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Sedentary behavior across different domains among adult women in the south of Brazil: a population based study

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Abstract *The aim of this study was to describe sedentary behavior (SB) across leisure, occupation, and transport domains and determine factors associated with excessive sedentary behavior (ESB). Cross-sectional survey with a representative sample of 1,126 women aged 20-69 years living in São Leopoldo/RS. SB, demographic, socioeconomic, behavioral and health factors data were collected using a questionnaire administered by interviewers. The cut-off point for ESB was defined as the median. Associations were tested using Poisson regression with robust error variance. The medians and interquartile intervals (min/day) for leisure, occupation, and transport SB were 163.9(86.6-2710.5), 51.4(0-257.1), and 17.1(5.7-37.3), respectively. The likelihood of leisure SB increased with education level, was higher among women who were not employed, lived in household without children, and smokers. In other domains, there was an inverse association between age, being white, economic class, education level, and income and ESB. Direct association between living in a household with a car and excessive transport SB and women who were not employed were 30% less likely to engage in ESB in this domain. The predominant domain in Total SB was leisure. Associations differed across domains, indicating that domain-specific interventions should be implemented in addressing excessive SB.*

Key words *Sedentary lifestyle, Women's health, Epidemiology*

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Introduction

In recent decades, research examining the relationship between lifestyle and health has shown that sedentary behavior (SB) is a risk factor for morbidity and mortality[1,2]. SB comprises activity in a sitting or reclining posture while awake characterized by an energy expenditure of ≤ 1.5 metabolic equivalents (METs)[3]. This concept differs from physical inactivity, when an individual does not practice the amount of daily physical activity (PA) recommended by the World Health Organization[4]. Evidence from prospective studies shows that spending more time engaging in SB increases the risk of diabetes, cardiovascular disease, metabolic syndrome, and death[5,6]. Although high levels of moderate PA (~60-75 minutes per day) can eliminate or reduce some of these risks[7], the majority of Brazil's female population (91.5%)[8] do not practice the minimum recommended amount of PA (~30 minutes per day of moderate-intensity physical activity)[4].

Generally, it is the sum total of all types of sedentary behavior, or total sedentary behavior (Total SB), that determines health impact[6]. However, some studies suggest that certain types of SB may contribute to given morbidities more than others[9,10]. While assessing Total SB may help identify individuals or population groups at a higher risk[11], this indicator alone is insufficient to plan interventions, because it does not provide an understanding of the sedentary activities that contribute most to excessive Total SB and the contexts in which it take place. It has therefore been suggested that studies examining SB should consider behavior across life domains, such as leisure, transport, and occupation[12]. This approach helps to understand both the composition of Total SB and associated factors, which may differ by domain[13,14].

Few epidemiological studies have examined SB in Brazil[8,15-18] and only one investigated behavior across different domains[16]. Little is known about the combined contribution of demographic, socioeconomic, behavioral, and health factors on the distribution of SB in population groups in developing countries. The survey "*Condições de Vida e Saúde de Mulheres Adultas: Estudo de Base Populacional no Vale dos Sinos. Avaliação após 10 Anos*" (The Living and Health Conditions of Adult Women: a Population-Based Study in Vale dos Sinos. A 10-Year Follow-up) provides an opportunity to investigate SB in this segment of the population. The objective of the present study was therefore to describe SB among these women across leisure, occupation, and transport domains (LSB, OSB, and TSB, respectively) and determine the factors associated with excessive sedentary behavior in each domain (ELSB, EOSB, and ETSB, respectively).

Methods

Conducted in 2015, the Living and Health Conditions of Adult Women survey is a cross-sectional study that investigated a representative sample of women aged between 20 and 69 years living in São Leopoldo. The following individuals were excluded: pregnant women; those mentally incapable of answering the questionnaire, based on the observations of the interviewer and confirmed by a person living in the household; and women unable to participate due to health reasons in the week prior to the interview.

São Leopoldo belongs to the Metropolitan Region of Porto Alegre and is located 33km from the capital of the State of Rio Grande do Sul. It has an area of 102,738 km^2 and the population at the time of the 2010 Census was 214,087 inhabitants (population density 2060.31 inhabitants/km^2) and showed a predominance of women (109,845)[19]. The Municipal Human Development Index in 2010 was 0.739, which is classified as high and above the national average (0.727)[20].

The survey sample size was calculated for each of the various study outcomes, with the outcome "overdue cytopathologic test" and exposure variable "education level" resulting in the largest samples. Sample size was calculated considering a risk ratio of 2.0, 95% confidence level, 80% statistical power, and unexposed/exposed ratio of 1:2. The resulting sample size was increased by 10% to compensate for potential losses and refusals and 15% to control for confounding factors, resulting in a final sample of 1,281 women. The sample was selected using two-stage cluster sampling. In the first stage, 45 census tracts were randomly selected from the total number of tracts in the city (n = 371)[19], followed by the random sampling of 36 households in each selected tract. Losses and refusals amounted to 12.1% of the sample, resulting in a final sample of 1,126 interviewed women. This number was used to calculate the power to detect the association between exposure variables and SB outcomes, resulting in a power of ≥ 70% to detect significant associations (prevalence ratio of ≥ 1.2) for exposure variables affecting between 33.6% and 78% of the sample, adopting a 95% confidence interval.

