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Commuting to and from work and factors associated among industrial workers from Southern Brazil

ABSTRACT

Cross-sectional study that aimed to estimate the prevalence of forms of commuting to and from work and to identify factors associated among industrial workers in the State of Rio Grande do Sul, southern Brazil. A total of 2,265 workers completed a questionnaire on the forms of commuting to and from work (walking/biking, bus or car/motorcycle). Multinomial logistic regression was used to estimate the association between the outcome and sociodemographic, occupational and behavioral variables. The main form of commuting to and from work was by bus (45.7%). Workers with higher socioeconomic condition were more likely to engage in passive commuting.

DESCRIPTORS: Workers. Residential Mobility. Transportation. Workplace. Cross-Sectional Studies.

INTRODUCTION

There is evidence showing that people who walk or cycle to and from work have a lower risk of morbidity and mortality from chronic non-communicable diseases, which may have a major public health impact.[3,4] Despite the well-known benefits of active commuting, a significant proportion of the population show low levels of physical activity in both developed[5] and developing countries.[2]

The literature shows the prevalence of active commuting is higher among those with lower income and education.[1,5] On the other hand, workers with higher education and family income tend to be more active during leisure time.

The current study aimed to estimate the prevalence of forms of commuting to and from work and to identify factors associated among industrial workers.

METHODS

Cross-sectional study based on secondary data from the epidemiological survey entitled "Lifestyles and Leisure-Time Habits among Industry Workers in Rio Grande do Sul, Brazil" carried out from August to December 2007. The study population consisted of 670,000 industrial workers registered by the Regional Department of Social Services for Industrial Workers (SESI) of the state of Rio Grande do Sul, Southern Brazil.

The following criteria were used to estimate the sample size: population estimated at 670,326,000 workers; sampling error of 3%; 95% confidence

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intervals (95%CI); 45% prevalence of leisure-time physical inactivity; design effect of 1.5; and sample size increased by 20% due to potential losses and refusals during data collection.

A two-stage sampling method was used. In the first stage, businesses were randomly selected according to the distribution of workers in large (≥500), medium-sized (100 to 499) and small companies (<100). In the second stage, workers of both sexes were randomly selected proportional to the company's size.

Data was collected in small groups of workers (three to 15) using a self-administered questionnaire applied by SESI staff and service providers.

A pre-validated questionnaire originally developed for this population was used for data collection.[a] The outcome commuting to and from work was measured using a closed question, "How do you commute to and from work most of the time?". The answer options included on foot, bicycle, bus, car/motorbike. Commuting on foot and commuting by bicycle were considered forms of active commuting. Work-related variables such as company size and occupational physical activity were categorized as listed in the Table. The variable leisure-time physical activity was assessed using the following question: "Do you engage in any regular physical activity during your leisure time such as working out, walking, running, sports, dancing or martial arts?." Active respondents during their leisure time were those who reported any physical activity at least once a week. The sociodemographic variables studied were gender, age, education level, and gross family income.

In the crude analysis the chi-square test was used to assess heterogeneity or linear trend at a 5% significance level ($p<0.05$). A multinomial logistic regression (adjusted) analysis was performed taking as reference the category active commuting to work. The hierarchical model consisted of four levels: demographic variables (age and gender); socioeconomic variables (education level and family income) and company size; occupational physical activity; and leisure-time physical activity. The backward method was applied for the selection of variables that remained in the regression model. The final model included the variables with $p<0.20$.

Considering an 80% power and 95% confidence level, this study was able to detect statistical significance for odds ratios (ORs) greater than 1.34 and 1.45 for commuting by bus and by car, respectively, when the prevalence of the outcomes in non-exposed groups were 25.6% for commuting by bus and 14.5% for commuting by car.

The questionnaires were scanned into a database using SPHYNX software (Software Solutions Inc., Washington DC, US). For statistical analyses, Stata version 11.0 was used.

