

Sheila Rizzato Stopa<sup>I</sup>

Chester Luiz Galvão César<sup>II</sup>

Neuber José Segri<sup>III</sup>

Moisés Goldbaum<sup>IV</sup>

Vanessa Martins Valente  
Guimarães<sup>V</sup>

Maria Cecília Goi Porto Alves<sup>VI</sup>

Marilisa Berti de Azevedo  
Barros<sup>VII</sup>

# Self-reported diabetes in older people: comparison of prevalences and control measures

## Diabetes autorreferido em idosos: comparação das prevalências e medidas de controle

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### ABSTRACT

**OBJECTIVE:** The objective of this study was to analyze the prevalence of diabetes in older people and the adopted control measures.

**METHODS:** Data regarding older diabetic individuals who participated in the Health Surveys conducted in the Municipality of Sao Paulo, SP, ISA-Capital, in 2003 and 2008, which were cross-sectional studies, were analyzed. Prevalences and confidence intervals were compared between 2003 and 2008, according to sociodemographic variables. The combination of the databases was performed when the confidence intervals overlapped. The Chi-square (level of significance of 5%) and the Pearson's Chi-square (Rao-Scott) tests were performed. The variables without overlap between the confidence intervals were not tested.

**RESULTS:** The age of the older adults was 60-69 years. The majority were women, Caucasian, with an income of between > 0.5 and 2.5 times the minimum salary and low levels of schooling. The prevalence of diabetes was 17.6% (95%CI 14.9;20.6) in 2003 and 20.1% (95%CI 17.3;23.1) in 2008, which indicates a growth over this period (p at the limit of significance). The most prevalent measure adopted by the older adults to control diabetes was hypoglycemic agents, followed by diet. Physical activity was not frequent, despite the significant differences observed between 2003 and 2008 results. The use of public health services to control diabetes was significantly higher in older individuals with lower income and lower levels of education.

**CONCLUSIONS:** Diabetes is a complex and challenging disease for patients and the health systems. Measures that encourage health promotion practices are necessary because they presented a smaller proportion than the use of hypoglycemic agents. Public health policies should be implemented, and aimed mainly at older individuals with low income and schooling levels. These changes are essential to improve the health condition of older diabetic patients.

**DESCRIPTORS:** Aged. Diabetes Mellitus, Epidemiology. Hypoglycemic Agents. Self Care. Life Style. Health Behavior. Health Services Accessibility. Health Surveys.

<sup>I</sup> Programa de Pós-graduação em Saúde Pública. Faculdade de Saúde Pública. Universidade de São Paulo. São Paulo, SP, Brasil

<sup>II</sup> Departamento de Epidemiologia. Faculdade de Saúde Pública, Universidade de São Paulo. São Paulo, SP, Brasil

<sup>III</sup> Departamento de Saúde Coletiva. Universidade Federal de Mato Grosso. Cuiabá, MT, Brasil

<sup>IV</sup> Departamento de Medicina Preventiva. Faculdade de Medicina. Universidade de São Paulo. São Paulo, SP, Brasil

<sup>V</sup> Escola de Artes, Ciências e Humanidades. Universidade de São Paulo. São Paulo, SP, Brasil

<sup>VI</sup> Instituto de Saúde. Secretaria de Estado da Saúde. São Paulo, SP, Brasil

<sup>VII</sup> Departamento de Medicina Preventiva e Social. Faculdade de Ciências Médicas, Universidade Estadual de Campinas. Campinas, SP, Brasil

#### Correspondence:

Sheila Rizzato Stopa  
Departamento de Epidemiologia – FSP-USP  
Av. Dr. Arnaldo, 715 Cerqueira César  
01246-904 São Paulo, SP, Brasil  
E-mail: sheilarizzato@usp.br

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## RESUMO

**OBJETIVO:** O objetivo deste trabalho foi analisar a prevalência de diabetes em idosos e as medidas de controle adotadas.

**MÉTODOS:** Foram analisados dados de idosos diabéticos participantes dos Inquéritos de Saúde no Município de São Paulo, SP, ISA-Capital, 2003 e 2008, estudos de base transversal. Compararam-se as prevalências e seus intervalos de confiança entre os dois anos de estudo, segundo variáveis sociodemográficas. Realizou-se a junção dos bancos de dados quando ocorreu sobreposição dos intervalos de confiança. Realizou-se teste Qui-quadrado com nível de significância de 5% e o Qui-quadrado de Pearson (Rao-Scott). Variáveis sem sobreposições entre os intervalos de confiança não foram testadas.

