Prevalence, Patterns, and Correlates of Physical Activity Among the Adult Population in Latin America

Cross-Sectional Results from the CESCAS I Study

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ABSTRACT

Background: Few data are available on population level regarding domain-specific correlates of physical activity (PA) in Latin America.

Objective: The aim of this study was to examine the relationships among PA patterns and their main sociodemographic determinants and cardiovascular risk factors in the Southern Cone of Latin America.

Methods: CESCAS I is a population-based prospective cohort study with a 4-stage stratified sampling of a general population of 7,524 adults aged 35 to 74 years from 4 midsized cities in Argentina, Chile, and Uruguay. PA was assessed using the transcultural adaptation of the International Physical Activity Questionnaire long form. The questionnaire asked about frequency (days per week) and duration (minutes per day) of moderate and vigorous intensity activities in 3 different domains: work, leisure time, and active transportation (walking and bicycling). PA levels of ≥600 metabolic equivalent tasks (MET) minutes per week was considered sufficiently active. Odds ratios for associations of sufficiently active status with sociodemographic determinants and cardiovascular risk factors were obtained using multivariable-adjusted logistic regression models.

Conclusions: Almost 65%) of the participants reported ≥600 MET minutes per week. The lowest prevalence of sufficiently active individuals was seen in Temuco, Chile (58.0%), among women (58.7%), older individuals (55.4%), those with higher educational level (61.6%), and homemakers (53.4%). Approximately 22.8% of the population reported no PA. In multivariable analysis, PA levels were lower among women, individuals who were older, obese, university educated, with clerical work, retired/unemployed or homemakers, and those with physical limitations. Future interventions to increase PA levels in the Southern Cone of Latin America must take into account disparities by gender and socioeconomic status. The promotion of PA during leisure time in women—unemployed and homemakers—and of active transportation for those performing office or clerical work should be a priority in this population.

The incidence of cardiovascular diseases (CVD) is increasing throughout the developing world and causes almost 16.7 million deaths each year, 80% of which occur in low- and middle-income countries [1]. There is substantial evidence from epidemiological studies that physical activity (PA) is associated with a lower risk of morbidity and mortality from CVD [2]. The most active men and women have a 30% to 35% lesser risk of CVD compared with the least active men and women [3]. These benefits may be due to improved lipid profiles, blood pressure, weight control, endothelial function, and insulin sensitivity [4,5]. Current PA guidelines recommend a minimum of 150 minutes of moderate to vigorous intensity activities or 75 minutes of vigorous intensity activities PA per week, or some combination with equivalent energy expenditure to achieve such health benefits [6]. Despite these recommendations, worldwide physical inactivity (energy expenditure <600 metabolic equivalent [MET] minutes per week [6]) contributes 6% to the burden of coronary heart disease, 7% to type 2 diabetes, 10% to breast cancer, and 10% to colon cancer. Every year, more than 533,000 deaths could potentially be avoided by decreasing physical

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inactivity by 10%. The total elimination of physical inactivity would increase the global population life expectancy by 0.68 years [7].

The prevalence of physical inactivity in Latin America was the highest reported worldwide [8] and ranked fifth as a risk factor for mortality in the Southern Cone of Latin America [9]. It is known that sociodemographic characteristics such as gender, age, and level of income and education vary across different PA domains (occupation, household, active transportation and leisure time) [10].

Few data on PA by domain are available from the Southern Cone of Latin America. Most reports are from Brazil [11,12] and Colombia [13,14] Data regarding domain-specific correlates of PA is essential for tailoring health promotion strategies.

The CESCAS I study is a population-based cohort study designed to examine CVD risk factor prevalence and associations with the incidence of CVD events in the Southern Cone of Latin America. Using baseline data from this study, we examined the relationships between sociodemographic determinants, prevalence of cardiovascular risk factors, and PA patterns by domain in a cross sectional sample of the adult population from 4 midsized cities in Argentina, Chile, and Uruguay.