The study protocol was approved by the Research Ethics Committee Universidade Federal de Santa Catarina (No. 099/2007). All workers were informed that their participation in the study was voluntary and all their responses will be kept confidential.

RESULTS

Of 2,527 workers eligible for the study, 89.6% agreed to participate. The final sample comprised 2,265 workers of which 56.2% were male. There was a greater proportion of workers younger than 30 (47.6%), with high school education (52.2%), family income between R$ 601.00 to 1,500.00 (45.6%), and who worked for medium-sized businesses (42.2%). It was also found that 54.4% of the sample was physically active during leisure time and 49.8% engaged in moderate occupational physical activity.

The prevalence of active commuting to and from work (walking/cycling) was 26.5%. The prevalence of commuting by bus and car/motorbike was 45.7% and 27.8%, respectively.

Those reporting physical inactivity during leisure time were more likely to commute by bus (OR = 1.60, 95%CI: 1.29;1.98) than active commuting. Those who reported moderate occupational physical activity engage more in active commuting (OR = 0.65, 95%CI: 0.46;0.92) compared to those with vigorous occupational physical activity (Table).

When comparing commuting by car/motorbike versus walking or cycling, there was seen a trend towards increased use of motorized transportation with increasing education and family income. Moreover, commuting by car/motorbike compared to walking/cycling was more likely among men (OR = 1.53, 95%CI: 1.22;1.92), workers with low occupational physical activity (OR = 1.69, 95%CI: 1.04;2.76) and those considered inactive during leisure time (OR = 1.42, 95%CI: 1.10;1.83) (Table).

DISCUSSION

The current study was the first to investigate forms of commuting in a representative sample of industrial workers in the state of Rio Grande do Sul. The prevalence of walking or cycling to work (26.5%) was higher than that found in other Brazilian studies.[2] However, our data is inconsistent with the international literature

[a] Barros MVG. Atividades físicas no lazer e outros comportamentos relacionados à saúde dos trabalhadores da indústria no Estado de Santa Catarina, Brasil [master's dissertation]. Florianópolis: Universidade Federal de Santa Catarina; 1999.

Table. Prevalences and crude and adjusted odds ratios (OR) of active commuting (walking/cycling) to and from work versus commuting by bus and car/motorbike according to sociodemographic and occupational factors and leisure-time and occupational physical activity among industrial workers in the state of Rio Grande do Sul, Southern Brazil, 2007.

