-69 years of age. Vaccination rate was also lower among elderly that were working during the data collection period: 68.3% compared to 75.6% among those not working ($p = 0.037$).

Table 2 shows the relationship between behavioral characteristics and vaccine uptake. There were proportionally more vaccinated individuals among the elderly that reported never having smoked.

Table 1

Influenza cavvination in elderly individuals (N = 1,399) according to demographic and socioeconomic characteristics. City of São Paulo, Brazil, 2006.

Variable	Influenza vaccine uptake		p-value *
	Yes (%) [n = 1,067]	No (%) [n = 332]	
Sex			0.464
Male	72.5	27.5	
Female	74.7	25.3	
Nationality			0.368
Brazilian	73.5	26.5	
Foreign	79.9	20.1	
Age (years)			< 0.001
60-69	69.5	30.5	
70-79	80.2	19.8	
≥ 80	79.4	20.6	
Schooling (years)			0.610
0-3	75.3	24.7	
4-7	73.5	26.5	
≥ 8	71.9	28.1	
Did not know/Did not answer	49.6	50.4	
Marital status (with spouse)			0.481
Yes	72.5	27.5	
No	75.5	24.5	
Did not know/Did not answer	100.0	-	
Lives alone			0.777
Yes	74.7	25.3	
No	73.7	26.3	
Did not know/Did not answer	100.0	-	
Skin color			0.812
White	73.5	26.5	
Brown	73.3	26.7	
Black	72.8	27.2	
Other	78.2	21.8	
Did not know/Did not answer	100.0	-	
Currently working			0.037
Yes	68.3	31.7	
No	75.6	24.4	
Did not know/Did not answer	79.0	21.0	

Source: Lebrão & Duarte [45].

* Rao-Scott chi-square test.

Table 3 shows self-reported health conditions according to influenza vaccine uptake. Elderly that reported chronic diseases showed higher vaccine uptake (p = 0.002).

Table 4 presents the analysis of unadjusted associations between vaccine uptake and use of and access to health services by the elderly. There were proportionally more vaccinated individuals among the elderly that had used health services in the previous year. However, hospitalization in the previous year was statistically associated with a lower vaccination rate. Higher vaccine uptake was also observed in study participants that received care under the Brazilian Unified National Health System (SUS) when compared to elderly that used private health services.

Table 2

Influenza vaccination in elderly individuals (N = 1,399) according to behavioral characteristics. City of São Paulo, Brazil, 2006.

Variable	Influenza vaccine uptake		p-value *
	Yes (%) [n = 1,067]	No (%) [n = 332]	
Alcohol consumption in previuos three months			0.109
Yes	70.1	29.9	
No	75.5	24.5	
Smoking status			0.035
Never smoked	76.7	23.3	
Former or current smoker	70.7	29.3	

Source: Lebrão & Duarte [45].

* Rao-Scott chi-square test.

Table 3

Influenza vaccination in elderly individuals (N = 1,399), according to self-reported health conditions. City of São Paulo, Brazil, 2006.

Variable	Influenza vaccine uptake		p-value *
	Yes (%) [n = 1,067]	No (%) [n = 332]	
Self-rated health			0.089
Good	71.6	28.4	
Bad	77.1	22.9	
Did not know/Did not answer	69.2	30.8	
Number of chronic diseases			0.002
0	64.1	35.9	
1	74.0	26.0	
≥ 2	77.8	22.2	
Fall in previous year			0.381
Yes	76.0	24.0	
No	73.0	27.0	
Depression			0.948
Yes	72.9	27.1	
No	74.0	26.0	
Did not know/Did not answer	73.6	26.4	
Bedridden			0.201
Yes	64.1	35.9	
No	74.0	26.0	

Source: Lebrão & Duarte [45].

* Rao-Scott chi-square test.

