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Active commuting among workers in the Southern of Brazil: a comparative analysis between 2006 and 2016

Deslocamento ativo entre trabalhadores da região Sul do Brasil: uma análise comparativa entre 2006 e 2016

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Abstract *This article aims to compare the prevalence of active commuting to work in adults in the Southern region of Brazil between 2006 and 2016 according to sociodemographic and labor characteristics. The data from the Brazilian System for the Surveillance of Risk and Protection Factors for Chronic Diseases - VIGITEL were compared in 2006 and 2016 (≥18 years). Active commuting to work, sex, age group, education and job characteristics were collected by telephone survey and transportation in the cities of Florianópolis, Curitiba and Porto Alegre, using absolute and relative frequencies with their respective 95% confidence intervals. Active commuting increased significantly in 2016 compared to 2006. Florianópolis had the highest prevalence in the two years analyzed. In all capitals, there was a significant increase in the prevalence of the outcome, mainly for women, with secondary education and only in Florianópolis for men, with low schooling. The prevalence has also increased for job characteristics in all capitals. Active commuting to work increased significantly among adults living in southern Brazil, with emphasis on Florianópolis. Expanding interventions in this context is a necessity in Brazil.*

Key words *Adults, Transport, Workers, Healthy city, Epidemiology*

Resumo *O objetivo deste artigo é comparar a prevalência de deslocamento ativo para o trabalho em adultos na região Sul do Brasil entre 2006 e 2016 de acordo com características sociodemográficas e laborais. Os dados do Sistema Brasileiro de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas (VIGITEL) foram comparados em 2006 e 2016 (≥18 anos). Deslocamento ativo para o trabalho, sexo, faixa etária, escolaridade e características laborais foram coletados por inquérito telefônico e analisados nas cidades de Florianópolis, Curitiba e Porto Alegre, utilizando as frequências absolutas e relativas com seus respectivos intervalos de confiança de 95%. O deslocamento ativo aumentou significativamente em 2016 em relação a 2006. Florianópolis apresentou as maiores prevalências nos dois anos analisados. Em todas as capitais houve aumento significativo na prevalência do desfecho, principalmente para mulheres, com ensino médio e apenas em Florianópolis para homens, com baixa escolaridade. A prevalência também aumentou para características laborais em todas as capitais. O deslocamento ativo para o trabalho aumentou expressamente entre os adultos que vivem no Sul do Brasil, com destaque para Florianópolis. Ampliar intervenções nesse contexto é uma necessidade no Brasil.*

Palavras-chave *Adultos, Transporte, Trabalhadores, Cidade saudável, Epidemiologia*

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Introduction

Active commuting to work, can be considered as an alternative to increased health promotion in adults[1] and an effective way to integrate physical activity into the daily routine, helping they to meet the physical activity recommendations of at least 150 minutes of moderate or intense physical activity per week[2,3]. The adoption of this behavior may help reduce the risk of all-cause mortality and incidence of cardiovascular disease[4], non-communicable diseases such as coronary artery disease[5], stroke, type 2 diabetes, obesity and hypertension[6,7]. These individual health benefits can extend to employers, including better quality of life and better worker performance. In this sense, monitoring physical activity patterns is an important step in the process of preventing and reducing health costs[8,9].

In the United States, for example, 38.3% of the adults do not report any type of work-time physical activity or active commuting to work and 21.1% report less than the recommended[10]. In European countries, the estimates are approximately 32% of adults (ranging from 12% in Sweden to 61% in Portugal) and another 25% do not beyond 3 hours of exercise per week[11]. In Brazil, one-third of the employed men and women commute actively from home to work and, in both sexes, this proportion decreases with increasing income and schooling and is higher among the youngers[12]. In Denmark, active commuting increased from 2007 (71.8%) to 2017 (76.4%) among men, individuals aged 25-34 and 35-44, all schooling, working distance/education groups above 5 km and place of residence (urban, suburban and rural)[13]. In the Capitals of Brazil, the findings showed a significant decrease in levels of physical activity related to commuting to work from 2006 to 2013[14-16]. These evidences indicate that the prevalence of active commuting to work varies between countries and is lower in Brazil. Moreover, the changes in this behavior over time is different around the world[13,14,16].