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Sedentary behavior (SB) was measured using a questionnaire developed by the authors based on a review of the literature[21,22] and an existing instrument[16]. The questionnaire was developed to enable the inclusion of sedentary activities in both sitting and reclining postures, in accordance with the definition of SB, and record activities on both weekdays and weekends. The following situations and/or places were included: a) computer, tablet or cellphone use for work/study at home; b) computer, tablet or cellphone use for leisure at home; c) watching TV; d) motorized transport (car, motorcycle, train, bus); e) the workplace, f) at college, on a course, or at university; g) drinking mate, h) visiting/seeing friends; and i) other activities (reading, religious activities, and manual activities). In the case of engagement in combined sedentary activities, the respondent was asked to report the main activity. Total SB and total leisure, occupation (including work and study), and transport SB (LSB, OSB, and TSB, respectively), expressed in minutes per day, were calculated considering different combinations of the situations and places outlined above: Total SB (all situations and places); LSB (b, c, g, and h); OSB (a, e, and f), and TSB (d). The totals were calculated based on the total amount of the time spent engaging in each activity each day divided by 7. The reliability of the questionnaire was tested using the test-retest method on sample of 97 study participants, resulting in correlation coefficients of 0.79, 0.79, and 0.82 (strong correlation) for Total SB, LSB, and OSB, respectively, and 0.60 (moderate correlation) for TSB.

For the independent variables we used a standardized, pre-coded, and pre-tested questionnaire based on different instruments administered by an interviewer. The questionnaire included the following demographic, socioeconomic, and behavioral variables: demographic variables - age (categorized in 10-year groups), skin color (white, non-white), marital status (with a partner, without a partner); socioeconomic variables - economic status (class A/B, C, D/E)[23], education level (0 to 4, 5 to 7, 8 to 10, 11 to 14, ≥ 15 years), per capita family income (number of minimum salaries in quartiles), employed (yes; no); behavioral variables - smoking (non-smoker, smoker), alcohol intake (< 30g/day, ≥ 30g/day)[24,25], leisure time PA (≥ 150 min/week, < 150 min/week)[4], and transport PA (yes, no). For simplification purposes, the physical activity items covered only transport and leisure using questions adapted from the short International Physical Activity Questionnaire (IPAQ)[26]. Intensity of the activity (moderate/vigorous) was asked in the case of an affirmative answer. The questionnaire also included the following items: household cars (none; one; two or more); household computers (none; one; two or more); children in the household (none; one; two or more); and self-reported health (excellent/very good/good, fair/bad).

The interviews were conducted by trained interviewers who participated in the pilot study using a census tract not selected in the sampling phase. Data collection was conducted by a group of researchers over an 8-month period. Data quality was tested on a random sample of 10% of the respondents using a sample of the questions from the questionnaire with fixed responses in the short-term (age, number of children, etc.).

The study was approved by the Research Ethics Committee of the Vale do Rio dos Sinos University and all participants signed an informed consent form.

The data was double entered into the EpiData software version 3.1 to check and correct for possible entry errors. Descriptive analysis was performed using the IBM SPSS software version 22.0 (IBM Corp., Armonk, United States). Since the data were not normally distributed, they were described with medians and interquartile ranges. Excessive SB was defined using the corresponding median of each domain as a cut-off point. This procedure was adopted by previous studies because a SB threshold for health risk has not been established[16,27]. The data were expressed as percentages with their respective 95% confidence interval (95% CI). Since some women reported unreal Total SB values (> 24h/day), the maximum value was defined as 1,140 minutes per day, considering a minimum of 5 hours of sleep per day and values above this cut-off were replaced by the median (1.1% of the sample). Associations were tested using Poisson regression with robust error variance[28] and the statistical software Stata MP 14.0 (Stata Corp., College Station, the United States). Variables that obtained $p \leq 0.20$ in the bivariate analysis were included in the adjusted analysis, performed using a conceptual model comprising three levels of determination: level 1, including the demographic variables adjusted to each other; level 2, including the socioeconomic variables adjusted to each other and to the variables that obtained $p \leq 0.20$ in level 1; and level 3, including the behavioral variables and household cars, children in the household, and self-reported health adjusted to each other and the variables that obtained $p \leq 0.20$ in the previous levels.

Marital status, employment, household cars, children in the household, self-reported health, and the behavioral variables were not included in the EOSB model because it is understood that these factors do not influence this outcome. Marital status and household computers were not tested in the ETSB model for the same reason. Variables with $p < 0.05$ were considered to be significantly associated with the outcome. In view of the sample design, the analyses were performed using Stata's svy command.

Results

The mean age of the respondents was 43.3 years (SD±13.4) and the majority of the sample were white (74.4%), had a partner (63.8%), and lived in a household without a child (59.1%). Average education level was 9.8 years (SD±10.8) and the majority of the respondents worked (56%), had a per capita income of < 1.5 minimum salaries (74.7%), and belonged to economic class C (52.8%). The majority of the sample lived in households with at least one car and computer (62.4% and 63%, respectively). A large majority of respondents did not practice a minimum of 150 minutes of leisure time PA per week (85.7%). On the other hand, the majority of the sample did not report alcohol abuse (97.5%), were not smokers (81.5%), and reported excellent/very good/good self-reported health (66.3%) (Table 1).