Table 5 shows the final Poisson multivariate regression model for explaining influenza vaccine uptake. Among demographic and socioeconomic factors, only older age remained as a predisposing factor for the outcome. Aprevalence or adherence was 1.13 (95%CI: 1.06-1.21) and 1.11 times higher (95%CI: 1.02-1.21) among individuals 70-79 years of age and 80 years and older, re-

Table 4

Influenza vaccination in elderly indiviguals (N = 1.399), according to use of and access to health services. City of São Paulo, Brazil, 2006.

Variable	Influenza vaccine uptake		p-value *
	Yes (%) [n = 1,067]	No (%) [n = 332]	
Health care in previous year			0.005
Yes	75.3	24.7	
No	61.2	38.8	
Place of care			0.023
Public service	76.8	23.2	
Private service	73.3	26.7	
Did not know/Did not answer	63.9	36.1	
Hospitalization in previous year			0.044
Yes	66.9	33.1	
No	74.6	25.4	

Source: Lebrão & Duarte [45].

* Rao-Scott chi-square test.

spectively, compared to those 60-69 years of age. The model also showed a higher proportion of vaccinated individuals in elderly that reported one or more chronic diseases, with health care in the previous year, and with no hospitalization in the previous year.

Discussion

The influenza vaccination rate in the sample of elderly (73.8%) is consistent with the estimate by the São Paulo Municipal Health Secretariat (SMS-SP), whose records show that 79% of persons 60 years or older residing in the city were vaccinated in 2006 [8].

Despite the slight difference in the estimates, both indicate that the target set by the Brazilian Ministry of Health (> 70%) was reached [17]. The difference may be partly due to the way the estimates were calculated. The current study recorded self-reported data in a representative sample of the elderly, while the estimate by the SMS-SP was based on administrative data on the amounts of doses distributed and actually applied. The vaccination scheme consisted of the application of one dose per person 60 years or older, regardless of whether they were institutionalized (in nursing homes or similar assisted-living facilities) or community-dwelling [18]. This may also have influenced the difference between the estimates, since the current study only included non-institutionalized elderly (60 years or older).

Among the unvaccinated elderly, a high proportion did or could not answer the question about the reasons for their non-adherence. The most frequently cited reasons were analogous to those reported in other studies in Brazil [12,19] and elsewhere, e.g., the United Kingdom [20] and Italy [21].

Negative perception of influenza vaccination, such as the belief that the vaccine itself could cause flu, was one reason cited for non-adherence. This belief was more common among the unvaccinated [12,22]. Dip & Cabrera [9] also studied the reasons for non-adherence to vaccination by the elderly and found that 83.2% of unvaccinated elderly expressed the wish not to be vaccinated, on grounds of fear of adverse events and distrust concerning the vaccine's efficacy.

Vaccination coverage was significantly lower among the younger elderly (60 to 69 years) than in the others (70 to 79 and 80 years or older). Other studies in Brazil have reported similar findings [9,10,11,12,13], as have studies in other countries [23,24,25]. Previous studies attempted to associate this observation with better self-rated health in younger elderly [20,26]. Lower vaccination coverage has been reported in younger elderly since the early years of the influenza vaccination campaign in various countries, confirming that the likelihood of being vaccinated increases with age [27,28,29].

Table 5

Final Poisson regression model for influenza vaccine uptake in the elderly (N = 1,399). City of São Paulo, Brazil, 2006.

	Influenza vaccine uptake	
	Crude PR	Adjusted PR
	PR (95%CI)	PR (95%CI)
Demographics *		
60-69	1.00	1.00
70-79	1.15 (1.08-1.24)	1.13 (1.06-1.21)
≥ 80	1.14 (1.05-1.24)	1.11 (1.02-1.21)
Self-reported health conditions **		
Number of chronic diseases		
0	1.00	1.00
1	1.15 (1.03-1.30)	1.13 (1.01-1.27)
≥ 2	1.21 (1.08-1.37)	1.18 (1.06-1.32)
Use of and access to health service ***		
Healthn care in previous year		
No	1.00	1.00
Yes	1.23 (1.04-1.46)	1.40 (1.08-1.80)
Place of care		
Private service	1.00	1.00
Public service	1.05 (0.97-1.13)	1.07 (0.99-1.15)
Hospitalization in previous year		
No	1.00	1.00
Yes	0.90 (0.80-1.01)	0.84 (0.75-0.96)

95%CI: 95% confidence interval; PR: prevalence ratio.