The Southern region stands out for having a human development index (HDI) higher than the national average[17]. A previous study with data from the Southern region of Brazil on active commuting to work showed a decline by 2013[15]. However, changes in the country's economic and political structure occurred after the publication of this study. For example, the National Urban Mobility Policy (PNMU), proposed in April 2012, which seeks to increase the participation of public and non-motorized transport in the population's motorized transport matrix, presenting itself as a promising strategy for active commuting to work, which can provide substantial benefits to the health of those involved[18]. Previous studies carried out in the South region have shown that favorable environmental changes contribute positively to the adoption of displacement behavior[19-22]. Furthermore, the practice of active commuting is influenced by sociocultural[23] and environmental[24-26] issues that are different among Brazilian regions[16,27].

Thus, the analysis of changes in active commuting to work over a decade in this region can contribute to the understanding of changes related to this behavior, as well as the impacts obtained through policies, programs and public actions implemented during this period. The knowledge acquired through this study of temporal trends can help the planning of policies to promote the practice of active commuting in the sense of maximizing them. In this perspective, this study aims to compare the prevalence of active commuting to work in adults in southern Brazil between 2006 and 2016 according to sociodemographic and labor characteristics.

Methods

Study outline

This is a comparative study with data from the Surveillance System for Risk Factors and Protection for Chronic Diseases by Telephone Inquiry (VIGITEL) for the years 2006 and 2016. VIGITEL is a population-based telephone survey conducted since 2006 by the Health Ministry in the 26 Brazilian capitals and in the Federal District, whose objective is to continuously monitor the prevalence of the main risk factors and protection for Non-communicable Chronic Diseases in adults in the country[28]. In the present study, data from the three capitals of the states of the Southern region (Curitiba, Florianópolis, and Porto Alegre) were analyzed. More details of methodological procedures of the study have been published elsewhere[28].

The population included adults, who owned fixed-line telephone in their residence in the referred years. The VIGITEL sampling process aims to interview at least 2,000 individuals aged ≥18 years per city, to estimate the frequency of risk factors in the adult population with 95% confidence level and sampling error of around two percentage points. In each capital, sampling

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was performed in two stages: a) random selection of fixed residential telephone lines; b) random selection of the resident of the domicile to be interviewed. Lines were not eligible for the system that corresponded to companies, no longer existed or were out of service, in addition to the lines that did not respond to 10 attempts in 2006 and six attempts in 2016 of calls made on various days and times, including Saturdays and Sundays and night periods, which probably corresponded to closed homes. More information about the sample design and the procedures used in the interviews are published[28].

Eligibility criteria

For the present study, only adults who answered "yes" to the question "For the past three months have you worked?" in 2006; or "In the last three months, have you worked?" in 2016.

Variables

The main variable of the study was active commuting for work, obtained through the questions: "Do you usually walk or bike from home to work?" in 2006 or "To go to or return to work, do you go walk or by bike?" in 2016. It is important to note that in 2016 it was considered "yes" the both the response options "Yes, part of the way" and "Yes, all the way". The active commuting to work corresponded to the employed adults who reported walking or bicycle from home to work, regardless of the travel time.

As other variables, gender (male, female), age range (18-39 years, 40-59 years, ≥60 years), educational level (years of studies categorized as 0-8 years considered as low schooling, 9-11 years considered as middle schooling, ≥12 years considered as high schooling) and labor characteristics from the questions: "In your work, do you walk a lot?" (Yes, No, Do not know) for commuting active at work and "In your work, do you carry weight or do other heavy activity?" (Yes, No, Do not know) for heavy physical activity at work.

Data collect

The data were collected through a questionnaire applied via telephone interviews conducted by VIGITEL from August to December in 2006 and from February to December in 2016. In both years the interviews were conducted by a specialized company.