Variable	Active commuting %	Commuting by bus			Commuting by car/motorbike		
		%	Crude OR 95% CI	Adjusted OR[a] 95% CI	%	Crude OR 95% CI	Adjusted OR[a] 95% CI
Gender							
Female	13.7	25.2	1	1	17.3	1	1
Male	12.8	20.5	1.15 (0.94;1.41)	1.15 (0.94;1.41)	10.5	1.55 (1.24;1.95)*	1.53 (1.22;1.92)*
Age (years)							
<30	13.4	21.9	1	1	12.3	1	1
30 to 39	7.3	12.7	1.07 (0.84;1.36)	1.07 (0.84;1.36)	9.0	1.35 (1.04;1.76)	1.33 (1.02;1.74)
≥40	5.8	11.0	1.17 (0.90;1.51)	1.15 (0.89;1.49)	6.7	1.27 (0.95;1.69)	1.20 (0.90;1.60)
Education level							
Incomplete elementary school	7.2	7.5	1	1	2.0	1	1
Complete elementary school	5.4	8.0	1.43 (1.04;1.95)	1.38 (1.00;1.91)	3.5	2.28 (1.48;3.52)	2.00 (1.28;3.15)
Complete middle and high school	12.3	25.1	1.97 (1.52;2.56)	1.76 (1.34;2.31)	14.8	4.27 (2.97;6.15)	2.62 (1.78;3.85)
College degree	1.6	5.2	3.22 (2.08;4.98)**	2.47 (1.54;3.98)**	7.5	17.1 (10.5;27.9)**	6.20 (3.61;10.68)**
Gross family income (reais)							
Up to 600	6.6	8.8	1	1	1.9	1	1
601 to 1,500	14.2	22.2	1.18 (0.91;1.52)	1.08 (0.82;1.40)	9.3	2.27 (1.54;3.34)	1.74 (1.17;2.58)
1,501 to 3,000	4.6	11.3	1.85 (1.35;2.54)	1.50 (1.07;2.09)	9.9	7.54 (4.98;11.4)	4.65 (3.00;7.21)
>3,000	0.8	3.5	3.22 (1.85;5.62)**	2.29 (1.28;4.11)**	7.0	30.1 (16.6;54.7)**	14.6 (7.80;27.37)**
Company size							
Small	9.0	9.8	1	1	8.3	1	1
Medium-sized	10.4	20.6	1.81 (1.42;2.32)	1.74 (1.35;2.24)	11.2	1.17 (0.90;1.52)	0.95 (0.71;1.27)
Large	8.3	11.2	1.95 (1.50;2.55)**	1.98 (1.51;2.60)**	8.3	1.26 (0.94;1.68)	1.36 (1.00;1.87)
Occupational physical activity							
Vigorous	7.7	5.5	1	1	1.8	1	1
Moderate	16.1	22.9	0.71 (0.51;0.99)	0.65 (0.46;0.92)	10.8	1.03 (0.67;1.59)	0.88 (0.56;1.39)
Low	2.8	17.1	1.10 (0.77;1.57)	0.89 (0.60;1.31)	15.3	3.00 (1.97;4.74)**	1.69 (1.04;2.76)**
Leisure-time physical activity							
Active	16.2	23.0	1	1	15.4	1	1
Inactive	10.4	22.6	1.53 (1.25;1.88)*	1.60 (1.29;1.98)*	12.6	1.28 (1.02;1.60)*	1.42 (1.10;1.83)*

[a] Adjusted for gender (1st hierarchical level), education level, income and company size (2nd hierarchical level), job characteristics (3rd hierarchical level) and leisure-time physical activity (4th hierarchical level).
* Wald test for heterogeneity p<0.05; **Wald test for linear trend, p<0.05.

as different prevalence rates were found according to the realities of individual countries.

This study found that socioeconomic factors are associated with active commuting, which corroborates the literature.[4] There is general agreement, especially in developing countries like Brazil, that people with unfavorable economic conditions are active commuters *not out* of desire but rather *out* of *necessity*. Workers with lower socioeconomic conditions commute by bike because it is more economical compared to the costs of public transportation or buying and maintaining a car.[1]

Regarding physical activity, workers who were inactive during leisure time were more likely to passively commute compared to those physically active during leisure time. In addition, workers who engaged in low occupational physical activities were more likely to passively commute to work. However, the relationship between active commuting and other forms of physical activity is controversial, and researchers have shown a positive relationship between the domains of leisure and commuting.[2]

A number of limitations need to be noted regarding the present study. A cross-sectional design prevents any inference on a causal relationship between forms of commuting and many exposures studied, mostly because of the difficulty of establishing timeliness. In addition, the assessment of physical activity according to public health recommendations requires data on frequency, intensity and duration of an activity but in the present study the intensity of commuting and time spent were not investigated. On the other hand, the study strengths should be noted including high response rate (89.6%), type of analysis used, and the association of forms of commuting to other domains of physical activity in a population little explored in the literature.

In conclusion, active commuting to and from work was associated with being female, having low income and education, working for small companies, and engaging in leisure-time and occupational physical activity.

In addition to its social, environmental and economic benefits, active commuting is a daily life activity performed on a larger scale than exercise programs. There is a need for public policies focusing on intersectoral actions involving urban planning, health education and corporate programs to encourage workers to adopt an active lifestyle.

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