Source: Lebrão & Duarte [45].

* Demographic and socioeconomic conditions not adjusted for the other variables;

** Self-reported health conditions adjusted for demographic conditions;

*** Variables on use of and access to health services adjusted for each other and for demographic characteristics and self-reported health conditions and behavioral factors.

Studies disagree on the association between vaccination and number of chronic diseases [9,10,11,12,13,30]. Contrary to the current study's results, other studies have failed to find an association between influenza vaccination and hypertension, diabetes, chronic lung disease, or cardiovascular disease [9], or with the total number of chronic diseases [13]. However, corroborating our results, studies in the United Kingdom [31] and United States [32] found that elderly with one or more chronic diseases presented higher vaccination rates. In addition, studies in South Korea [24] and Sweden [27] as well as multicenter studies in European countries [33,34] observed that elderly with comorbidities were more likely to have been vaccinated, significantly increasing the influenza vaccination rates. Studies in Brazil found an association between influenza vaccination and self-reported chronic diseases [10,11,12] like hypertension and diabetes.

One possible explanation for this association is that hypertension and diabetes are highly prevalent in the elderly and possibly lead them to seek health care services more often to control these diseases, for physician consultations, and to receive medicines. Individuals with chronic diseases may thus have more access to information on vaccination campaigns for the elderly and are more prone to come for vaccination. According to the literature, influenza vaccine uptake in the elderly is related to recommendation by health care professionals and ease of access to health services [10,30,31,34,35]. In Spain, Jiménes-García et al. [36] identified higher influenza vaccination rates in elderly with chronic obstructive pulmonary disease who had consulted a physician in the previous year, due to the greater odds of receiving recommendations to be vaccinated. In Brazil, Araújo et al. [4] found that elderly with comorbidities (hypertension and diabetes)

attended health services more often and received more orientation from primary care professionals, especially nurses, hence leading to greater vaccine uptake.

A study in São Paulo State [30], showed a higher vaccination rate among elderly with self-reported chronic diseases (hypertension, diabetes, and chronic lung disease) and living in municipalities with smaller populations. According to the authors, in these municipalities the elderly depend more on the Brazilian Unified National Health System (SUS), especially for receiving medicines. Thus, elderly with chronic diseases enjoy closer ties to primary care units (UBS) or family health units (USF). Therefore, they are also more likely to receive recommendations from health professionals on vaccination. However, the current study found no association between vaccination coverage and place of last health appointment or between care received in the public versus private sector.

A higher influenza vaccination rate was found in elderly that had received health care in the year prior to answering the questionnaire. Other studies in Brazil have shown similar findings [9,13]. Presumably, individuals that are more concerned about their health or that have more access to information are more likely to seek professional care and other resources such as vaccines. Likewise, older people with closer ties to health services would have greater odds of obtaining more information and encouragement for vaccination [12]. The literature reports that attendance at health care services favors adherence to influenza vaccination [23] and that vaccination is associated with existence of a reference physician [37] or the vaccine's recommendation by a health care professional [31] and trust in the health services, respectively [38]. Vaccine uptake is encouraged by contact between the elderly and health professionals: several physician consultations or a consultation in the previous year, being examined by a health professional, and attending health services regularly [13,22,25,39].

Other authors have confirmed that recommendation of the vaccine by physicians and nurses is an important factor in promoting adherence [20,21]. Burns et al. [40] found that vaccine uptake was higher in individuals that had received orientation from physicians and nurses, including the vaccine's importance and possible adverse events.