Data analysis

The description of the adult population of VIGITEL in each year of the survey according to sociodemographic and work characteristics was performed by means of absolute and relative frequency distributions with their respective confidence intervals (95%CI). All other analyzes were carried out stratified by capital to investigate possible differences between cities.

To correct the different probabilities of sample selection due to the number of fixed telephone lines at home and the number of resident individuals, weights were assigned to each individual. As fixed telephony coverage does not cover all residences in the cities, a weighting factor was also assigned to approximate the sociodemographic composition of the sample to the composition of the population aged ≥18 years from each city. In addition, another weighting factor has been incorporated, considers the differences between the population contingent and the similar number of individuals sampled in each city. The analyses were done in Stata software (version 13.0) using the "svy" procedure (with weighting factors) suitable for analysis of data obtained by a complex sampling plan. Comparison of the prevalence of active commuting to work between the years (2016-2006) in the region as a whole and in each capital city, as well as in relation to the independent variables (sex, age groups, years of study, active commuting at work, heavy work activity), was performed by comparing the confidence intervals (%), and considered significant changes when the intervals did not overlap.

Because it was a telephone interview, the free and informed consent was substituted by the oral consent obtained during the telephone contacts with the interviewees. VIGITEL was approved by the National Committee for Ethics in Research for Human Subjects of the Ministry of Health (CONEP)[28].

Results

In 2006, VIGITEL identified 8,840 eligible lines in the three capitals of the South Region, with a total of 6,031 interviews completed, indicating a system success rate of 68.2%. In 2016, still in the three capitals, VIGITEL identified 8,572 eligible lines, with 5,932 interviews completed, which indicates a success rate of 69.2%.

The distribution of worker adults VIGITEL participants (≥18 years) in the years 2006 (mean 39.37, standard deviation: 12.81 years old) and 2016 (mean 48.78, standard deviation: 15.39 years old) in total and by capitals is shown in Table 1. In both years 2006 and 2016, more than half of the adults were female, with nine or more years of study, and were active commuting at work. There was an increase in the percentage of adults aged 60 years. The practice of heavy work activities was reported by approximately a quarter of the workers, and this distribution showed little variation from 2006 to 2016.

Active commuting to work was reported by about a quarter of adults in 2006, with a highlight being Florianópolis city, which reached around one-third. In 2016, all prevalences increased significantly, and Florianópolis remained being the capital with highest active commuting (Figure 1).

Regardless of sociodemographic and work characteristics was observed an increase in prevalence active commuting in all capitals between 2006 and 2016 (Table 2). There was significant increase in both gender in Florianópolis, and in the female in Curitiba and Porto Alegre cities. Additionally, significant increase was found in adults aged 18-39 of all capitals, and in adults aged 40-59 years, except of Florianópolis. A significant increase in the prevalences of active commuting to work was observed for the range of 0 to 4 years of study in Florianópolis, from 9 to 11 years of study for Porto Alegre, and for ≥12 years of study in the three capitals. From 2006 to 2016 was observed increase of active commuting in each capital only for workers who did not perform active work shift and heavy activities at that location. The highest increase in the prevalence of the outcome occurred: in Curitiba, for workers with higher level of schooling; in Florianópolis, for those with lower educational level; and in Porto Alegre for women.

Discussion

The main results of this study showed that the active commuting to work increased significantly after a decade in all capitals analyzed, especially among women and those with the highest educational level, reaching about one fifth of workers in 2006 and one quarter in 2016. Florianópolis was the city with the highest prevalence in both surveys. In all capitals there was a significant increase in the prevalence of the outcome of female and younger workers, with high schooling, and for workers who did not perform active work shift and heavy activities at that location. The increase in prevalence among men and low schooling occurred only in Florianópolis.