METHODS

Study design and sampling

CESCAS I is a population-based prospective cohort study initiated in February 2011. Baseline data on risk factors and prevalence of CVD were collected between 2011 and 2013. A detailed description of the study population and design has been presented elsewhere [15]. Briefly, the CESCAS I study used a 4-stage random sample of a general population of 7,524 adults aged 35 to 74 years from 4 midsized cities in Argentina (Bariloche and Marcos Paz), Chile (Temuco), and Uruguay (Canelones-Barros Blancos). In the first stage, census radii were randomly selected from each of the 4 locations, stratified by socioeconomic level. In the second stage, a number of blocks proportional to the radius size were randomly selected. In the third stage, households within each block were selected by systematic random sampling. All members between 35 and 74 years in the selected households were listed to create the study sampling frame. In the final stage of sampling, 1 listed member per household was selected randomly to be included in the study. The overall response rate was 73.4% and the response rates were similar in men and women and across different locations. The present analysis was restricted to the 7,524 adults who responded to the PA questionnaire in the first phase. All participants provided an informed consent form and the study was approved by independent Institutional review boards in Argentina, Chile, Uruguay, and the United States, as well as by the National Heart, Lung and Blood Institute of the National Institutes of Health.

Data collection

Baseline data were collected in participant's household by trained interviewers regarding exposure to risk factors and prevalence of CVD. Data was collected using cross-culturally adapted questionnaires from the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) [16]. Once the survey was completed, each participant was scheduled for a clinical examination to obtain physical measurements (blood pressure, weight, height, and waist circumference), electrocardiogram, and overnight fasting blood samples.

PA assessment

PA was assessed using the transcultural adaptation of the International Physical Activity Questionnaire long form (IPAQ) used in the HCHS/SOL study [17]. The IPAQ had an acceptable reliability (Spearman correlation coefficients around 0.8); however, the validity was moderate at best (correlation coefficients around 0.3), but comparable with most other self-report validation studies [18].

The questionnaire asked about frequency (days per week) and duration (minutes per day) of moderate and vigorous intensity activities in the last 7 days in 3 different domains: work, leisure time, and active transportation (walking and bicycling). In addition, 1 question assessed the total time spent in sedentary activities (e.g., watching television and playing video/board games).

We estimated energy expended on the assessed PA in MET. One MET is defined as the energy it takes to sit quietly, which is about 1 calorie per every kilogram (2.2 pounds) of body weight per hour for an average adult (e.g., 1 MET = 1 kcal/kg/h). The corresponding METs for the 3 PA intensities are the following: light intensity activities, <3.0 METs; moderate intensity activities, 3.0−6.0 METs; and vigorous intensity activities, >6 METs. The values used in this study were 8 METs for vigorous intensity activities, 4 METs for moderate intensity activities, and 3.3 METs for walking or biking following IPAQ guidelines for data processing and analysis [19]. We expressed the total PA score per week as total MET minutes per week calculated as the sum of energy expended in walking or biking, and moderate to vigorous intensity activities. Only activities performed for 10 or more minutes were included in the calculation of the PA scores. If a subject reported participating in any activity for more than 180 minutes, we truncated this at 180 minutes [16]. We defined sufficiently active as 600 MET minutes per week or more, according to the current World Health Organization (WHO) guidelines for PA [6].

Covariate measurement

The present study analyzed 9 independent variables: 4 sociodemographic variables (age, sex, level of educational attainment, and occupation), 4 CVD risk factors (body weight, hypertension, diabetes, and current smoking status), and self-reported physical limitation (asking to

participants about their ability to climb stairs or walk for more than 1 hour). Educational level was classified as primary school or lower, middle or high school, or university. Occupation was classified as manual labor, office or clerical work, retired, unemployed, and homemaker. Hypertension was defined as a mean systolic blood pressure of ≥140 mm Hg and/or diastolic blood pressure of ≥90 mm Hg, and/or self-report of current use of antihypertensive medications [20]. Body mass index was calculated as body weight divided by the square of height (kg/m^2), and participants were categorized into normal weight (18.5 to 24.9 kg/m^2), overweight (25.0 to 29.9 kg/m^2), and obese (≥30.0 kg/m^2) groups according to the WHO guidelines [21]. Hypercholesterolemia was defined as total cholesterol of ≥240 mg/dl and/or use of lipid-lowering medication [22]. Diabetes was defined as fasting glucose ≥126 mg/dl or self-reported history of diabetes [23]. Current smoking was defined as smoking at least 1 cigarette per week at the time of the survey [24]. Central obesity was defined as waist circumference of ≥102 cm for men and ≥88 cm for women [22].