In relation to hospitalization in the year prior to answering the questionnaire, various studies have signaled that hospitalization could be an opportunity for applying influenza and pneumococcal vaccination, in addition to patients receiving medical recommendations on the vaccines' benefits for the prevention of severe influenza, pneumonia, exacerbation of chronic conditions, and death [37,41,42]. Although hospitalization represents another form of interaction with health services, a negative association was observed with vaccination, corroborating findings reported in the literature [12]. This relationship is consistent with the hypothesis that non-adherence is higher among both individuals that believe they can do without the vaccine and those who fear they are too weak to receive it [3]. Some hospitalizations of the elderly are also due to pneumonia and other complications of respiratory infections [41,42]. Still, the relationship between hospitalization and influenza vaccine uptake has not been confirmed by various studies conducted in Brazil [9,10,11,13,30].

The current study's principal limitation is that it was based exclusively on self-reported information from the elderly concerning their influenza vaccination status. Participants were asked whether they had been vaccinated in 2006, but this information was not checked against their vaccination cards or other medical and administrative records. This strategy is not free of recall bias; however, the question on vaccination was asked for the same reference year, and previous studies have provided favorable evaluation of the elderly's self-reported information on vaccination [43,44]. Since the study followed a probabilistic sampling plan, the results can be considered representative of community-dwelling elderly in the city of São Paulo. However, the study's findings cannot be extrapolated to other cities, institutionalized elderly, or other target vaccines for the same age group.

Conclusions

The study found that influenza vaccination coverage among elderly in the city of São Paulo in 2006 reached the Brazilian Ministry of Health's target for that year, and that the belief that the vaccine was not effective or necessary was the most frequently cited reason for non-adherence. Based on the findings, the lack of statistical association between adherence and socioeconomic variables shows that there are no inequalities in access to the influenza vaccine in the city of São Paulo. The increase in vaccination rates with increasing age and number of chronic diseases also indicates the adequacy of services for groups at greatest risk, but these results show that health services still have greater case-resolution capacity for the inclusion and treatment of higher-risk patients or groups.

Thus, planning of new campaigns should focus on developing strategies to include younger

and healthier elderly. Previous studies had already found higher vaccine uptake among elderly with greater interaction with health services and among users of the public health system. For the health system, this observation implies the need to continue publicizing the advantages of influenza vaccination for the elderly. Equally important is the search for means of communication with elderly individuals who for some reason have not used health services recently, in order to encourage their adherence to the National Immunization Program.

Resumen

El objetivo del estudio fue estimar la cobertura de vacunación contra la gripe en los ancianos e identificar los factores asociados con la adherencia a la vacunación. Un estudio poblacional de corte transversal, con los datos recogidos en 2006 por el estudio Salud, Bienestar y Envejecimiento. Participaron 1.399 adultos mayores de São Paulo, Brasil. La asociación entre la adherencia a la vacuna y las variables independientes fue evaluada por razones de prevalencia, estimada por la regresión de Poisson. El auto-reporte de vacunación fue 73,8%. La vacunación antigripal fue asociada a edad avanzada, presencia de enfermedades crónicas y atención de salud en el año anterior. Fue observada una asociación negativa con la hospitalización en el año anterior. Se concluyó que era necesario fomentar la vacunación de las personas mayores con menos de 70 años y sin enfermedades crónicas y orientar a los profesionales de la salud para ampliar la cobertura en los grupos con menor participación en las campañas.

Gripe Humana; Programas de Inmunización; Vacunación Masiva; Cobertura de Vacunación; Salud del Anciano

Contributors

R. F. Moura proposed the study, reviewed the literature, analyzed the data, and wrote the article. F. B. Andrade and J. L. F. Antunes analyzed the data, discussed the results, and wrote the article. Y. A. O. Duarte and M. L. Lebrão collected the data, discussed the results, and wrote the final version.

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