The medians and interquartile ranges for Total SB, LSB, OSB, and TSB were 271.4 min/day (150.0-463.2), 163.9 min/day (86.8-270.5), 51.4 min/day (0-257, 1), and 17.1 min/day (5.7-37.3), respectively. The means and respective 95% confidence intervals for Total SB, LSB, OSB, and TSB were 319.4 min/day (306.8-331.9), 208.1 min/day (197.1-219.2), 141.5 min/day (95%CI: 128.7-154.4), and 33.1 min/day (95%CI: 29.8-36.2), respectively (data not shown in the Table).

The contribution of each domain to Total SB in the overall sample and by economic class is shown in Figure 1. This graph shows the mean SB values (min/day). In the overall sample, the predominant domain in Total SB was LSB (63%), followed by OSB (27%) and TSB (10%). There was no difference in the distribution of LSB across the different economic classes ($p \geq 0.05$). However, the percentage contribution of LSB to Total SB in each class varied, accounting for 82% of Total SB in class D/E and 52% in class and A/B. There was a statistically significant difference in the distribution of OSB across classes

Table 1. Characteristics of the study sample (n=1126).

Variable	n	(%)
Age group (years)		
60 to 69	163	14.5
50 to 59	228	20.2
40 to 49	275	24.4
30 to 39	244	21.7
20 to 29	216	19.2
Skin color		
Non-white	288	25.6
White	838	74.4
Marital status		
Without a partner	408	36.2
With a partner	718	63.8
Economic class		
D and E	136	12.1
C	595	52.8
A and B	389	34.7
Education level (years)		
0 to 4	204	18.1
05 to 07	253	22.5
08 to 10	197	17.5
11 to 14	360	32.0
15 + years	110	9.8
Income per capita in MS[1]		
Up to 0.52	276	25.3
0.53 a 0.86	270	24.8
0.87 a 1.53	271	24.9
≥ 1.54	272	25.0
Employed		
Yes	631	56.0
No	494	43.9
Household cars		
None	417	37.0
One	547	48.6
Two or more	162	14.4
Household computers		
None	423	37.6
One	461	40.9
Two or more	242	21.5
Children in the household[2]		
Two or more	140	12.4
One	320	28.4
None	66	59.1
Smoking		
Non-smoker	918	81.5
Smoker	208	18.5
Alcohol intake		
< 30g/day	1098	97.5
≥ 30g/day	28	2.5
Leisure time PA		
≥150 minutes per week	161	14.3
<150 minutes per week	965	85.7
Transport PA		
Yes	744	66.1
No	382	33.9
Self-reported health		
Excellent/very good/good	746	66.3
Fair/bad	380	33.7
Total	1126	100.0

[1] MS: minimum salaries (MS in 2015 = R$1,006.88); [2] ≤ 12 years; PA: Physical Activity.

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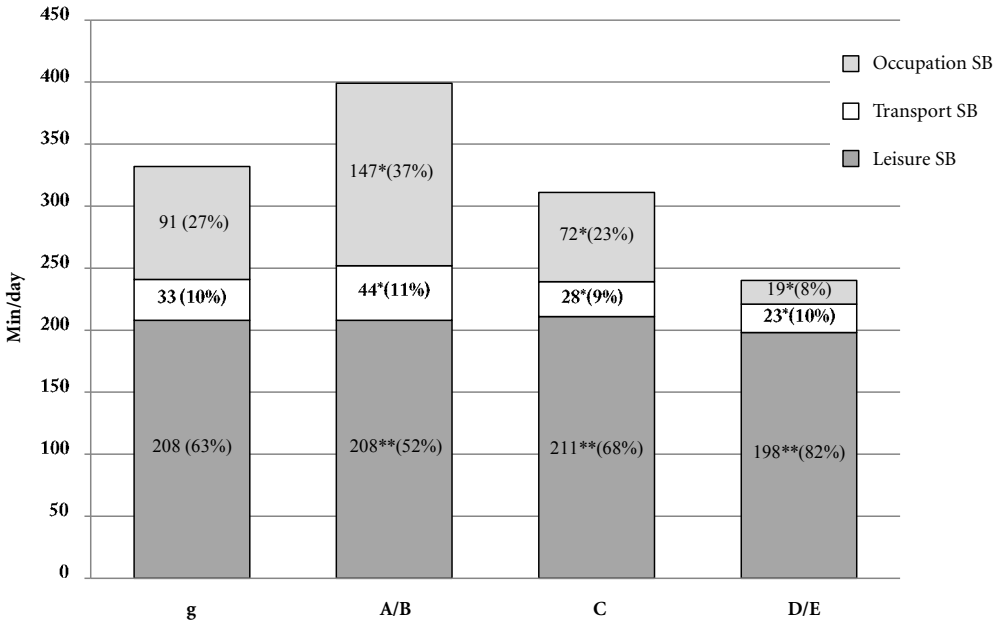

Figure 1. Mean time spent engaging in SB and percentage contribution of each domain to overall SB in the overall sample and by economic class.