In this study, increased prevalence of active commuting to work over a decade shows a scenario contrary to that observed in trend studies conducted in Brazil[29], and in others Brazilian regions[15,16,27]. One of the possible explanations for that is the reduction in marketing in the automotive sector from 2013 (-2.3%) to 2016 (-20.5%)[30], and the economic crisis in Brazil due the aging of the vehicles circulating throughout the country, as well as the registration of fewer buses of public transport in the streets[31]. The incentive to increase the levels of physical activity that occurred in recent years[32] may also have had an impact on the increase of active commuting, especially in workers with little time to practice leisure exercises.

Florianópolis stood out as the capital with the highest active commuting in 2006 and 2016. Data from the Brazilian Institute of Geography and Statistics (IBGE) showed that in both years the fleet of circulating vehicles in the three capitals, regardless of type, were smaller for Florianópolis compared to the other capitals of the South region[33,34]. In Sidney, a study showed that there is a clear dose-response relationship between the number of vehicles in the residence and the active commuting for work, regardless of gender and age group, that is, the higher the average vehicle, the lower the exposure to active commuting[35]. The active commuting for work is a behavior dependent on several aspects, such as road infrastructure, traffic safety and environments, residential density, mixed land use and social support[36]. In this sense, it is important to consider all these aspects in understanding the increase of this behavior. However, studies of such scope have not been identified in the literature, and deserve attention of the scientific community.

The practice of physical activity in the context of commuting is an important alternative for actions aimed at promoting physical activity at a population level[37]. Despite this, the increase in the prevalence found after a decade may not necessarily reflect a practice guided by the benefits that this behavior offers to health. The separation of social or ethnic groups within a certain space, together with an inefficient public transport system, favors the practice of active commuting, considering the increase in the time needed to reach public transport, as well as making transfers inside him[38].

Table 1. Relative frequencies of demographic, socioeconomic, and work characteristics variables according year data collection and capital state in the South of Brazil (2006 and 2016).

Variables	Curitiba		Florianópolis	
	2006 (n=1,324)	2016 (n=1,035)	2006 (n=1,320)	2016 (n=888)
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)
Sociodemographic characteristics				
Sex				
Male	54.8 (51.8;57.8)	52.5 (48.3;56.6)	55.0 (46.2;51.6)	53.0 (48.5;57.4)
Female	45.2 (50.4;55.8)	47.5 (43.4;51.7)	45.0 (41.9;48.1)	47.0 (42.6;51.5)
Age group (years)				
Young adults (18-39)	62.2 (59.6;65.0)	53.0 (48.9;57.1)	60.8 (57.7;63.8)	56.6 (52.3;60.7)
Middle-aged adults (40-59)	32.8 (30.1;35.6)	38.1 (34.4;42.0)	34.9 (32.0;37.8)	36.3 (32.4;40.4)
Old-aged (≥60)	5.0 (3.9;6.4)	8.8 (7.5;10.4)	4.3 (3.2;5.8)	7.1 (5.9;8.5)
Years of study				
0-4	12.2 (10.2;14.6)	4.7 (34.0;6.4)	9.9 (7.9;12.3)	3.4 (2.0;5.7)
5-8	20.8 (18.1;23.7)	17.4 (14.2;21.1)	19.4 (16.6;22.6)	11.3 (8.3;15.0)
9-11	34.7 (31.9;37.6)	33.1 (29.1;37.3)	30.8 (28.0;33.8)	39.4 (35.0;44.1)
≥12	32.3 (29.6;35.2)	44.8 (40.8;49.0)	39.9 (36.9;42.9)	45.9 (41.6;50.3)
Labor characteristics				
Active commuting at work				
Yes	56.0 (53.0;59.0)	51.6 (47.5;55.8)	56.3 (53.2;59.4)	56.9 (52.5;61.2)
No	44.0 (41.0;47.0)	48.4 (44.2;52.5)	43.7 (40.6;46.8)	43.1 (38.8;47.5)
Heavy work activity				
Yes	29.3 (26.4;32.3)	29.3 (25.5;33.5)	26.9 (23.9;30.0)	28.7 (24.4;33.3)
No	70.7 (67.7;73.6)	70.7 (66.5;74.5)	73.1 (70.0;76.1)	71.3 (66.7;75.6)