**RESULTADOS:** Os idosos tinham predominantemente de 60 a 69 anos, eram do sexo feminino, de cor branca, com renda > 0,5 até 2,5 salários mínimos e baixa escolaridade. A prevalência de diabetes foi de 17,6% (IC95% 14,9;20,6) em 2003 e 20,1% (IC95% 17,3;23,1) em 2008, sugerindo crescimento no período (p no limite da significância). O uso de hipoglicemiantes apresentou maiores prevalências, seguido por dieta alimentar, entre os meios adotados para controlar o diabetes. Houve baixa frequência das práticas de atividade física, apesar da diferença significativa encontrada no período. Ocorreram diferenças significativas relacionadas ao acesso e ao uso de serviço público de saúde para controle do diabetes, maior em idosos com menor renda e menor escolaridade nos dois anos analisados.

**CONCLUSÕES:** O diabetes é uma doença complexa e desafiadora para o portador e para os sistemas de saúde. São necessárias iniciativas que encorajem práticas de promoção de saúde, uma vez que estas apresentaram percentuais inferiores ao uso de hipoglicemiantes. Deve-se investir em políticas públicas de saúde, principalmente direcionadas aos idosos de baixa renda e escolaridade. Tais mudanças são essenciais para a melhoria das condições de saúde dos idosos portadores de diabetes.

**DESCRITORES:** Idoso. Diabetes Mellitus, Epidemiologia. Hipoglicemiantes. Autocuidado. Estilo de Vida. Comportamentos Saudáveis. Acesso aos Serviços de Saúde. Inquéritos Epidemiológicos.

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## INTRODUCTION

Population aging is one of the greatest challenges in public health, particularly in medium-income countries.<sup>a</sup> There has been a significant increase in the older population ( $\geq 60$  years) in Brazil over the last decades: from 1.7 million in 1940 to 20.5 million in 2010 (10.8% of the Brazilian population).<sup>a,b</sup>

Moreover, Brazil is going through a process of epidemiological transition. Chronic diseases, which are typical of aging, are in focus in the context of public health. Diabetes mellitus is one of the main diseases that affect the older population. Its increasing

prevalence and high morbidity and mortality make it a global epidemic.<sup>10,23</sup>

Diabetes is challenging for the health systems worldwide. Population aging, growing urbanization, and intensification of globalization as well as the adoption of unhealthy lifestyles and industrialized diets are the main causes for the increased incidence and prevalence of the disease.<sup>10</sup>

The number of patients with diabetes worldwide exceeds 180 million and is estimated to reach 350 million in 2025.<sup>23</sup> According to the Ministry of Health,

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<sup>a</sup> Camarano AA, Kanso S. Perspectivas de crescimento para a população brasileira: velhos e novos resultados. Brasília (DF): Instituto de Pesquisa Econômica Aplicada; 2009.

<sup>b</sup> Instituto Brasileiro de Geografia e Estatística. Censo 2010. Brasília (DF); 2010 [cited 2014 Feb 28]. Available from: <http://www.censo2010.ibge.gov.br/sinopse/webservice>

over 10 million individuals in Brazil have diabetes, of which approximately 33.0% are between 60 and 79 years of age.<sup>c</sup>

The aim of this study was to analyze the prevalence of diabetes among older people and the adopted control measures.

## METHODS

This cross-sectional study used data from Health Surveys in the Municipality of Sao Paulo, SP, Southeastern Brazil, ISA-Capital 2003, and ISA-Capital 2008. The addressed topics were related the individual's overall health (lifestyle, living conditions, state of health, and use of health services).

In the ISA-Capital 2003, 3,357 individuals (872 older adults) were interviewed. The sample was stratified by groups in two stages: census and households. Sixty census sectors were drawn based on the PNAD-2002 sample (National Household Sample Survey). The sectors were drawn into three strata, according to level of schooling of the head of the family, measured by the percentage of those who had a university degree: < 5.0%, 5.0%-24.99%, and  $\geq$  25.0%.

