

Vaccination against influenza in the elderly: data from FIBRA, Campinas, São Paulo, Brazil

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Abstract *The vaccine against influenza is the main preventative intervention in public health for this disease. The aim of this study was to establish the prevalence of influenza vaccination in senior citizens according to indicators for their functional capacity, frailty, social support and involvement and state of health. This cross-sectional study was conducted in Campinas in 2008-2009 (FIBRA network, Unicamp center) with a probability sampling of the elderly population (≥ 65 years old). The dependent variable was immunization against influenza in the twelve months prior to the research. The adjusted prevalence ratios were estimated by means of Poisson multiple regression analysis. Of the six hundred and seventy-nine senior citizens involved, 74.4% stated they had been vaccinated during the previous year. The prevalence of the vaccination was significantly higher among men and lower among those with a higher level of education. Slow gait speed is positively associated with immunization, as are most of the social involvement indicators. This can contribute towards improving immunization adherence against seasonal influenza and should be widely acknowledged in order to broaden immunization coverage in Campinas.*

Key words *Aged, Influenza immunization, Prevalence, Frailty in the elderly*

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Introduction

Influenza has a great impact on the morbidity and mortality rates of elderly people¹⁻⁴. The vaccine against influenza, which has been distributed for free to elderly people and to some other risk groups by the Ministry of Health since 1999, is the main preventative intervention in public health for this disease^{1,2,5}.

International and national studies have shown that there is an association between socio-demographic variables and immunization against influenza in elderly residents in the community⁶⁻¹². The presence of diseases such as systemic high blood pressure (SHBP) and diabetes mellitus are also associated with the above mentioned vaccination against influenza in the elderly^{6,8,10,12}. Medical recommendations or those from a health professional are highlighted as being the main factor associated with adherence to this preventative procedure^{6,8,10,12}.

In 2013, in the State of São Paulo, four million two hundred and thirty-four thousand and one hundred and sixty-seven immunobiological doses were applied to members of the population aged sixty years or more, attaining a level of coverage of 87.5%¹³. In spite of formal recommendations made to senior citizens and other risk groups to be vaccinated, and although this vaccine is important in preventing hospitalizations and deaths^{1,2}, it has been noted that many municipal districts in Brazil, such as Campinas, have still not attained an adequate level of immunization coverage (106,018 doses, with a coverage level of 77.9%)¹⁴.

An evaluation of factors associated with the vaccination against influenza among senior citizens, taking into account variables related to indicators for functional capacity, frailty, social support and social involvement, is still rarely found in the Brazilian literature. The aim of this study was to investigate the prevalence of the vaccination against influenza, according to the functional capacity, frailty, social support and involvement and state of health indicators, based upon information obtained by means of a specific investigation related to older members of the population.

Methods

Cross-sectional population data was used from a study into the frailty of elderly people, conducted in 2008/2009 (Rede FIBRA - *Rede de Estudos*

sobre Fragilidade em Idosos Brasileiros, polo Unicamp). Research was conducted based on a probability cluster sampling, in that one sampling unit represented ninety census sectors within the urban area of Campinas (SP). The minimum estimated sampling size for the municipality was six hundred and one individuals, with a sampling error of 4%. These senior citizens were contacted in their own homes by teams of trained interviewers (community health workers, university students, pastoral workers and recreational and physical education professionals)¹⁵.

The senior people who do not meet the exclusion criteria¹⁶ were asked to listen to the objectives, conditions and ethical concerns of the research study and, in the event that they decided to participate, sign an Informed Consent form. Information was obtained by means of a structured questionnaire applied during previously scheduled interviews, which were conducted in basic health units, community centers, schools and churches. The interviews were divided into two groups. In the first, everyone undertook frailty, anthropometric, clinical, mental state measurement tests and information was gathered relating to socio-demographic variables¹⁵. The scores obtained in the Mini-Mental State Examination (MMSE)^{17,18} was used as criteria for inclusion in the second group of measurements. Senior citizens who managed to attain the minimum required points relating to their level of education continued to participate in the research (seventeen points for those who cannot read and write, twenty-two for those who went to school for one to four years, twenty-four points for those with five to eight years of study and twenty-six points for those who had attended school for ≥ 9 years at the time of the research), less a standard deviation, based on values suggested by Bruckiet al.¹⁹. These senior citizens were investigated by means of a self-reported health statement about their physical and mental state, functional capacity and psychosocial variables¹⁵.