Statistical analysis

This study was designed to provide precise estimates of the prevalence of PA by gender, age groups (35 to 44, 45 to 54, 55 to 64, and 65 to 74 years), and location. Prevalence estimates were weighted on the basis of the age and gender distribution of the population according to 2010 census data. Age-standardized estimates of prevalence were calculated by the direct method, based on the World Standard Population as recommended by the WHO [25]. Gender-stratified analyses were performed to explore behavioral differences between men and women. To describe the general characteristics of the study population, we used the absolute and relative frequencies for categorical variables. To describe energy expenditure, PA scores we used median, 25th, and 75th percentiles because the data were positively skewed. PA scores were also dichotomized as "sufficiently active" or "inactive" as previously described based on WHO guidelines. Estimates of prevalence were reported as proportions with 95% CI. The prevalence of PA by domain was calculated as the percentage of the total population who spent ≥600 MET minutes per week in that domain.

Odds ratios (OR) and 95% CI for the association between PA status and independent variables of interest were obtained using multivariable-adjusted logistic regression models. The inclusion of independent variables in the regression model was conducted in the following order: 1) demographic variables (age and sex); 2) socioeconomic factors (education level and occupation); and 3) medical and health conditions (body weight, hypertension, diabetes, and smoking status). Finally, we included physical limitation for performing moderate intensity activities. Independent variables with $p < 0.05$ from 2-tailed tests were considered significantly associated with the outcome of interest. All analyses were conducted in STATA 10.0 (Stata Corp, College Station, Texas, USA) and took into account the complex sampling strategy using survey commands.

RESULTS

Of the 10,254 individuals randomly selected from the sampling frame, 550 were never found at their homes and 1,394 refused to participate. Of the 8,310 who completed home surveys, 855 did not attend the clinical examination. Thus, the final sample for this analysis includes 7,524 participants (3,165 men and 4,359 women). The overall response rate was 73.4%, and the response rates were similar in men and women and across locations. The general characteristics of the population are shown in Table 1. We found a high prevalence of overweight and obesity affecting 87% of the overall population (41.3% overweight and 35.7% obese). Thirty-four percent of the population had only primary school or less education; 43.1% were not currently working and 22.9% described their work activities as highly sedentary. Only 12.9% of women reported performing vigorous intensity activity and the most frequent leisure activities were brisk walking and going to the gym. Conversely, 39.9% of men reported performing vigorous intensity activity and the most frequent activities was team sports (soccer and basketball) followed by brisk walking. Men more often reported ≥6 hours seated per day as compared with women (15.1% vs. 10.5%, respectively), but less often reported physical limitations in performing moderate intensity PA (6.7% vs. 13.7%, respectively).

Almost two-thirds of the population (64.8%) reported meeting the recommended level of PA and were classified as sufficiently active according to WHO guidelines [6] (Table 2). The lowest prevalence of sufficiently active individuals was seen in Temuco, Chile (58.0%), in women (58.7%). Sufficient activity was less often seen among older individuals (55.4%), those with a higher educational level (61.6%), and homemakers (53.4%). Overall, 22.8% (95% CI: 21.6 to 24.0%) reported not performing any PA (19.5%; 95% CI: 17.8 to 21.2% among men and 25.7%; 95% CI: 24.0 to 27.4% among women).

Men had significantly higher PA scores than women among currently working individuals (median: 2,763 vs. 989 MET minutes per week, for men and women respectively), as well as among the retired, unemployed and homemakers (median: 1,188 vs. 692 MET minutes per week, for men and women respectively) (Online Table 1).