* p < 0,001; ** p > 0,05 (difference in distribution of SB tested using the Kruskal–Wallis test).

(p < 0.001) and in the percentage contribution of OSB to Total SB in each class. The domain that contributed least to Total SB in each category was TSB (ranging from 9 to 11%). Although the percentage contributions of TSB to Total SB in each class were similar, there was a difference in the distribution of TSB across the classes (p < 0.001).

Table 2 shows that the variables that showed an association with ELSB after control for confounding factors were education level, employment, children in the household, and smoking. Respondents with 15 years or more of education were 30% more likely to show ELSB than those with 0 to 4 years of study, while women who did not work were 60% more likely to show ELSB than those who did. Respondents without children in the household and smokers were 40% and 30% more likely, respectively, to show ELSB (95%CI: 1.1-14).

All the variables tested in the adjusted analysis except household computers showed a statistically significant association with EOSB. The data also showed an inverse linear association between age group and EOSB and a direct linear association between socioeconomic class, education level, and income and the outcome. White women were 40% more likely than non-whites to show EOSB (Table 3).

All the variables tested in the adjusted analysis except smoking, leisure time PA, transport PA, and self-reported health were significantly associated with ETSB (Table 4). The data also showed that the likelihood of ETSB decreases with age, while white women were 20% more likely than non-whites to show ETSB. There was a direct linear association between socioeconomic class, education level, and income and ETSB. Women who did not work were 30% less likely to show ETSB than those who work (95% CI: 0.6-08). The likelihood of ETSB increased with the number of cars in the household.

Discussion

Half of the overall sample reported that they spent at least 270 minutes engaging in SB (equivalent to 4.5 hours per day), with LSB, OSB and TSB accounting for 63%, 27%, and 10% of Total SB, respectively. Certain variables were associat-

Table 2. Prevalence, crude and adjusted prevalence ratios (PR) and 95% confidence interval (95% CI) of excessive leisure sedentary behavior by sample characteristics (n=1126).

Variable	Prevalence	PR crude	p-value	Adjusted [A] PR	p-value
	% (95% CI)	(95% CI)		(95%CI)	
Level 1					
Age group (years)					
60 to 69	58.9 (49.2-68.6)	1	0.28*	§	§
50 to 59	52.6 (45.2-60.0)	0.9 (0.7-1.1)			
40 to 49	40.0 (33.2-46.8)	0.7 (0.5-0.8)			
30 to 39	44.3 (37.1-51.4)	0.8 (0.6-0.9)			
20 to 29	59.7 (53.1-66.3)	1.0 (0.8-1.2)			
Skin color					
Non-white	48.6 (43.1-54.4)	1	0.51**	§	§
White	50.5 (46.5-54.5)	1.0 (0.9-1.7)			
Marital status			0.67**		
Without partner	51.0 (46.0-56.0)	1		§	§
With partner	49.4 (44.3-54.6)	1.0 (0.8-1.1)			
Level 2					
Economic status					
D and E	43.4 (37.4-49.4)	1	0.13*	1	
C	50.4 (44.8-56.0)	1.2 (1.0-1.4)		1.2 (1.0-1.4)	0.195*
A and B	51.9 (46.4-57.4)	1.2 (1.0-1.5)		1.2 (0.9-1.5)	
Education level (years)					
0 to 4	48.5 (42.0-55.1)	1	0.13*	1	
05 to 07	47.4 (41.6-53.2)	1.0 (0.8-1.2)		1.0 (0.9-1.2)	0.040*
08 to 10	50.3 (42.0-58.6)	1.0 (0.9-1.3)		1.1 (0.9-1.4)	
11 to 14	51.1 (45.4-56.7)	1.1 (0.9-1. 2)		1.1 (0.9-1.3)	
15	54.5 (46.0-63.1)	1.1 (0.9-1.4)		1.3 (1.1-1.7)	
Income in MS[1]					
Up to 0.52	47.5 (41.4-53.5)	1	0.21*	§	§
0.53 to 0.86	48.5 (42.0-55.0)	1.0 (0.9-1.2)			
0.87 to 1.53	51.3 (43.7-58.9)	1.1 (0.9-1.3)			
≥ 1.54	52.9 (46.0-59.9)	1.1 (0.9-1.3)			
Work					
Yes	40.6 (36.0-45.2)	1	< 0.001**	1	< 0.001**
No	61.9 (56.8-67.0)	1.5 (1.3-1.8)		1.6 (1.4-1.9)	

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ed with all three domains, while others were domain-specific.

Both the median and mean values of Total SB observed in the present study (271.4 min/day; IQR: 150.0-463.2 and 319.4 min/day; 95% CI: 306.8-331.9) were similar to the findings of a study of a female sample in Pelotas[16] (median: 240 min/day, IQR:135.0-480; mean: 323 min/day, 95% CI: 305,0-341.0). The respondents of the present study spent a mean of 50 more minutes a day engaging in SB than the women of a study in Ribeirão Preto[18] (mean: 270.3 min/day; 95% CI: 256.3-284.23). However, these comparisons should be treated with caution since the studies used different instruments to measure SB[12]. For example, the lower values among women in Ribeirão Preto may be partially explained by the use of the IPAQ, which contains only one question on time spent sitting, thus leading to a possible underestimation of total sitting time[18]. In addition, the IPAQ does not consider time spent in engaging in TSB. The higher values observed by the present study may also be due to the fact that our instrument assessed SB in both sitting and

Table 2. Prevalence, crude and adjusted prevalence ratios (PR) and 95% confidence interval (95% CI) of excessive leisure sedentary behavior by sample characteristics (n=1126).