Variables	Porto Alegre		South	
	2006 (n=1,253)	2016 (n=1,032)	2006 (n=3,897)	2016 (n=2,955)
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)
Sociodemographic characteristics				
Sex				
Male	52.7 (49.4;56.0)	51.9 (48.0;55.8)	54.0 (52.0;56.0)	52.3 (49.7;54.9)
Female	47.3 (44.0;50.6)	48.1 (44.2;52.0)	46.0 (43.9;48.0)	47.7 (45.1;50.3)
Age group (years)				
Young adults (18-39)	55.8 (52.5;59.0)	52.0 (48.2;55.9)	59.5 (57.6;61.5)	53.1 (50.5;55.6)
Middle-aged adults (40-59)	37.4 (34.5;40.6)	37.1 (33.6;40.7)	34.8 (33.0;36.7)	37.5 (35.2;39.9)
Old-aged (≥60)	6.8 (5.4;8.6)	10.9 (9.4;12.5)	5.6 (48.1;66.0)	9.4 (8.5;10.4)
Years of study				
0-4	8.2 (6.2;10.7)	2.8 (2.1;3.9)	10.4 (9.1;11.9)	3.8 (30.7;47.5)
5-8	22.7 (19.6;26.1)	19.6 (16.6;23.0)	21.4 (19.5;23.3)	17.5 (15.4;19.7)
9-11	34.0 (30.9;37.1)	35.2 (31.5;39.0)	34.0 (32.1;35.9)	34.7 (32.2;37.3)
≥12	35.2 (32.3;38.1)	42.4 (38.6;46.3)	34.3 (32.5;36.1)	44.0 (41.5;46.6)
Labor characteristics				
Active commuting at work				
Yes	54.1 (50.7;57.4)	51.8 (47.9;55.7)	55.3 (53.3;57.3)	52.3 (49.7;54.9)
No	45.9 (42.6;49.3)	48.2 (44.4;52.1)	44.7 (42.7;46.7)	47.7 (54.1;50.3)
Heavy work activity				
Yes	30.7 (27.5;34.1)	28.3 (24.8;32.0)	29.5 (27.6;31.6)	28.8 (26.4;31.4)
No	69.3 (65.9;72.5)	71.8 (68.0;75.2)	70.5 (68.4;72.4)	71.2 (68.6;73.6)

Weighted prevalence.

Source: Authors.

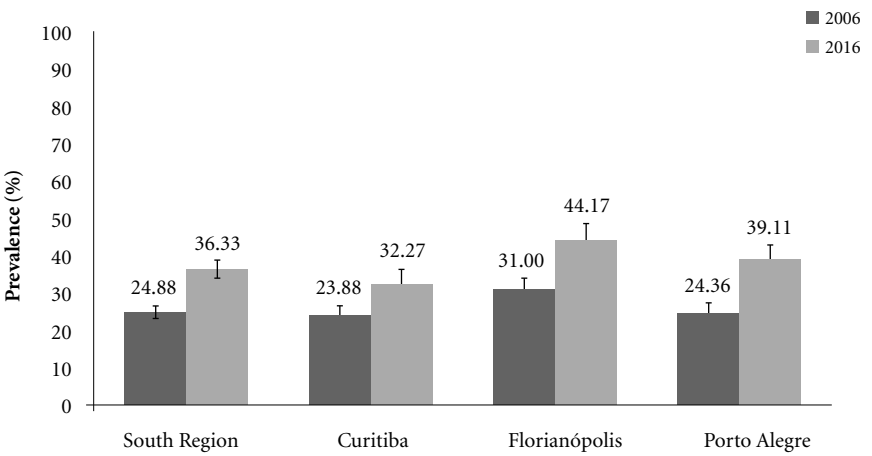

Figure 1. Prevalence and confidence intervals of active commuting to work in 2006 and 2016 among worker adults in the South of Brazil and according to capitals.