Data relating to six hundred and seventy-nine individuals aged ≥ 65 years, from a total of nine hundred senior citizens who took part in the initial stages of the survey, was used in this study. This group, which scored above the MMSE cut-off points, responded to the dichotomous item (yes or no) about the flu vaccine for the twelve-month period prior to the research, and to other relevant questions included in the survey.

The following independent variables were selected for the analysis of factors associated with influenza immunization:

- *Socio-demographics*: gender (female and male), age groups (65 to 69; 70 to 74; 75 to 79; 80 or older), married status (married, single/divorced/widowed), education (0. 1 to 4. 5 or more years of study), family income in minimum salaries (MS) applicable during the period of research, the values of which were grouped into five levels (<1 MS; $1 \leq MS \leq 3$; $3 > MS \leq 5$; $MS > 5$), and living arrangements.

- *Functional capacity*: this was assessed by means of self-reported statements provided by the senior citizens, with the exception of the following activities:

- Instrumental Activities of Daily Living (IADL): investigated by means of the Lawton Instrumental Activities of Daily Living Scale (IADL)^{20,21}, which contains eight items. For the purpose of this study, those classified as dependent were those who mentioned the need for partial or total help to carry out one or more activities.

- Basic Activities of Daily Living (BADL): Katz Basic Activities of Daily Life Scale^{22,23}, was used to investigate the level of help required for their self-care activities. In this study, those classified as dependent were those senior citizens who reported needing partial or total help to carry out one or more activities.

- *Care expectations*: was obtained by means of the question *If you require help for any of these activities (IADL/BADL) do you have anyone you can count on?* with possible answers being: *I am alone; only my partner; partner and children; children and grandchildren; other relations/friends/professionals*. Based on these replies, the variable was classified as “no” (alone) or “yes” (all other answers).

- *Perceptions of self-care*: Assessed by means of a scale with five levels of intensity. The question is: *How do you rate the care you take with your health?* The senior citizen can choose one of the alternatives: *very good, good, average, bad and very bad*.

- *Variables indicating social involvement*: this included visiting other people in their homes, how often they attended a church/religious temple to participate in activities linked to religion, took part in social reunions, parties or dances, how often they participated in community centers or groups exclusively for older people and how often they drove a car. All these variables were classified as: *no longer, never did or continue to do so*, and dichotomized.

- *Indicators of frailty*: this included the five criteria proposed by Fried et al.²⁴, by which senior

citizens are classified as being frail (positive for three or more criteria), pre-frail stage (positive for one or two criteria) and non-frail (when no criterion is present), described as follows:

- Non-intentional weight loss during the previous year (yes or no). If the answer was yes, an investigation was made into the reduction (in kilograms), and those senior citizens who stated they had lost more than 4.5kg or 5% of their body weight were classified as frail.

- Tiredness, measured by two of the self-reported items taken from the *Center for Epidemiologic Studies Depression Scale (CESD)*²⁵, with four possible answers (always, usually, infrequently and never or rarely). Senior citizens who answered *always* or *usually* to any one of these questions were classified as being frail.

- Handgrip strength (kgf) was measured with a Jamar dynamometer (Lafayette Instruments, Lafayette, USA) placed in the dominant hand of the elderly person, who made three attempts, with a one-minute interval in between each attempt. Senior citizens are classified as being frail when the average of their three attempts is among the 20% lower distribution values, adjusted for the person's gender and body mass index ($BMI = \text{weight/height}^2 - \text{kg/m}^2$), according to the levels suggested by the World Health Organization (WHO) and described by Marucci and Barbosa²⁶. The cut-off points (CP) for men were: $0 < BMI \leq 23$, $CP \leq 27.00$; $23 < BMI < 28$, $CP \leq 28.67$; $28 \leq BMI < 30$, $CP \leq 29.50$; $BMI \geq 30$, $CP \leq 28.67$. Cut-off points for women: $0 < BMI \leq 23$, $CP \leq 16.33$; $23 < BMI < 28$, $CP \leq 16.67$; $28 \leq BMI < 30$, $CP \leq 17.33$; $BMI \geq 30$, $CP \leq 16.67$.