Variable	Prevalence	PR crude	p-value	Adjusted [A] PR	p-value
	% (95% CI)	(95% CI)		(95%CI)	
Level 3					
Household cars					
None	50.1 (45.5-54.0)	1	0.91*	§	§
One	50.1 (44.8-55.3)	1.0 (0.9-1.1)			
Two or more	49.4 (39.8-58.9)	1.0 (0.8-1.2)			
Household computers					
None	47.3 (42.8-51.7)	1	0.11*	1	0.325*
One	50.1 (44.7-55.5)	1.1 (0.9-1.2)		1.0 (0.9-1.2)	
Two or more	54.5 (47.1-62.0)	1.5 (1.0-1.4)		1.1 (0.9-1.4)	
Children in the household[2]					
Two or more	41.4 (30.3-52.5)	1	< 0.001*	1	0.001*
One	40.6 (34.4-46.8)	1.0 (0.7-1.4)		1.0 (0.7-1.4)	
None	56.3 (52.0-60.6)	1.4 (1.0-1.8)		1.4 (1.0-1.8)	
Smoking					
Non-smoker	48.5 (44.5-52.5)	1	< 0.001	1	<0.001**
Smoker	56.7 (50.9-62.6)	1.2 (1.0-1.3)		1.3 (1.1-1.4)	
Alcohol intake					
< 30g/day	49.7 (46.0-53.5)	1	0.23**	§	§
≥ 30g/day	60.7 (41.2-80.2)	1.2 (0.9-1.7)			
Leisure time PA					
≥150 minutes per week	52.6 (45.7-59.5)	1	0.30**	§	§
<150 minutes per week	49.2 (45.5-52.9)	0.9 (0.8-1.1)			
Transport PA					
Yes	49.3 (44.9-53.7)	1	0.49**	§	§
No	51.3 (46.2-56.4)	1.0 (0.9-1.2)			
Self-reported health					
Excellent/very good/good	48.3 (44.1-52.4)	1	0.03**	1	0.489**
Fair/bad	53.4 (48.9-58.0)	1.1 (1.0-1.2)		1.0 (0.9-1.1)	
Total	50.0 (46.3-53.7)				

[1]SM: minimum salaries (MS in 2015 = R$1,006.88); [2]≤12 years; PA: physical activity; *Wald test for linear trend; **Wald test to test for heterogeneity of the portions; [A]Each variable adjusted for the variables from the same and previous levels. Only variables with p ≤ 0.20 were included; §Variables with p ≤ 0.20 in the crude analysis.

reclining postures, while the studies mentioned above included only sitting posture.

The data presented show that half of the respondents reported spending at least 163.9 min/day engaging in LSB. The lack of studies using the same approach as the present study (for example, the inclusion of TV watching and leisure time computer use) hampers comparisons with national averages. Although our findings demonstrate that watching TV is the most frequent LSB, national data show a declining trend in the time spent on this activity in recent years[17].

Half of the respondents who worked or studied (n = 685) spent at least 50 min/day engaged in workplace and/or study sedentary activities. The mean values for these activities (141.5 min/day; 95% CI: 121.68-161.41) were similar to those reported by the study conducted in Pelotas (~150 min/day; 95% CI: 130-165)[16]. Furthermore, the respondents of the present study spent a mean of 10 minutes more a day in TSB than the participants of the study in Pelotas (33 min/day; 95% CI: 29.8-36.2 compared to ~45 min/day; 95% CI: 40-50)[16]. All the women in the sample were included in this domain, considering that for the purposes of this study transport includes travel to work and for study and leisure purposes. However, occupation can have a significant influence

Table 3. Prevalence, crude and adjusted prevalence ratios (PR) and 95% confidence interval (95% CI) of excessive occupation sedentary behavior by sample characteristics. (n=1126).