The prevalence of sufficiently active status by domain is shown in Table 3. Overall, subjects tended to meet the recommended level of PA more frequently through transportation and occupation; a lower proportion met PA levels in their leisure time (38.8%, 34.1%, and 19%, for each domain, respectively). Subjects who met the sufficiently active status at work were more likely to be younger, male, less educated, and

TABLE 1. Characteristics of the study population

	Overall (n = 7,524)	Men (n = 3,165)	Women (n = 4,359)
Age group, yrs			
35–44	1,716 (22.8)	706 (22.3)	1,010 (23.2)
45–54	2,072 (27.5)	832 (26.3)	1,240 (28.5)
55–64	2,114 (28.1)	935 (29.5)	1,179 (27.1)
65–74	1,622 (21.6)	692 (21.9)	930 (21.3)
Educational level			
Primary school or lower	34.1 (32.8–35.3)	32.9 (31.0–34.7)	35.1 (33.5–36.8)
Middle or high school	42.1 (40.7–43.5)	42.7 (40.6–44.7)	41.7 (39.8–43.5)
University	23.8 (22.5–25.1)	24.5 (22.5–26.4)	23.2 (21.5–24.9)
Occupation status			
Manual labor	34.0 (32.6–35.4)	43.7 (41.5–45.8)	25.6 (24.0–27.3)
Office or clerical work	22.9 (21.6–24.1)	28.4 (26.4–30.5)	18.0 (16.4–19.7)
Retired	20.2 (19.3–21.2)	19.1 (17.7–20.5)	21.2 (19.9–22.6)
Unemployed	8.6 (7.7–9.4)	8.4 (7.1–9.6)	8.7 (7.5–10.0)
Homemaker	14.3 (13.3–15.3)	0.5 (0.2–0.7)	26.3 (24.6–28.1)
Risk factors*			
Overweight	41.3 (39.9–42.7)	47.7 (45.6–49.8)	35.5 (33.7–37.3)
Obesity	35.7 (34.4–37.0)	31.9 (30.0–33.8)	39.1 (37.3–40.9)
Hypertension	40.8 (39.4–42.1)	44.7 (42.6–46.7)	37.3 (35.5–39.0)
Hypercholesterolemia	24.4 (23.3–25.6)	23.1 (21.4–24.9)	25.6 (24.0–27.1)
Diabetes	12.4 (11.5–13.3)	10.6 (9.4–11.7)	14.0 (12.8–15.3)
Current smoker	29.7 (28.4–31.0)	33.3 (31.3–35.3)	26.5 (24.8–28.3)
Intensity level of PA*			
Vigorous	25.6 (24.4–26.9)	39.9 (37.9–42.0)	12.9 (11.5–14.2)
Active days per week	4.2 (1.9–5.7)	4.3 (1.9–5.7)	3.4 (2–5.6)
Daily duration, min/d	160 (59–173)	163 (90–174)	93 (50–158)
Moderate	39.7 (38.3–41.0)	42.2 (40.2–44.3)	37.4 (35.6–39.2)
Active days per week	4.9 (2.8–6.3)	5.1 (3.4–6.4)	4.7 (2.5–6.3)
Daily duration, min/d	171 (59–177)	156 (81–172)	170 (56–176)
Walking or biking	61.1 (59.7–62.5)	58.7 (56.6–60.7)	63.3 (61.5–65.1)
Active days per week*	5.3 (3.8–6.4)	5.7 (4.2–6.5)	5 (3.3–6.4)
Daily duration, min/d	59 (27–108)	55 (28–101)	59 (27–106)
Type of exercise†			
Brisk walking	12 (11.1–12.9)	12.5 (11.2–13.9)	11.5 (10.4–12.7)
Team sports: soccer, basketball	6.5 (5.7–7.3)	13.1 (11.6–14.7)	0.6 (0.3–1.0)
Gym—moderate intensity activities	4.6 (4.1–5.2)	2.8 (2.1–3.5)	6.3 (5.4–7.2)
Jogging	3.9 (3.3–4.4)	6 (4.9–7.0)	2 (1.4–2.6)
Biking <20 km/h	3.7 (3.1–4.2)	4.2 (3.3–5.1)	3.2 (2.5–3.9)
Physical limitations			
To moderate intensity activities	10.4 (9.6–11.2)	6.7 (5.8–7.6)	13.7 (12.4–14.9)

Values are n (%) or % (95% CI). Weighted prevalence of overweight: body mass index ≥25 and <30 kg/m^2; Obesity: body mass index ≥30 kg/m^2; Hypertension: systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥90 mm Hg and/or use of antihypertensive medication; Hypercholesterolemia: total cholesterol ≥240 mg/dl and/or use of lipid-lowering medication; Diabetes: fasting glucose ≥126 mg/dl or self-reported history of diabetes.