The planned minimum sample size was 420 individuals for each domain, i.e., sex and age: < 1 year, 1-11 years; 12-19 years (males and females); 20-59 years (males and females); and  $\geq$  60 years (males and females). This was based on an estimated prevalence of 50%, a confidence level of 95% (95%CI), a sampling error of 0.06, and a design effect of 1.5.

In the ISA-Capital 2008, 3,271 individuals (924 older adults) were interviewed, and the stratified sampling was performed by groups in two stages: census sectors (70 sectors) and households. The sample was formed by eight demographic domains, as in the survey of 2003. The sample size varied between 300 and 780 domains. These were calculated considering an estimated prevalence of 50.0%, 95%CI, a sampling error between 0.04 and 0.07, and a design effect of 1.5.

We used the sampling domains of  $\geq$  60 years for both the male and female sexes from the two surveys.

Data were obtained by means of a questionnaire composed of groups of topics with specific questions – mainly closed questions with pre-established alternatives. The questionnaires were administered by trained interviewers and answered by the older individuals themselves.

The dependent variable was the presence of self-reported diabetes.

The independent variables were demographic and socioeconomic characteristics, such as sex (male and female), age (60-69 years, 70-79 years, and  $\geq$  80 years), ethnicity (Caucasian and non-Caucasian), marital status (married, stable relationship, single, separated/divorced, widower), level of schooling (years of study: 0-3, 4-7,  $\geq$  8), occupation (with an activity, without an activity, unemployed), per capita income (minimum salary:  $\leq$  0.5, > 0.5-2.5,  $\geq$  2.5). The following parameters were also analyzed: knowledge and practice of measures of diabetes control (diet, regime to lose/maintain weight, physical activity, routine use of insulin, use of insulin on a need basis, routine use of oral hypoglycemic agents, use of oral hypoglycemic agents on a need basis, no measures, and others), complications (vision problems, kidney problems, and circulatory problems), and the use of health services to control diabetes (flu and pneumonia immunization, proximity of the vaccination center to the older person's home, and type of service: public or private).

Association between demographic/socioeconomic variables and the presence of diabetes was estimated using the Chi-square test, and the level of significance was set as 5%.

Prevalences and 95%CI were compared to evaluate the control practices and use of health services by diabetic patients. The overlap between the confidence intervals was determined for the two distinct groups.

The difference between the two years was considered significant when there was no overlap between the confidence intervals. Otherwise, the databases from 2003 and 2008 were combined (combined database) using the statistical software Stata 11.0 and the append command.

The combination of the databases was necessary to determine if small overlaps between confidence intervals were statistically significant. To assemble the information contained in both databases in a single database, all the variables kept the same name and answer category and a new variable was created to identify from which database the observation originated.<sup>17</sup> The association was performed using Pearson's Chi-square (Rao-Scott). The variables without overlap between the confidence intervals were not tested.

The data analysis was performed using the statistical software Stata 11.0 and the survey module, which takes into consideration the effects of complex sampling.

The present study was approved by the Ethics Committee of the *Faculdade de Saúde Pública* of the *Universidade de São Paulo* (Opinion 48.299, de 2012).

<sup>c</sup> Portal Brasil. Saúde do Idoso. Brasília (DF); 2012 [cited 2014 Feb 28]. Available from: <http://www.brasil.gov.br/sobre/saude/saude-do-idoso/diabetes>

## RESULTS

Diabetes mellitus was reported by 17.6% (95%CI 14.9;20.6) of the older individuals who answered the 2003 survey and by 20.1% (95%CI 17.3;23.1) of those who answered the 2008 survey. This increase tended to be significant. There was a significant association between self-reported diabetes and low income (in 2003) and between self-reported diabetes and low levels of schooling (in 2008) (Table 1).

In 2003, 52.1% of the older adults with diabetes mentioned following a diet. These individuals were mainly women (73.8%;  $p = 0.029$ ). The percentage of older individuals with diabetes following a diet in 2008 was 61.0%. In both years, > 90.0% of the

older adults stated not following a regime to lose/maintain their weight. There was a low frequency of physical activity, with > 85.0% of the older people stating that they did not perform any physical activities ( $p = 0.029$ ), in both years (Table 2).