Source: Authors.

In relation to sex, in our study women showed an increase in the prevalence of active commuting for work from 2006 to 2016 in all cities and for men the increase occurred only in Florianópolis. A study conducted in three cities in the metropolitan region of São Paulo, Brazil, also found an increase in the active commuting after a decade (2000-2010) in both sexes[39]. Systematic review of active commuting in low- and middle-income countries revealed that men ride more than women on the commute, while women walk more than men[40]. Studies that investigate the characteristics of each capital regarding active commuting are needed in order to better elucidate the reasons for the increase in prevalence in men occurring only in Florianópolis.

In the present study, the frequency of elderly workers who exhibited this behavior remained the same a decade later, while in adults there was an increase. Similar results were found in a comparative study (2000-2010) for all age groups (≥18 years old)[39]. In Brazilian population the active commuting tends to decrease with advancing age[15,16,27]. Even for the elderly, as expected, the results potentially reflect the consequences of an environment less conducive to active transport for vulnerable groups[41]. As an example, in 2018 the Federal Government launched the Brazil Friend of the Elderly Strategy, which aims to promote the integration of public policies so that the communities and cities of the country become more friendly to the elderly, with an emphasis on the active aging[42].

Adults with 12 years or more of schooling increased the frequency of this behavior in all capitals. This was the category with the lowest prevalence of active displacement in 2006 and, consequently, it was the only category that increased after a decade. The literature shows that there is an inverse relationship between the active commuting to work and schooling[15,16,27], that is, a higher schooling and a lower use of active transport in workers[39]. In Brazil, in relation to the other countries of the world, salary returns originating from schooling are high, which intensifies the importance of education to explain the future income of Brazilians[43]. Also, different levels of education are related to different habits of life, such as health, opportunities for social mobility and forms of political participation[33]. In terms of public policies, by expanding access to public transport and providing infrastructure for active commuting among the poorest individuals, it is expected that migration to motorized modes of transport will not occur[12].

Particularly, in Florianópolis the active commuting increased among workers with lower level of schooling in an expressive way. This scenario is similar to that found in high-income countries in low socioeconomic status groups[44]. Of the three capitals investigated, Florianópolis is the only coastal capital and perhaps the climate

Table 2. Prevalence (%) and changes of active commuting to work according to demographic, socioeconomic, and work characteristics variables of the worker adults in the South of Brazil, and capital states (2006 and 2016).

Variables	Active (walking or cycling) commuting to work					
	Curitiba			Florianópolis		
	2006 (n=1,324)	2016 (n=1,035)	Δ	2006 (n=1,320)	2016 (n=888)	Δ
	% (95%CI)	% (95%CI)	%	% (95%CI)	% (95%CI)	%
Sociodemographic characteristics						
Sex						
Male	23.1 (19.5;27.3)	30.5 (25.0;36.5)	7.3	29.2 (25.1;33.7)	41.0 (34.6;47.8)	**11.8**
Female	24.8 (21.3;28.6)	34.3 (28.9;40.1)	**9.5**	33.1 (29.2;37.4)	47.8 (41.8;53.8)	**14.6**
Age group (years)						
Young adults (18-39)	23.1 (19.7;26.8)	33.1 (27.1;39.7)	**10.0**	32.9 (28.9;37.1)	43.4 (36.7;50.4)	**10.5**
Middle-aged adults (40-59)	25.5 (21.5; 29.9)	31.3 (26.0;37.0)	5.8	28.3 (24.0;33.0)	45.1 (39.0;51.3)	**16.8**
Old-aged (≥60)	23.7 (13.8;37.7)	31.9 (25.1;39.6)	8.2	26.7 (15.1;42.7)	45.8 (37.3;54.6)	19.0
Years of study						
0-4	36.7 (27.8;46.5)	36.8 (22.1;54.4)	0.1	36.3 (25.9;48.3)	77.3 (51.9;91.4)	**40.9**
5-8	28.0 (21.5;35.5)	45.1 (34.2;56.5)	17.1	40.1 (31.7;49.2)	56.3 (40.5;71.0)	16.2
9-11	26.5 (22.3;31.1)	31.2 (24.2;39.1)	4.7	33.7 (28.6;39.1)	43.2 (35.7;51.1)	9.6
≥12	13.9 (10.7;17.7)	27.7 (22.8;33.2)	**13.8**	23.1 (19.4;27.2)	39.6 (34.2;45.3)	**16.5**
Labor characteristics						
Active commuting at work						
Yes	28.3 (24.6;32.3)	36.1 (30.5;42.0)	7.7	38.0 (33.8;42.5)	47.3 (41.1;53.6)	9.3
No	18.2 (14.9;22.1)	28.3 (23.0;34.2)	**10.0**	21.9 (18.4;25.9)	40.0 (33.9;46.6)	**18.1**
Heavy work activity						
Yes	31.9 (26.3;38.0)	40.3 (32.2;49.0)	8.5	38.0 (31.6;44.9)	43.1 (33.7;53.1)	5.1
No	20.6 (17.9;23.6)	29.0 (24.8;33.6)	**8.4**	28.5 (25.3;31.9)	44.6 (39.7;49.6)	**16.1**