- Gait speed, indicated by the average time in seconds that an elderly person takes to walk, three times, at their usual pace and on level ground, a distance of 4.6 meters, according to the recommendations proposed by Guralnik et al.²⁷ and Nakano²⁸. Senior citizens were considered to be frail when, in their three attempts, their average time was among the 20% highest distribution times in seconds of the sampling they needed to accomplish their gait speed. The averages were adjusted by the median height (cm) for men and for women (men: $0 < \text{height} \leq 168$, $CP \leq 5.49$ seconds; $\text{height} > 168$, $CP \leq 5.54$ seconds; women: $0 < \text{height} \leq 155$, $CP \leq 6.61$ seconds; $\text{height} > 155$, $CP \leq 5.92$ seconds).

- Physical activity: The *Minnesota Leisure Time Physical Activity Questionnaire (MLT-PAQ)*²⁹ was used to investigate the practice of active sports and physical exercise, and the performance of domestic tasks (each activity being

equal to one measure of absolute intensity, as an indicator of energy expended). In order to calculate the weekly metabolic rate expenditure, a formula was adopted that took into account the metabolic rate equivalent to each physical exercise and each domestic task reported, the minutes spent each day performing these and the number of days of the week when individuals practiced these activities, adjusted according to their weight. To establish guidelines to classify senior citizens according to their level of physical exercise, in the general sense of the term, the authors decided to create five levels according to the results of each sampling and, based on this criterion, classify the individuals who scored less than the first quintile as being inactive or frail.

- *Self-rated health*: obtained by means of the question: *In general, how would you describe your health?* The answers were chosen from the following: *very good, good, regular, bad* and *very bad*.

- *Chronic diseases*: obtained by means of eight dichotomous items that investigate whether a physician had made any form of prior diagnosis of heart disease, SAH, heart attack (CVA), ischemia/stroke, diabetes mellitus, cancer, arthritis or rheumatism, lung disease and osteoporosis. The following categories were created: *none or up to two of these diseases* and *three or more diseases*.

The association between the above-mentioned immunization against influenza and the selected independent variables were checked using a chi-square test, with a 5% significance level. The gross ratio prevalence was estimated and adjusted according to age, with respective 95% confidence intervals. The multivariate analysis was conducted by means of Poisson regression, according to the following hierarchical model: in the first stage the socio-demographic characteristics associated with immunization were included. In the second stage, in addition to the variables belonging to the first group that maintained significance after being adjusted by other variables belonging to the same hierarchical level, the functional capacity, self-care perception, care expectations and social insertion indicators were added, so that the only ones that remained were those with a significance in the adjustment for the other variables belonging to the same hierarchical level and those of a level higher than itself. In the third stage, variables related to frailty and states of health indicators were introduced. Thus, the variables that presented a significant association with immunization were included in the

simple analysis ($p < 0.20$) and, in the final model, what remained were those that presented a < 0.05 p value, when adjusted by the higher level variables and by those from the same hierarchical level. The Stata 11.0 program was used to analyze these data.

The Project was submitted to and approved by the Human Research Ethics Committee, College of Medical Sciences at the State University of Campinas.

Results

Of the six hundred and seventy-nine senior citizens who participated in this study, 68.2% were women ($n = 465$). The average age was 72.3 years ($DP = 5.4$) and the maximum age was ninety years old. The prevalence of the influenza immunization was 74.4% ($n = 505$; $IC_{95\%}$: 71.1 – 77.7). Among the socio-demographic variables analyzed, gender, education and family income were associated in the analysis with immunization against influenza, even after adjustments were made for age (Table 1). With regards the functional capacity, self-help perception, care expectations and social involvement indicators, shown on Table 2, it was noted that their frequent involvement in religious activities at their church or religious temple ($RP = 1.19$; 95% CI: 1.01 – 1.41), and their participation in community groups made up exclusively of senior citizens ($RP = 1.12$; 95% CI: 1.02 – 1.24), were positively associated with influenza immunization.