The prevalence of routine use of insulin was similar in both years; it was more prevalent in women: 88.2% ( $p = 0.010$ ) of the older women with diabetes in 2003 and 81.4% ( $p = 0.016$ ) in 2008. Hardly any older individuals (< 1%) used insulin on a need basis. The prevalence of routine use of oral hypoglycemic agents was 61.0% in 2003 and 71.8% in 2008, which represented a significant increase during this period. In both years, hardly any older individuals (< 3%) used oral hypoglycemic agents on a need basis. The

**Table 1.** Prevalence of diabetes mellitus according to demographic and socioeconomic characteristics in older adults. ISA-Capital, Sao Paulo, SP, Southeastern Brazil, 2003 and 2008.

Variable	2003			2008		
	n	Prevalence (%) <sup>a</sup>	p <sup>b</sup>	n <sup>c</sup>	Prevalence (%)	p <sup>b</sup>
Age group (years)			0.15			0.81
60 to 69	474	16.5		443	18.7	
70 to 79	307	20.5		323	21.5	
≥ 80	91	11.9		158	20.8	
Sex			0.51			0.34
Female	451	18.7		568	20.5	
Male	421	15.4		356	19.3	
Ethnicity			0.80			0.09
Caucasian	589	17.3		655	18.8	
Non-caucasian	261	17.5		267	22.8	
Marital status			0.40			0.63
Married	496	14.4		488	18.4	
Stable relationship	62	18.9		35	16.6	
Single	57	20.0		74	23.1	
Separated/Divorced	58	17.2		85	18.6	
Widower	179	23.9		235	24.2	
Level of schooling (years)			0.09			<b>0.03</b>
0 to 3	362	20.2		314	22.0	
4 to 7	313	18.4		349	23.6	
≥ 8	181	12.5		259	14.9	
Occupation			0.43			0.24
With an activity	312	18.3		284	16.9	
Without an activity	494	17.1		606	32.9	
Unemployed	46	17.1		22	21.2	
Income (in minimum salaries)			<b>0.04</b>			0.57
≤ 0.5	181	21.2		201	22.3	
> 0.5 to 2.5	488	18.2		564	20.8	
> 2.5	203	13.9		159	16.1	

<sup>a</sup> Sample weightings were taken into consideration.

<sup>b</sup> Pearson's Chi-square test.

<sup>c</sup> Numbers in the weighted sample.

Significant differences shown in bold.

**Table 2.** Habits adopted by diabetic older individuals to control diabetes. ISA-Capital, Sao Paulo, SP, Southeastern Brazil, 2003 and 2008.

	2003			2008			p
	% <sup>a</sup>	95%CI	n <sup>b</sup>	% <sup>a</sup>	95%CI	n <sup>b</sup>	
<b>Diet</b>							
No	47.9	37.7;58.2	76	39.0	31.3;47.4	78	0.188
Yes	52.1	41.8;62.4	74	61.0	52.6;68.9	121	
<b>Regimen to lose or maintain weight</b>							
No	96.7	90.8;98.9	145	90.6	82.6;95.1	179	0.078
Yes	3.3	1.1;9.2	5	9.4	4.9;17.4	20	
<b>Physical activity</b>							
No	98.0	86.8;99.7	149	86.6	77.6;92.3	175	<b>0.029</b>
Yes	2.0	0.3;13.2	1	13.4	7.7;22.4	24	
<b>Routine use of insulin</b>							
No	84.9	76.3;90.7	129	84.2	78.0;88.9	165	0.877
Yes	15.1	9.3;23.7	21	15.8	11.1;22.1	34	
<b>Use of insulin when there is a problem</b>							
No	99.3	95.2;99.9	149	99.6	97.1;99.9	198	0.716
Yes	0.7	0.1;4.8	1	0.4	0.1;2.9	1	
<b>Routine use of oral hypoglycemic agents</b>							
No	39.0	30.2;48.6	61	28.2	22.3;34.9	58	0.053
Yes	61.0	51.4;69.8	89	71.8	65.1;77.7	141	
<b>Use of hypoglycemic agents when there is a problem</b>							
No	97.1	93.2;98.8	145	98.1	94.8;99.3	195	0.523
Yes	2.9	1.3;6.8	5	1.9	0.7;5.2	4	
<b>No measures</b>							
No	94.3	89.9;96.9	139	97.0	93.6;98.7	193	0.188
Yes	5.7	3.1;10.1	11	3.0	1.3;6.4	6	
<b>Others</b>							
No	90.4	84.5;94.1	136	94.9	90.3;97.4	188	0.119
Yes	9.6	5.9;15.5	14	5.1	2.6;9.7	11	

<sup>a</sup> Prevalence in the weighted sample.