Variables	Active (walking or cycling) commuting to work					
	Porto Alegre			South		
	2006 (n=1,253)	2016 (n=1,032)	Δ	2006 (n=3,897)	2016 (n=2,955)	Δ
	% (95%CI)	% (95%CI)	%	% (95%CI)	% (95%CI)	%
Sociodemographic characteristics						
Sex						
Male	26.4 (21.9;31.4)	32.5 (27.3;38.1)	6.1	25.1 (22.5;27.9)	32.5 (29.0;36.2)	**7.5**
Female	22.1 (18.8;25.9)	46.3 (41.0;51.7)	**24.1**	24.6 (22.4;27.1)	40.5 (37.0;44.1)	**15.8**
Age group (years)						
Young adults (18-39)	26.6 (22.3;31.3)	40.9 (34.9;47.4)	**14.4**	25.5 (23.0;28.1)	37.4 (33.4;41.5)	**11.9**
Middle-aged adults (40-59)	20.4 (16.7;24.7)	39.1 (34.1;44.4)	**18.7**	23.7 (21.1;26.4)	35.8 (32.5;39.4)	**12.2**
Old-aged (≥60)	27.8 (18.7;39.6)	30.2 (24.3;36.8)	2.4	25.9 (19.3;33.8)	32.5 (28.2;37.1)	6.6
Years of study						
0-4	29.6 (18.9;43.2)	47.6 (32.1;63.7)	18.0	34.5 (28.0;41.5)	44.3 (33.5;55.7)	9.9
5-8	27.9 (20.3;36.9)	38.3 (30.0;47.4)	9.5	29.2 (24.5;34.3)	43.1 (36.4;50.1)	**14.0**
9-11	24.0 (19.5;29.1)	46.3 (39.7;53.1)	**22.3**	26.2 (23.4;29.3)	38.7 (34.3;43.3)	**12.5**
≥12	21.3 (17.6;25.5)	33.2 (27.7;39.2)	**12.0**	18.0 (15.8;20.5)	31.2 (27,9;34.8)	**13.2**
Labor characteristics						
Active commuting at work						
Yes	28.4 (24.1;33.1)	45.0 (39.6;50.4)	12.2	29.5 (26.9;32.2)	40.9 (37.4;44.5)	**11.5**
No	19.7 (16.1;23.8)	32.8 (27.6;38.4)	**15.8**	19.2 (17.0;21.7)	31.3 (27.9;35.0)	**12.1**
Heavy work activity						
Yes	26.5 (20.8;32.9)	38.7 (31.5;46.4)	12.2	33.3 (26.6;34.3)	40.0 (34.9;45.4)	**6.7**
No	23.5 (20.2;27.1)	39.3 (34.9;43.9)	**15.8**	22.6 (20.7;24.7)	34.9 (32.1;37.8)	**12.2**

Weighted prevalence. The delta represents the change in the percentage points of the prevalence of active commuting to work in 2016 in relation to the prevalence of 2006. Chi-Square. Bold: p<0.