Table 3 shows the prevalence of immunization, according to frailty and state of health indicators. A slow gait ($RP = 1.13$; 95% CI: 1.02 – 1.25) and the worst self-rated health ($RP = 1.11$; 95% CI: 1.02 – 1.21) were positively associated with the vaccination against influenza. In the simple analysis, among the chronic health conditions investigated, only those with hypertension showed the greater prevalence of immunization ($RP = 1.12$; 95% CI: 1.01 – 1.23).

The findings of the hierarchical regression analysis are shown in Table 4. The prevalence of immunization was significantly higher among men ($RP = 1.14$; 95% CI: 1.04 – 1.25) and lower in those with higher levels of education ($RP = 0.83$; 95% CI: 0.72 – 0.96). A slow gait was positively associated with immunization ($RP = 1.13$; 95% CI: 1.02 – 1.25), as were most of the social involvement indicators ($p < 0.05$).

Table 1. Prevalence and ratio of immunization against influenza in the elderly, according to socio-demographic variables. FIBRA-Campinas, 2008-2009.

Variables	n	%	Adjusted PR (95%CI)
Gender		p = 0.025	
Female	465	71.8	1
Male	214	79.9	1.11 (1.02 - 1.21)
Age group (in years)		p = 0.937	
65-69	246	74.4	1
70-74	227	73.1	0.98 (0.88 - 1.09)
75-79	134	76.1	1.02 (0.91 - 1.15)
80 or older	72	75.0	1.01 (0.87 - 1.17)
Married Status		p = 0.058	
Married	374	77.3	1
Single/divorced/widowed	302	70.9	0.91 (0.83 - 1.00)
Education		p = 0.007	
Never studied	113	79.6	1
1 to 4 years	376	77.1	0.97 (0.87 - 1.08)
5 or more	189	66.1	0.83 (0.72 - 0.95)
Monthly family income		p = 0.146	
< 1 MS	119	68.1	1
1 ≤ MS < 3	244	78.7	1.16 (1.01 - 1.33)
≥ 3 MS < 5	163	74.8	1.11 (0.95 - 1.29)
≥ 5 MS	153	71.9	1.06 (0.90 - 1.24)
Living arrangements		p = 0.291	
Alone	108	73.1	1
With partner	186	79.6	1.09 (0.95 - 1.25)
With sons/daughters	148	71.6	0.98 (0.84 - 1.14)
With partner & children	164	75.0	1.03 (0.89 - 1.19)
Other relations & outsiders/ others	68	67.6	0.93 (0.76 - 1.13)

MS = Minimum salary in force at the time of the research = R\$ 450.00. Adjusted PR (95% CI) = Prevalence ratio adjusted for age (95% confidence interval).

Discussion

This study sought to establish the prevalence of immunization against influenza, according to indicators for functional capacity, frailty, social support and involvement and state of health, with data research conducted with senior citizens living in Campinas (SP). The findings show the prevalence of influenza immunization in 74.4%, a fact that has also been observed in senior citizens living in other countries³⁰⁻³² as well as in Brazil^{10-12,33}. It should be stressed that the goal established by the Ministry of Health at the time of the research was 80%³⁴. Official figures indicated that immunization coverage in the State of São Paulo during 2008 was in the order of 81.9% and most municipalities attained the epidemiological goal established for this immunization (homogeneity of 77.8%)¹⁴.

The prevalence of immunization against influenza was significantly higher among men, as confirmed by Shemesh et al.³⁵ and Sarria-Santamera and Timoner³⁶. However, the difference between genders in relation to acceptance of the vaccine was not observed in various other studies^{6,10-12,30-32,37}.

With regard to age, no differences were found in the age groups studied. Since less coverage was observed in senior citizens under the age of seventy^{10-12,33,36,37}, age was considered as an adjustable variable for the purpose of the analyses.

The association observed between immunization and a person's level of education corroborates information contained in other studies conducted with elderly people in different regions of the State of São Paulo¹¹. It is possible that in some places the preventative services offered by the public health services are less valued by senior

Table 2. Prevalence and prevalence ratio, according to indicators for functional capacity, perceptions of self-care, care expectations & social insertion. FIBRA-Campinas, 2008-2009.