Variable	Prevalence	Crude PR	p-value	Adjusted [A] PR	p-value
	% (95% CI)	(95% CI)		(95% CI)	
Level 1					
Age group (years)					
60 to 69	42.9 (26.2-59.5)	1	< 0.001*	1	< 0.001*
50 to 59	35.7 (24.8-46.7)	0.8 (0.5-1.3)		0.8 (0.5-1.3)	
40 to 49	45.2 (38.3-52.2)	1.1 (0.7-1.5)		1.1 (0.7-1.5)	
30 to 39	51.7 (44.0-59.5)	1.2 (0.8-1.8)		1.2 (0.8-1.8)	
20 to 29	66.0 (57.3-74.6)	1.5 (1.0-2.3)		1.5 (1.0-2.4)	
Skin color					
Non-white	38.3 (31.9-44.8)	1	< 0.001*	1	< 0.001**
White	52.9 (47.1-58.7)	1.4 (1.2-1.6)		1.4 (1.2-1.6)	
Marital status					
Without partner	50.4 (43.1-57.6)	NA		NA	
With partner	48.7 (43.3-54.1)				
Level 2					
Economic status					
D and E	19.4 (12.1-26.7)	1	< 0.001*	1	0.033*
C	41.8 (35.8-47.8)	2.2 (1.5-3.2)		1.4 (0.9-2.1)	
A and B	66.2 (60.2-72.1)	3.4 (2.3-5.1)		1.6 (1.0-2.6)	
Education level (years)					
0 to 4	24.7 (15.9-33.5)	1	< 0.001*	1	< 0.001*
05 to 07	25.5 (18.2-32.9)	1.0 (0.7-1.6)		0.9 (0.6-1.4)	
08 to 10	40.0 (31.4-48.6)	1.6 (1.0-2.7)		1.3 (0.8-2.1)	
11 to 14	65.2 (59.1-71.3)	2.6 (1.8-3.9)		1.7 (1.1-2.5)	
15	78.0 (69.8-86.2)	3.2 (2.2-4.5)		1.7 (1.1-2.6)	
Income in MS[1]					
Up to 0.52	28.4 (22.5-34.2)	1	< 0.001*	1	< 0.001*
0.53 to 0.86	36.2 (30.2-42.3)	1.3 (1.0-1.7)		1.2 (0.9-1.6)	
0.87 to 1.53	51.6 (44.1-59.2)	1.8 (1.4-2.3)		1.4 (1.0-1.8)	
≥ 1.54	71.5 (64.5-78.5)	2.5 (1.9-3.2)		1.7 (1.3-2.2)	
Work					
Yes	51.3 (45.8-56.9)	NA		NA	
No	25.9 (14.7-37.1)				

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on time spent engaging in TSB. The fact that a large part of respondents were not working at the time of the study may therefore have contributed to the low values found for this domain. Though not investigated in this study, it is also possible that the city's characteristics may facilitate other forms of transport, such as walking or bicycle, reducing time spent on motorized transport due to the shorter distances travelled between places[29,30].

The data presented show that the domain that contributed most to Total SB in the overall sample was LSB (63% do Total SB). This finding is important because LSB is the domain that has the greatest potential for reduction[31], which is desirable considering the increased risk of morbidity and mortality associated with SB[5,6]. Evidence from studies examining cardiometabolic risk markers show that reallocating 30 minutes of sedentary time with either light-intensity physical activity or moderate to vigorous physical activity may be beneficial for health[32]. In the present study, this would require a 20% reduction in the time spent engaging in LSB. Figure 1 also shows that mean domain values and their respective

Table 3. Prevalence, crude and adjusted prevalence ratios (PR) and 95% confidence interval (95% CI) of excessive occupation sedentary behavior by sample characteristics. (n=1126).

Variable	Prevalence	Crude PR	p-value	Adjusted [A] PR	p-value
	% (95% CI)	(95% CI)		(95% CI)	
Level 3					
Household cars					
None	36.3 (29.9-42.7)	NA		NA	
One	53.2 (47.2-59.3)				
Two or more	63.6 (53.7-73.4)				
Household computers					
None	31.4 (25.4-37.5)	1	< 0.001*	1	0.338*
One	51.4 (44.3-58.5)	1.6 (1.3-2.1)		1.1 (0.8-1.4)	
Two or more	69.4 (62.3-76.4)	2.2 (1.8-2.7)		1.1 (0.9-1.5)	
Children in the household[2]					
Two or more	33.7 (22.6-44.9)	NA		NA	
One	45.7 (39.6-51.8)				
None	54.6 (47.3-61.8)				
Smoking					
Non-smoker	52.3 (46.7-57.9)	NA		NA	
Smoker	35.8 (28.4-43.2)				
Alcohol intake					
< 30g/day	49.5 (44.1-54.9)	NA		NA	
≥ 30g/day	44.4 (22.8-66.1)				
Leisure time PA					
≥150 minutes per week	66.3 (57.4-75.0)	NA		NA	
<150 minutes per week	43.8 (38.8-48.8)				
Transport PA					
Yes	46.1 (40.7-51.5)	NA		NA	
No	55.1 (46.1-64.0)				
Self-reported health					
Excellent/very good/good	54.0 (48.4-59.6)	NA		NA	
Fair/bad	35.3 (28.1-42.5)				
Total	49.3 (44.0-54.7)				

[1]SM: minimum salaries (MS in 2015 = R$1,006.88); [2]≤12 years; PA: physical activity; NA: Not Analyzed; *Wald test for linear trend; **Wald test to test for heterogeneity of the portions; [A]Each variable adjusted for the variables from the same and previous levels. Only variables with p ≤ 0.20 were included.

percentage contribution to Total SB may vary according to exposure variable. We chose economic class to demonstrate these differences because socioeconomic inequalities can influence SB in different situations: at home, through the use of appliances and devices that can save time spent on household chores and promote leisure time sedentary activities (internet, computers, etc.); in the workplace, where new technologies mean work activities are performed in a sitting position; and transport, though access to motorized transport[33]. Despite methodological differences in SB assessment, our results are similar to the findings of the Pelotas study[16], which showed a reduction in the percentage contribution of OSB and an increase in the percentage contribution of LSB to Total SB with decreasing economic status and similar percentage contributions of TSB across the three economic classes. One possible explanation for the differences in the percentage contributions of OSB and LSB across economic classes is that women with lower economic status tend to work in more physically demanding occupations and therefore spend less time in a sitting posture at work. However, although our findings show a large difference in the percentage contribution of LSB to Total SB in each economic class, there was no significant difference in the distribution of LSB across the classes. These findings are important because they show that

Table 4. Prevalence, crude and adjusted prevalence ratios (PR) and 95% confidence interval (95% CI) of excessive transport sedentary behavior by sample characteristics. (n=1126).