Source: Authors.

and the scenario favor more the active commuting to work among the adults with lower level of schooling.

In this study, we observed that taking walks at work as well as heavy activities may be related to functions requiring less intellectual effort, considering that individuals with higher levels of schooling have better socioeconomic levels[45]. In adulthood, work constitutes the main context of physical activity practice, although the health of workers with high levels of physical activity in this context is relatively weak[46]. The practice of physical activities in the work environment is not always carried out as a choice, but obligatorily, which can result in stress that affects health.

While Curitiba stands out for the reference urban mobility structure in the country, Florianópolis is highlighted by the presence of bicycle paths in strategic locations of the city. On the other hand, Porto Alegre presents the highest crime rates compared than Curitiba and Florianópolis cities[47], as well as a precarious infrastructure for the practice of active commuting. However, it is noteworthy that although Porto Alegre presents an unfavorable scenario in relation to the other capitals, the increase in the prevalence of active commuting to work was higher in this city (14.8 percentage points - Figure 1). The availability of information on the importance of practicing physical activities increasingly exposed in accessible media, associated to the crisis that occurred in Brazil, exposes active transportation as a way of reducing living costs (Porto Alegre is the capital with the highest cost of fuel compared to Curitiba and Florianópolis cities), which may explain these results. These facts indicate that other aspects, besides the environment, are important determinants of this behavior in workers.

The National Policy on Health Promotion has physical activity as one of the priority themes and encourages the construction of healthy environments and territories[32]. In addition, from 2012 the municipalities gained autonomy to structure their cities' urban mobility plans according to local needs (National Urban Mobility Policy - PNMU). While sustainable urban mobility PNMU encourages the use of non-motorized modes and collective public transportation[48]. One of the main objectives is to increase the participation of collective and non-motorized transportation in the population commuting matrix[48].

As limitations, the use of mobile phones in bulk coupled with low maintenance costs, adherence to residential telephone services has declined over the years, especially among low-income individuals. However, this possible bias was minimized through the use of weighting factors. Although the selection of individuals was restricted to those with a fixed telephone line, a study[48] that compared the prevalence of active displacement in adults from a capital in the Southern region by telephone and face-to-face interviews found similar results. We also emphasize that a limitation presented by the study was the impossibility of separating people with disabilities, who naturally cannot actively move to work from those who did not move actively by choice. Finally, the lack of information about the characteristics of the environment may have limited the understanding of the aspects that could explain the changes that occurred in active commuting to work over time.

Positively, this is the first study to analyze the changes in the active commuting to work after a decade of follow-up in the population of workers in the South of Brazil. The monitoring of this behavior over time allowed the understanding of how the sociodemographic and work characteristics interact with this outcome in the context of the country's political economic changes, such as the crisis in the Brazilian economy. In addition, it allowed the discussion of public policies of urban mobility (in)existing in this region of the country.

Conclusion

From 2006 to 2016 the active commuting to work increased by 11.45 percentage points, especially among women and those with the highest educational level in all capitals. For men and among those with lower schooling the prevalence of active commuting also increased, in Florianópolis only. These results may be useful in structuring the PNMU of the capitals, with a view to health promotion, through the construction of favorable environments for the maintenance of the healthy life habits of the workers.

Collaborations

All authors contributed effectively to the study design and preparation of the manuscript. G Minatto, AM Gerage, BN Oliveira, FT Paiva Neto, RS Delevatti and GF Del Duca participated in the writing of the document and in the analysis and interpretation of the data. KS Silva e D Malta participated and contributed to the writing, critical review and approval of the final version to be published.

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