Variables	n	%	p value	Adjusted PR (95%CI)
Functional capacity			0.950	
Independent	600	74.3		1
Dependent on 1 or more IADL/BADL	74	74.7		1.00 (0.87 - 1.15)
Care expectations			0.397	
No	72	77.8		1
Yes	594	73.7		0.95 (0.83 - 1.08)
Perceptions of self-care			0.455	
Very good/good	482	75.3		1
Regular/bad/very bad	193	72.5		0.96 (0.87 - 1.06)
Social insertion			0.473	
Visits other people's homes				
No longer does this/never did this	162	72.2		1
Still does this	513	75.0		1.04 (0.93 - 1.15)
Attends a church/religious temple for activities linked to religion			0.015	
No longer attends/never attended	85	63.5		1
Still attends	589	75.9		1.19 (1.01 - 1.41)
Participates in social meetings, parties/dances			0.129	
No longer participates/ never participated	321	71.6		1
Still participates	353	76.7		1.07 (0.98 - 1.17)
Participates in community centers or groups exclusively for senior citizens			0.037	
No longer participates/never participated	396	72.6		1
Still participates	106	81.5		1.12 (1.02 - 1.24)
Drives a car			0.231	
No longer drives/has never driven	506	75.5		1
Still drives	168	70.8		0.94 (0.84 - 1.05)

Adjusted PR (95% CI) = Prevalence ratio adjusted for age (95% confidence interval).

citizens who have better socio-economic levels. Another hypothesis is that, when accessing private and specialized health services, these senior citizens are not advised to be immunized against influenza and/or are less aware of immunization campaigns. Donalisio et al.¹² and Lima-Costa¹⁰ found no association between a person's level of education and immunization in the municipalities of Botucatu and in the metropolitan region of Belo Horizonte, respectively. However, international studies indicate a greater prevalence of immunization against influenza among senior citizens with a higher level of education^{6,32}. Thus, no consensus exists in the international literature about this association, as shown in a systematic revision of social health determinants and seasonal immunization against influenza in senior citizens⁶.

With regards to the frailty and state of health indicators assessed, it was observed that the prev-

alence of immunization was significantly higher only in the case of senior citizens who had a slow gait. Gait speed is considered to be a predictive indicator of significant negative outcomes in the elderly population, including falls, hospitalization, incapacity and death³⁸. It should be emphasized that, in this study, a slow gait, when this indicates a change in a physical function, especially a loss of mobility, has not been identified as a factor that prevents anyone from being immunized.

No significant statistical differences were observed between the frequency senior citizens are vaccinated in relation to self-reported diabetes, cardiovascular disease, and heart attack/strokes/ischemia and lung diseases. This is an important point, in view of the formal recommendations made for risk groups to be immunized and in view of the importance given to this vaccination program by the health services as a means to prevent hospitalization and death^{1,2,5}. Mansur et al.³⁹

Table 3. Prevalence and prevalence ratio, according to indicators for frailty and state of health. FIBRA-Campinas, 2008-2009.

Variables	n	%	p value	Adjusted PR (95%CI)
Frailty			0.214	
Not frail	307	72.6		1
Pre-frail stage	340	76.7		1.05 (0.96 - 1.15)
Frail	31	64.5		0.88 (0.67 - 1.16)
Criteria of frailty				
Non-intentional loss of weight			0.109	1
No	567	75.3		0.90 (0.78 - 1.04)
Yes	99	67.7		0.88 (0.99 - 1.01)
Tiredness			0.840	
No	556	74.1		1
Yes	116	75.0		1.01 (0.90 - 1.14)
Low handgrip strength			0.277	
No	562	73.7		1
Yes	112	78.6		1.06 (0.95 - 1.19)
Physical inactivity			0.128	
No	553	74.9		1
Yes	102	67.6		0.90 (0.78 - 1.04)
Slow gait			0.040	
No	570	72.8		1
Yes	107	82.2		1.13 (1.02 - 1.25)
Health self-evaluation			0.018	
Very good/good	396	71.2		1
Regular/bad/very bad	280	79.3		1.11 (1.02 - 1.21)
High blood pressure			0.021	
No	241	69.3		1
Yes	437	77.3		1.12 (1.01 - 1.23)
Diabetes Mellitus			0.668	
No	529	74.1		1
Yes	149	75.8		1.02 (0.92 - 1.13)
Heart disease (angina, myocardial infarction or heart attack)			0.212	
No	499	73.3		1
Yes	178	78.1		1.06 (0.97 - 1.17)
Stroke/CVA/Ischemia			0.314	
No	627	74.0		1
Yes	51	80.4		1.08 (0.94 - 1.25)
Lung diseases (bronchitis & emphysema)			0.912	
No	609	74.4		1
Yes	68	75.0		1.01 (0.87 - 1.16)