<sup>b</sup> Absolute numbers in the sample.

Significant differences are shown in bold.

options “no measures” and “other” showed prevalences of < 10.0% in both years (Table 2).

In 2003, 23.5% of the older adults said that they had some form of complication from diabetes; and in 2008, this percentage was 28.9%. Vision problems were more prevalent than kidney problems (63.6% in 2003 and 72.3% in 2008). In 2003, the prevalence of vision problems in older diabetic patients was higher in married individuals (72.5%;  $p = 0.002$ ) and in retired individuals (78.2%;  $p = 0.038$ ). In 2008, the prevalence of vision problems was higher in non-Caucasian individuals (35.8%;  $p = 0.027$ ). The prevalence of kidney problems was 15.4% in 2003 and 38.5% in 2008 (this difference was statistically significant ( $p = 0.046$ )) (Table 3) and was associated with low schooling levels in 2003 ( $p = 0.048$ ) and in 2008 with the male sex (56.5%) ( $p = 0.004$ ). The prevalence

of circulatory problems was 34.4% in 2003 and 52.3% in 2008 and was higher in the male older individuals (50.0%) in 2008 ( $p = 0.012$ ).

Approximately 70.7% of the older adults were vaccinated against the flu in 2003 and 66.9% in 2008 (Table 4). The majority used the public health service to receive the vaccine (> 95.0% in both years), and in 2008, public health service was the most used by the older individuals with low income ( $p = 0.008$ ). Most stated having received the vaccine at the health center closest to their home. The proximity of the vaccination center to the patients' homes was associated with low income ( $p < 0.001$  and  $p = 0.002$ , in 2003 and 2008, respectively) and with low schooling levels ( $p = 0.003$  in 2003).

In 2003, 28.9% of the older adults with diabetes reported having received the vaccine against pneumonia; and in 2008, this percentage was 24.3%. In both years, > 95.0% of individuals stated that they received this vaccine at public health centers and at the center that was closest to home (Table 4). In 2008, this fact was associated with the level of schooling: it was higher in individuals with  $\geq 8$  years of study ( $p = 0.032$ ).

## DISCUSSION

The prevalence of self-reported diabetes in the older adults was 17.6% in 2003 and 20.1% in 2008. The prevalence of diabetes was 17.9% in Sao Paulo, according to the SABE Project<sup>8</sup> (Health, Well-being and Aging) and 14.6% in Bambuí, SP, according to the Project Bambuí<sup>16</sup> (population-based cohort study on the health of the older people, which used laboratory tests to determine the presence of the disease, conducted in 1997).

The increase in the prevalence of diabetes from 2003 to 2008 may be due to the higher number of diagnosed cases of diabetes or to the actual expansion of the disease. The higher number of diagnosed cases may be the result of the introduction of HiperDia,<sup>22</sup> which allows to monitor patients with diabetes registered in basic health units. HiperDia was established between 2001 and 2003 and involved campaigns of diabetes screening, diagnosis confirmation, and treatment initiation. The expansion of the disease results from the increase in the prevalence of obesity in the older population. Obesity is the risk factor for diabetes incidence and hinders its treatment when the disease is already established. The prevalence of obesity is higher in the diabetic population.<sup>4,7</sup>

Income (in 2003) and level of schooling (in 2008) were significantly associated with diabetes, which indicates that the prevalence of diabetes among the older people was affected by socioeconomic factors. The Project Bambuí<sup>16</sup> and the study conducted in the city of Araraquara, SP, Southeastern Brazil,<sup>20</sup> also found significant associations between diabetes and low-income levels. Lima-Costa<sup>9</sup> (2004) suggests that schooling affects behaviors prejudicial to the health of older adults and that low levels of schooling are associated with the occurrence of chronic diseases and other dysfunctions.