*Features of each physical activity intensity level, expressed in weighted medians and 25th, 75th percentiles calculated in adults who reported activities of that intensity.

†In leisure time.

performing manual labor. Those who met PA levels through transportation were older and less educated. Those who met the recommended level of PA in their leisure time were younger, male, more educated, and currently working in manual, office, or clerical work. In the multivariable analysis, PA levels decreased with older age (OR: 0.77; 95% CI: 0.61 to 0.98), and was lower among women (OR: 0.62; 95% CI: 0.54 to 0.72), the

obese (OR: 0.68; 95% CI: 0.58 to 0.81), those with university education (OR: 0.78; 95% CI: 0.65 to 0.94), engaged in office or clerical work (OR: 0.60; 95% CI: 0.49 to 0.73), retired/unemployed or homemakers (OR: 0.45; 95% CI: 0.36 to 0.56), subjects with physical limitations (OR: 0.67; 95% CI: 0.56 to 0.81) and those who spent ≥6 h/d seated (OR: 0.40; 95% CI: 0.33 to 0.49) (Table 4).

TABLE 2. Prevalence of sufficiently active status* by sex

Population group	Overall	Men	Women
Overall	64.8 (63.5–66.2)	71.7 (69.8–73.6)	58.7 (56.9–60.6)
Age, yrs			
35–44	67.7 (65.1–70.4)	74.1 (70.4–77.7)	61.8 (58.0–65.5)
45–54	65.5 (63.2–67.9)	73.4 (70.1–76.7)	58.5 (55.2–61.8)
55–64	64.4 (62.1–66.7)	69.0 (65.7–72.2)	60.3 (57.0–63.6)
65–74	55.4 (52.7–58.1)	64.2 (60.3–68.0)	48.8 (45.1–52.4)
Location			
Marcos Paz, Argentina	75.7 (73.7–77.6)	79.5 (76.5–82.5)	71.9 (69.3–74.5)
Bariloche, Argentina	72.2 (70.2–74.3)	77.0 (74.1–80.0)	67.8 (65.1–70.6)
Temuco, Chile	58.0 (55.6–60.4)	66.9 (63.5–70.2)	50.5 (47.2–53.8)
Barros Blancos, Uruguay	65.7 (63.2–68.1)	71.2 (67.5–74.8)	60.5 (57.3–63.8)
Educational level			
Primary school or lower	66.7 (64.8–68.6)	74.0 (71.3–76.8)	60.6 (57.9–63.2)
Middle or high school	65.1 (63.0–67.3)	71.6 (68.6–74.5)	59.2 (56.2–62.2)
University	61.6 (58.4–64.7)	68.6 (64.3–73.0)	54.9 (50.5–59.3)
Occupation status			
Manual labor	77.9 (75.8–80.1)	80.2 (77.4–83.0)	74.6 (71.2–78.1)
Office or clerical work	62.1 (58.9–65.4)	67.5 (63.4–71.6)	54.8 (49.7–59.9)
Retired	56.8 (54.4–59.3)	63.7 (60.2–67.3)	51.5 (48.2–54.8)
Unemployed	56.2 (50.8–61.5)	59.5 (52.0–66.9)	53.4 (46.0–60.9)
Homemaker	53.4 (49.6–57.1)	80.3 (61.4–99.2)	53.0 (49.1–56.8)

Values are % (95% CI).

*Inactive defined as <600 metabolic equivalent minutes per week from work, leisure time activities, and active transport.

DISCUSSION

The results of the present study provide valuable insights into patterns and correlates of PA among the urban population in 4 cities of Argentina, Chile, and Uruguay. Of the total population, 64.8% met current PA recommendations and were more likely to be younger than 65 years old, male, with lower education, performing manual laborers, with normal weight, and without physical limitations. When the level of PA by domain was analyzed, active transportation through walking or biking was the main contributor to total daily energy expenditure, followed by occupation and leisure time. Active transportation correlated with variables that are usually associated with a lower income population, such as lower education, retired, unemployed, homemaker, manual laborers, and older population. With regard to occupation, those who reported to perform moderate and vigorous intensity activities (the IPAQ does not ask about light intensity activities) were also more likely to be less educated manual laborers, but mostly younger men.