Adjusted PR (95% CI) = Prevalence ratio adjusted for age (95% confidence interval).

confirmed a reduction in the mortality rates for ischemic heart diseases among the elderly, before and after the start of the annual vaccination campaigns against flu in the city of São Paulo.

From the time vaccination campaigns for senior citizens first began, efforts have been made at various levels to broaden their scope^{1,13}. The specialized literature on the subject and the content of promotional campaigns that target lay persons, also emphasize how important it is to

be immunized against influenza as a preventative measure against the most serious effects that this disease can produce, from viral to secondary bacterial pneumonia and even death, especially among individuals belonging to high-risk groups^{1-4,36,40-42}.

A population-based study conducted in Botucatu (SP)¹² found an independent association between systemic high blood pressure (SHBP) and influenza immunization, a fact also

Table 4. Final findings of the hierarchical regression analysis of factors associated with immunization against influenza in the elderly. FIBRA-Campinas, 2008-2009.

Variables	First stage Adjusted PR* (95% CI)	Second stage Adjusted PR** (95% CI)	Third stage Adjusted PR*** (95% CI)
Gender			
Female	1	1	1
Male	1,11 (1,02-1,21)	1,14 (1,05-1,25)	1,14 (1,04-1,25)
Education			
Never studied	1	1	1
1 to 4 years	0,97 (0,87-1,08)	0,97 (0,87-1,08)	0,97 (0,87-1,08)
5 years or more	0,83 (0,72-0,95)	0,83 (0,72-0,95)	0,83 (0,72-0,96)
Attends church/religious temple for activities linked to religion			
No longer attends/never attended		1	1
Still attends		1,20 (1,02-1,40)	1,21 (1,03-1,43)
Participates in social meetings, parties or dances			
No longer participates/never participated		1	1
Still participates		1,14 (1,04-1,26)	1,10 (1,01-1,21)
Participates in community centers or groups exclusively for the elderly			1
No longer participates/never participated		1	1,14 (1,04-1,26)
Still participates		1,13 (1,03-1,25)	
Gait speed frailty			
No			1
Yes			1,13 (1,02-1,25)

*Adjusted by socio-demographic variables. **Adjusted for socio-demographic variables, indicators of functional capacity, and perceptions of self-care, care expectations & social insertion. ***Adjusted by socio-demographic variables, indicators of functional capacity, perceptions of self-care, care expectations and social insertion, and indicators of frailty and state of health. PR: Prevalence ratio adjusted by means of Poisson multiple regression analysis.

observed by Francisco et al.¹¹ with data from a population-based survey carried out in regions within the State of São Paulo. In Belo Horizonte, the survey on high blood pressure showed a clear association with immunization¹⁰. An increase in immunization coverage among senior citizens with comorbidities is of vital importance to public health^{3,4,40}. For this reason, immunization is recommended by the *Advisory Committee on Immunization Practices* (ACIP) and the Brazilian Ministry of Health. Since 2006, guidelines issued by the *American Heart Association* (AHA) and the *American College of Cardiology* (ACC) have recommended immunization in patients with atherosclerotic diseases in general⁴³.

The Advanced Activities of Daily Living (AADL) involve more complex recreational, productive and social tasks to enable a functional assessment to be made of the elderly⁴⁴. The frequency of their attendance at church/religious temples to take part in activities related to religion, as well as their involvement in meetings/parties or dances, and community centers/groups are pos-

itively associated with immunization, even after adjustments are made for the income or level of education of the senior citizens concerned (data not presented).