Variable	Prevalence	Crude PR	p-value	Adjusted[A] PR	p-value
	% (95% CI)	(95% CI)		(95% CI)	
Level 1					
Age group (years)					
60 to 69	37.4 (30.3-44.6)	1	<0.001*	1	<0.001*
50 to 59	38.6 (31.2-46.0)	1.0 (0.8-1.3)		1.0 (0.8-1.3)	
40 to 49	53.5 (47.1-59.8)	1.4 (1.2-1.7)		1.4 (1.2-1.8)	
30 to 39	54.1 (46.9-61.3)	1.5 (1.2-1.8)		1.4 (1.2-1.8)	
20 to 29	57.4 (51.4-63.4)	1.5 (1.3-1.9)		1.5 (1.3-1.9)	
Skin color					
Non-white	43.1 (36.6-49.5)	1	0.064**	1	0.046**
White	51.1 (45.9-56.2)	1.2 (1.0-1.4)		1.2 (1.0-1.4)	
Marital status					
Without partner	48.0 (43.2-52.9)	NA		NA	
With partner	49.6 (44.6-54.6)				
Level 2					
Economic status					
D and E	5.7 (0.0-19.0)	1	<0.001*	1	0.018*
C	14.3 (5.0-30.7)	1.7 (1.3-2.3)		1.3 (1.0-1.8)	
A and B	28.6 (12.9-55.7)	2.5 (1.9-3.4)		1.5 (1.0-2.1)	
Education level (years)					
0 to 4	27.0 (21.2-32.7)	1	<0.001*	1	<0.001*
05 to 07	39.5 (33.7-45.3)	1.5 (1.1-1.9)		1.2 (0.9-1.7)	
08 to 10	40.6 (32.0-49.2)	1.5 (1.1-2.0)		1.2 (0.9-1.6)	
11 to 14	64.4 (58.8-70.2)	2.4 (1.9-3.0)		1.6 (1.2-2.1)	
15	77.3 (69.2-85.4)	2.9 (2.3-3.6)		1.6 (1.2-2.2)	
Income in MS[1]					
Up to 0.52	33.0 (28.0-38.0)	1	<0.001*	1	0.006*
0.53 to 0.86	44.1 (45.1-60.4)	1.3 (1.1-1.6)		1.2 (1.0-1.5)	
0.87 to 1.53	52.8 (45.1-60.4)	1.6 (1.3-1.9)		1.2 (1.0-1.5)	
≥ 1.54	68.0 (60.7-75.3)	2.1 (1.7-2.5)		1.4 (1.1-1.7)	
Work					
Yes	61.2 (56.4-66.0)	1	<0.001*	1	<0.001*
No	33.6 (29.2-38.0)	0.6 (0.5-0.6)		0.7 (0.6-0.8)	

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interventions should be domain-specific[34] and tailored to the specific characteristics of the target population.

The results of the adjusted analysis showed a direct linear association between education level and ELSB. This finding is consistent with the literature that looked at leisure time sedentary activities beyond time spent watching TV[27,35]. It is therefore likely that the respondents with a higher level of education level performed other types of leisure time sedentary activities. Our study showed a positive association between not working and lower number of children in the household and ELSB, which suggests that women with more spare time spend this time on leisure time sedentary activities[36]. Our findings show that smokers were more likely to show ELSB, suggesting clustering of unhealthy behaviors[37]. Although there is no evidence on which types of interventions are most effective in reducing ELSB[38], our findings suggest that actions should include the promotion of healthy lifestyles and raising awareness about the danger of spending excessive time engaging in SB[39,40].

The data presented show an inverse linear association between age and EOSB. This asso-

Table 4. Prevalence, crude and adjusted prevalence ratios (PR) and 95% confidence interval (95% CI) of excessive transport sedentary behavior by sample characteristics. (n=1126).