By contrast, those who achieved the recommended levels of PA in leisure time were more likely to be men with university education and those performing office or clerical work. Similar to previous reports, indicators of higher education were associated positively with greater participation in exercise/sports in leisure time and lower moderate or vigorous intensity activities in occupation [26-28]. This might suggest a better understanding of information regarding the health benefits of PA. It should be noted that the energy spent in active transportation and occupation was correlated somewhat inversely with energy expenditure during leisure time (exercise/sports), reflecting time constraints and different determinants for these domains of PA.

We found a great disparity in PA levels between women and men: women spent one-third of the total energy expended by men (989 vs. 2763 MET minutes per week, respectively). A large proportion of women were retired, unemployed, or homemakers, who showed the lowest energy expenditure in our study. In addition, only 12.9% of women reported to perform any vigorous intensity activities and a low proportion participated in leisure time exercise/sports (21.3%). Previous research conducted in Latin America showed similar results; women were less likely to participate in leisure time PA but spent more time in household activities [29,30]. We found no evidence of disparity participation in PA and sports related to traditional gender roles from Argentina, Chile, or Uruguay. In occupation, women also showed a lower PA score compared with men (770 vs. 4810 MET minutes per week, respectively), mainly at the expense of reducing manual labor activities. Finally, 13.5% reported some limitation for walking or climbing stairs, which decreased the possibility to achieve a sufficiently active status, reflected in lesser energy expenditure in comparison with women with no physical limitations (492 vs. 1,088 MET minutes per week, respectively).

Among the 4 cities, Temuco (Chile) was the location with the lowest prevalence of sufficiently active population (58%), followed by Barros Blancos in Uruguay (65.7%). This difference might be explained by differences in built environment (parks, road safety, or bike paths); however, there are no published data in relation to this topic. A previous report from Temuco described higher levels of PA (sufficiently active: 81.6% [31]). The discrepancy could be explained partially by the inclusion of the energy expended in the household domain, which was not included in our study.

This is the first study reporting prevalence and PA patterns from Marcos Paz, Bariloche (Argentina), and Barros Blancos (Uruguay); therefore, the only possible comparison was against previous reports describing PA at regional level. The prevalence of sufficiently active status found in Marcos Paz and Bariloche was higher than that

TABLE 3. Prevalence of sufficiently active status by domain*

Population Group	Occupation	Transportation	Leisure Time
Overall	34.1 (32.8–35.4)	38.8 (37.5–40.2)	19.0 (17.9–20.1)
Age, yrs			
35–44	38.6 (35.9–41.3)	38.1 (35.5–40.8)	22.6 (20.3–24.9)
45–54	37.9 (35.6–40.3)	37.3 (35.0–39.7)	18.5 (16.6–20.5)
55–64	31.5 (29.3–33.8)	40.4 (38.0–42.8)	15.4 (13.6–17.1)
65–74	16.4 (14.4–18.4)	42.0 (39.3–44.6)	15.3 (13.4–17.2)
Sex			
Men	43.3 (41.2–45.4)	39.5 (37.4–41.5)	24.2 (22.4–26.1)
Women	25.9 (24.2–27.6)	38.3 (36.5–40.1)	14.3 (13.1–15.6)
Location			
Marcos Paz, Argentina	27.0 (24.7–29.3)	62.6 (60.2–64.9)	15.7 (13.8–17.6)
Bariloche, Argentina	43.1 (40.7–45.5)	33.8 (31.6–36.0)	26.1 (23.9–28.2)
Temuco, Chile	29.5 (27.3–31.7)	38.1 (35.7–40.4)	16.7 (14.9–18.6)
Barros Blancos, Uruguay	36.7 (34.1–39.2)	35.2 (32.8–37.7)	15.4 (13.5–17.3)
Educational level			
Primary school or lower	36.0 (34.0–38.0)	42.2 (40.2–44.2)	12.3 (10.9–13.6)
Middle or high school	35.6 (33.4–37.7)	38.4 (36.3–40.6)	21.1 (19.3–22.9)
University	28.6 (25.7–31.5)	34.7 (31.7–37.7)	25.0 (22.3–27.7)
Occupation status			
Manual labor	56.6 (54.1–59.1)	41.4 (38.9–43.9)	20.0 (17.9–22.0)
Office or clerical work	28.5 (25.6–31.5)	32.6 (29.6–35.7)	25.6 (22.7–28.4)
Retired	NA	40.6 (38.2–42.9)	15.7 (14.0–17.5)
Unemployed	NA	41.5 (36.3–46.7)	15.5 (11.5–19.5)
Homemaker	NA	39.8 (36.1–43.5)	12.3 (9.9–14.8)