The AADL are related to the highest functional levels found among the elderly, except for those activities related to resolving practical problems in familiar surroundings, to self-care and survival⁴⁵. These are associated with social participation and the performance of social roles⁴⁶. In the study conducted by Donalisio et al.¹², the involvement of elderly people in the community (voluntary work, meetings, neighborhood activities) was significantly associated with self-reported immunization. In Rio Grande do Sul, a survey indicated that the myths and beliefs that prompted the elderly not to be vaccinated are influenced by their own experiences and by those of their social circle⁴⁷.

In spite of not attaining the goals established by the Ministry of Health, data disclosed in this study has shown that the immunization campaigns in Campinas in 2008 achieved a wide

coverage, both among senior citizens with less physical mobility, as well as among those with higher functional levels. Among the variables considered, the factors independently associated with immunization include demographic characteristics, social involvement, and one of the phenotypes of frailty, as defined by Fried et al.²⁴.

The socio-economic conditions of Brazilian senior citizens are very heterogenic, as are conditions to ensure access to health care services, functional capacity, chronic disease control, social support, lifestyle and psychosocial aspects⁴¹. This is particularly true in relation to immunization against influenza, since several studies have established that the guidance provided by physicians or other health professionals about the importance of being vaccinated as the main predictor among elderly people^{6,8,11,30}. This data was not collected during this study, which restricts the specific evaluation of this variable for the elderly people studied in this survey.

In the FIBRA study, quotas were recruited from a sampling of men and women from four different age groups (65-69, 70-74, 75-79 and 80 or older), which corresponded to that observed in the same age and gender groups in the urban population of Campinas. However, according to Neri et al.¹⁵, the discrepancies noted between the quotas that are estimated and those that are obtained may represent a limitation to a broader generalization of findings for the population. It should also be noted that the information relating to immunization was self-reported and data were collected simultaneously. Nonetheless, it has been shown how important it is to remind elderly people to be immunized against influenza^{48,49}. Selecting senior citizens without cognitive deficiencies and the fact that they were required to make their own way to the data collection location might imply a certain degree of bias in those selected to participate in this study, that is to say, the fact is that it is possible that most of the senior citizens who participated in this survey were in good physical, emotional and cognitive shape during the period of research.

Initially made available by the Ministry of Health in 1999 to individuals over the age of sixty-five and to some risk groups, as from 2000, immunization against influenza was expanded

to include citizens aged between sixty and sixty-four years of age. At the moment, various different groups (health workers, indigenous peoples, children aged between six months and five years of age, pregnant women, mothers who have given birth within the past forty-five days, those with chronic non-communicable diseases and other specific clinical conditions) are considered as priority cases for immunization¹. An infection caused by influenza in the elderly can involve a series of problems related to their general state of health. It can also lead to serious clinical conditions, pneumonia and death^{1,2,5,13}. The main preventative public health intervention available for this condition is immunization^{1,2}. Senior citizens and health professionals should give greater value to health care and disease prevention services. According to Dias et al.⁵⁰, *the curative stereotype of medicine, which is ingrained in the mind of the population, especially among the elderly, means that people only seek medical treatment in the more advanced stages of these diseases ...*, which involves greater costs related to treatment and reduces the possibility of obtaining a better diagnosis as well as the chance to reverse the clinical condition itself.

The prevalence of immunization against influenza in Campinas in 2008 was below the goals established by the Ministry of Health. The formulation of strategies to increase immunization coverage needs to concentrate more on older people with a higher level of education. Health professionals working within the public sector and, especially those in private health care, should recommend immunization and ensure that senior citizens are aware of its benefits in preventing influenza and other related health problems, since failing to underline the need for immunization translates into lost opportunities which can have very negative effects on their quality of life.

Active ageing is a process whereby health opportunities, participation and safety are optimized, with the aim of improving the quality of life of senior citizens⁵¹. Thus, social involvement can help encourage more people to be immunized against seasonal influenza. In addition, efforts should be made to expand immunization coverage in Campinas.

Collaborations

PMSB Francisco and FSA Borim prepared the proposal and drafted this article, planned and conducted the analyses and were responsible for revising the relevant literature. AL Neri coordinated the fieldwork, revised the data analyses, undertook the critical revision of the content and approved the final text of the manuscript.

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