Variable	Prevalence	Crude PR	p-value	Adjusted[A] PR	p-value
	% (95% CI)	(95% CI)		(95% CI)	
Level 3					
Household cars					
None	34.3 (29.6-39.0)	1	<0.001*	1	<0.001*
One	53.4 (48.7-58.1)	1.6 (1.3-1.8)		1.2 (1.0-1.5)	
Two or more	72.2 (62.2-82.3)	2.1 (1.8-2.5)		1.5 (1.2-1.8)	
Household computers					
None	36.2 (31.7-40.7)	NA		NA	
One	49.7 (45.0-54.4)				
Two or more	70.2 (61.7-78.8)				
Children in the household[2]					
Two or more	43.6 (32.7-54.4)	1	0.751*	§	§
One	52.5 (47.5-57.5)	1.2 (0.9-1.6)			
None	48.5 (43.4-53.6)	1.1 (0.9-1.4)			
Smoking					
Non-smoker	51.0 (46.2-55.9)	1	0.016**	1	0.738**
Smoker	40.4 (33.9-46.8)	0.8 (0.7-1.0)		1.0 (0.8-1.1)	
Alcohol intake					
< 30g/day	48.8 (44.6-53.1)	1	0.227**	§	§
≥ 30g/day	57.1 (42.6-71.7)	1.2 (0.9-1.5)			
Leisure time PA					
≥ 150 minutes per week	56.3 (49.6-63.1)	1	0.002**	1	0.697**
< 150 minutes per week	46.7 (42.6-50.8)	0.8 (0.7-0.9)		1.0 (0.9-1.1)	
Transport PA					
Yes	45.8 (41.9-49.7)	1	0.008**	1	0.536**
No	55.2 (47.9-62.6)	1.2 (1.1-1.34)		1.0 (0.9-1.1)	
Self-reported health					
Excellent/very good/good	55.0 (49.6-60.3)	1	<0.001**	1	0.668**
Fair/bad	37.4 (33.4-41.4)	0.7 (0.6-0.8)		1.0 (0.9-1.1)	
Total	49.0 (44.8-53.2)				

[1]SM: minimum salaries (MS in 2015 = R$1,006.88); [2]≤12 years; PA: physical activity; NA: Not Analyzed; *Wald test for linear trend; **Wald test to test for heterogeneity of the portions; [A]Each variable adjusted for the variables from the same and previous levels. Only variables with p ≤ 0.20 were included. §Variables with p ≤ 0.20 in the crude analysis.

ciation may be partially explained by the fact that OSB included time spent sitting for study, which tends to be greater in younger women. However, studies that assessed only work SB reported similar findings[41]. The results of the final model also showed an association between OSB and skin color, revealing that white women were 38% more likely to show EOSB than non-whites. A study assessing occupational differences and skin color showed that white women are more likely to work in administrative or technical activities than non-whites[42]. All the socioeconomic variables were directly associated with EOSB, regardless of skin color, which is consistent with the findings of other studies[41,43]. Although not assessed by the present study, other studies have reported that working in certain types of occupations such as administrative, office, and service jobs increases the likelihood of high levels of SB, compared to more physically demanding occupations[44,45]. These studies suggest that women who show EOSB would benefit from workplace interventions, such as the use of workstations that create a variation in sitting postures[46].

All the sociodemographic variables analyzed in the adjusted model showed an association with ETSB in the same direction as the associations with EOSB. Other variables that main-

tained a direct association with ETSB in the final model were working and having a household car. We did not find studies examining this domain with female-only samples, thus limiting comparisons. Further research is needed to determine whether having access to environments that provide favorable conditions for walking and cycling reduces ETSB among women[47].

One of the strengths of the present study is that it is a representative population-based study, meaning that the results can be extrapolated to the female population of São Leopoldo. Furthermore, SB was measured across various activities taking into account both weekdays and weekends. Finally, our analysis considered three different SB domains and a wide range of exposure variables.

Limitations include the fact that cross-sectional studies are limited in their ability to determine the cause-and-effect relationship between variables. Another limitation is the fact that the validity of the questionnaire used was not tested, thus leading to the possibility of over or underestimation of SB. It is also possible that some combined sedentary activities were doubly reported, overestimating the time spent engaging in Total SB. Finally, despite using medians to describe the characteristics of women engaging in ESB, these values do not necessarily represent a health risk. Evidence shows that the risk of all-cause mortality among adults increases when Total SB exceeds 7 hours per day[48]. Based on this finding, one-quarter of the sample of the present study have an increased risk of mortality, showing a minimum of 7.7 hours per day spent on SB. Thus, the use of the median may attenuate the measures of effect. However, to the best of our knowledge, criteria for classifying ESB in each domain have not been established.

LSB was the predominant domain in Total SB. The percentage contribution of each domain and distribution of SB varied according to economic class. The findings showed an association between demographic variables and EOSB and ETSB, but no association was found with ELSB. At least one socioeconomic variable was positively associated with the outcome in each domain. Having a job was the only variable that showed an association in opposite directions, being directly associated with ELSB and inversely associated with ETSB. In addition, having a household car and not living in a household without a child directly influenced SB in two domains. Of all the behavioral variables analyzed, only smoking was associated with ELSB.

The findings of this study contribute to the identification of women at greater risk of engaging in excessive SB and defining appropriate interventions to reduce SB in each domain. Future studies should examine social, political, and environmental variables to obtain a deeper understanding of the factors influencing SB.

Collaborations

CB Cafruni reviewed the literature, was responsible for study conception and design and the development of the data collection instrument, trained the interviewers, supervised field work, and participated in data analysis and the writing of this article. MTA Olinto coordinated research and contributed to the drafting of the article. JSD Costa coordinated research and contributed to the drafting of the article. FS Bairros contributed to project conception and design, the development of the data collection instrument, trained the interviewers, coordinated field work, and participated in the drafting of this article. RL Henn contributed to study conception and design, the development of the data collection instrument, data analysis, and to the drafting of this article.

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