The number of older individuals who followed a diet did not increase significantly. There was a significant difference between the sexes in 2003 with regard to diet, with a higher percentage of women following a diet. The results are in line with data from VIGITEL,<sup>12</sup> in which women showed a higher intake of fruits, legumes, and vegetables and less intake of meat with excess fat. Moreover, the routine use of insulin was associated with the variable sex in both years. These results are similar to those obtained in other studies and suggest that women are more willing to undergo insulin treatment than men.<sup>4</sup>

The routine use of an oral hypoglycemic agent tended to be significant in the period under study, and it was the most frequent habit of the older diabetic population. The prevalence of the use of hypoglycemic agents by the older population was 64.7% in a survey conducted in Minas Gerais<sup>5</sup> in 2003.

Only one habit, among the most reported by the older diabetic patients (diet, use of oral hypoglycemic agents, and use of insulin), was related to health promotion and prevention of chronic diseases. Physical activity was not

**Table 3.** Complications from diabetes in older individuals. ISA-Capital, Sao Paulo, SP, Southeastern Brazil, 2003 and 2008.

	2003			2008			P
	% <sup>a</sup>	95%CI	n <sup>b</sup>	% <sup>a</sup>	95%CI	n <sup>b</sup>	
Presence of complications							
No	76.5	66.8;84.0	112	71.1	62.5;78.4	138	
Yes	23.5	16.2;33.2	38	28.9	21.6;37.5	61	0.370
Vision problems <sup>c</sup>							
No	36.4	20.7;55.8	14	27.7	16.3;42.9	15	
Yes	63.6	44.2;79.4	23	72.3	57.1;83.7	46	0.440
Kidney problems <sup>c</sup>							
No	84.6	65.4;94.1	32	61.5	45.3;75.5	37	
Yes	15.4	5.9;34.6	5	38.5	24.5;54.7	24	<b>0.046</b>
Circulatory problems <sup>c</sup>							
No	65.6	40.9;84.1	26	47.7	32.0;63.9	29	
Yes	34.4	15.9;59.1	11	52.3	36.1;68.4	32	0.223

<sup>a</sup> Prevalence in the weighted sample.

<sup>b</sup> Absolute numbers in the sample.

<sup>c</sup> Among the older adults who reported having some complication.

Significant differences shown in bold.

**Table 4.** Use of vaccination health centers by self-reported diabetic older individuals. ISA-Capital, Sao Paulo, SP, Southeastern Brazil, 2003 and 2008.

	2003			2008			P
	% <sup>a</sup>	95%CI	n <sup>b</sup>	% <sup>a</sup>	95%CI	n <sup>b</sup>	
Received flu vaccine							
No	29.3	21.9;38.1	42	33.1	26.1;40.8	60	0.505
Yes	70.7	61.9;78.1	106	66.9	59.2;73.9	138	
Type of service <sup>c</sup>							
Public	95.1	86.9;98.3	98	96.6	89.5;99.0	133	0.640
Private	4.9	1.7;13.1	4	3.4	1.0;10.5	3	
Was it the closest center to home? <sup>c</sup>							
No	19.2	10.8;31.8	17	20.9	14.5;29.2	28	0.797
Yes	80.8	68.2;89.2	85	79.1	70.8;85.5	110	
Received pneumonia vaccine							
No	71.1	60.5;79.9	97	75.7	67.9;82.1	145	0.456
Yes	28.9	20.1;39.5	36	24.3	17.9;32.1	46	
Type of service <sup>d</sup>							
Public	95.9	75.5;99.5	35	95.7	73.5;99.5	44	0.970
Private	4.1	0.5;24.5	1	4.3	0.6;26.5	1	
Was it the closest center to home? <sup>d</sup>							
No	21.3	10.1;39.5	6	15.4	7.6;28.7	8	0.502
Yes	78.7	60.5;89.9	29	84.6	71.3;92.4	36	

<sup>a</sup> Prevalence in the weighted sample.

<sup>b</sup> Absolute numbers in the sample.

<sup>c</sup> Among the older adults who reported having received the flu vaccine.

<sup>d</sup> Among the older adults who reported having received pneumonia vaccine.

a frequent practice, although it increased over the period under analysis and despite the significant difference between 2003 and 2008. Physical exercise is essential for the control of the disease and is a part of its treatment.<sup>19</sup>

A study conducted in Minas Gerais showed similar results with regard to complications from diabetes, i.e., higher prevalence of vision problems in the older adults who lived with a partner, who were retired, and who were housewives.<sup>21</sup> This complication was predominant in non-Caucasian individuals, which is in line with the results presented in the international literature.<sup>6</sup> Non-Caucasian individuals have higher blood pressure levels than Caucasian individuals, which is a risk factor for the development of the vision problems. According to data from the NHANES, the prevalence of vision problems in the non-Caucasian population is 46.0% higher than in the Caucasian population.<sup>6</sup>

Differences with regard to kidney complications were observed between 2003 and 2008, which is in agreement with the Brazilian literature. A Brazilian study with data regarding the period between 2000 and 2004 demonstrated a prevalence of diabetic nephropathy of 15.0%,<sup>1</sup> whereas

in 2009, it was 27.0% as per The Brazilian Dialysis Census of the Brazilian Nephrology Association.<sup>18</sup>

Diabetes increases the risk of developing cardiovascular disorders. These conditions have a negative effect on the quality of life of older people with diabetes and can lead to death. A study conducted in Maringá, PR, over four 3-year periods (1979-1981, 1984-1986, 1990-1992, and 1996-1998) indicates diseases of the circulatory system as the principal cause of mortality in older individuals with diabetes.<sup>13</sup>

In 2003, 70.7% of older people with diabetes were vaccinated against the flu; in 2008 this percentage was 66.9%. The immunization program in the older population was initiated in the 1960s and was recommended by the World Health Organization. The minimum vaccination coverage goal established by the National Immunization Program was 70.0% until 2007 and was increased to 80.0% in the following year.<sup>d</sup>

More than 95.0% of the vaccinated older adults used the public health services to receive the vaccine, in both years. This fact was associated with low income. A study that used data from the SABE project<sup>11</sup> suggested a significant association between the use of public services and low income.

<sup>d</sup> Portal Saúde. Saúde lança nesta 3ª feira Campanha Nacional de Vacinação contra gripe de 2012. Brasília (DF); 2012 [cited 28 Feb 2014]. Available from: <http://www.brasil.gov.br/saude/2012/04/saude-lanca-nesta-3a-feira-campanha-nacional-de-vacinacao-contra-gripe-de-2012>

The centers where the patients received the flu vaccine were those closest to their homes. This result was statistically associated with low income and low schooling levels; moreover, it was similar to data obtained in a study<sup>2</sup> conducted in Pelotas, RS, Southern Brazil. The individuals who lived nearest to the health centers were those with lower incomes and lower education levels.

Vaccination against pneumonia was 28.9% in 2003 and 24.3% in 2008. Older diabetic patients are more susceptible to pneumonia because they are at greater risk for hyperglycemia, low immunity, reduced lung function, and other co-morbidities.<sup>3</sup>

The majority of the older adults stated that they received the vaccine in the centers closest to their homes. Proximity of the vaccination centers to home was associated with the individuals' level of schooling and the vaccination coverage was lower in those with low levels of education. The older patients with higher schooling levels showed better health status, better lifestyles, higher level of information, and better socioeconomic conditions, when compared to those with lower schooling levels.<sup>14</sup>

The information used to estimate the prevalences were self-reported, i.e., laboratory tests were not used to

confirm the diagnosis of diabetes. Previous studies have indicated that the validity of self-reported information varies according to the disease, the impairments and comorbidities, and the sociodemographic characteristics.<sup>15</sup> It is estimated that 50.0% of individuals with diabetes are not aware they have the disease, which remains asymptomatic until screening tests are performed or until disease-related complications occur.<sup>e</sup> The analysis period was restricted to 5 years, according to the periodicity of the survey that was used.

Diabetes mellitus is a common and serious disease that causes financial burden to the patients as well as health services. Diabetes deserves special attention among the complex and challenging disorders that currently affect the society and the health systems; it is a public health problem. Programs to encourage practices of health promotion and healthy lifestyles should be implemented, because these have a positive effect on the quality of life of older individuals with diabetes. A reflection on the policies and measures aimed at this particular population are necessary to improve the care given to diabetic patients. Such actions are indispensable for the promotion of better living conditions and health among this population.

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