Values are % (95% CI). NA, not applicable.

*Proportion of population who spent ≥600 metabolic equivalent minutes per week in each domain.

reported in 2009 at a regional level (75.7% vs. 44.6% and 72.2% vs. 44.9%, respectively) [32]. These discrepancies could be related to the fact that regional reports considered the sufficiently active status if achieved ≥600 MET minutes per week at least 5 days a week (IPAQ definition) [33]. Therefore, those subjects who spent ≥600 MET minutes per week but in <5 days a week were classified as inactive, resulting in underestimation of the prevalence of sufficient activity. The prevalence found Barros Blancos (65.7%) was similar to that reported at a national level in Uruguay in 2006 (64.9%) [34].

The prevalence of sufficiently active status in our study was slightly higher than the levels reported for the Americas and upper-middle income countries (56.7% and 58%, respectively) [8]. Other individual reports of PA from Latin America, mostly from Brazil, showed in general lower prevalences of subjects achieving recommended levels of PA (58.9% [8], 19.3% [35], 27.5% [36], 43.1% [37], 19.4% [38], and 33.4% [39]). Reports from Colombia (53.5% [14] and 21.2% [40]) and Peru (44.4% [41]) showed similar results.

Strengths of the current report include the multistage sampling process used in CESCAS I study, which allowed a direct estimation of the prevalence of PA levels in adults and also minimized selection bias. The PA questionnaire was administered by trained interviewers providing a comprehensive picture of participants' PA patterns by collecting extensive and detailed information on the type, duration, and length of various domains of PA. The response rate in our study was high (73.4%).

Study limitations

A few limitations of the present study must be underscored. First, although validation studies in Latin America [42] suggested that the IPAQ had acceptable validity and reliability in comparison with accelerometers, responses to the IPAQ tend to overestimate occupation and household physical activities. In this context, the lack of validation of self-report using activity monitors is a major limitation of the current study.

Nevertheless, this questionnaire is the most frequent tool used for assessing PA at population level because it is intended to quantify PA behaviors over a longer duration of time and thus incorporates elements of psychosocial and environmental context [43]. Second, we used the same questionnaire as in the HCHS/SOL study, which did not include the household domain. This omission might result in a slight underestimation of the prevalence of sufficient PA; however, our results were similar to other previous reports from Latin America. Third, METs are not an equivalent of fitness; thus, a moderate intensity PA based on MET may actually be vigorous for some people. Finally, these results are representative of the selected cities included in the study and, therefore, do not necessarily represent the general adult population of Argentina, Chile and Uruguay.

CONCLUSIONS

In conclusion, the proportion of sufficiently active subjects in the 4 cities of the Southern Cone is low compared with the worldwide prevalence, but higher than that reported for Latin America [8]. Results from the present study are important to understand the patterns of PA in different domains in accordance with sociodemographic characteristics and CVD risk factors. Interventions to increase PA level in women, the unemployed, and people with low education should focus on promoting PA in leisure time, in contrast with people performing office or clerical work or higher education, where the intervention should be focused on promoting active transportation. Follow-up of this population-based cohort study will allow the identification of trends in PA in the Southern Cone of Latin American and their prospective association various health outcomes, particularly CVD and risk factors.

TABLE 4. ORs (95% CI) for being sufficiently active associated with selected sociodemographic and clinical variables*

Risk Factors	Univariate	Multivariate
Age, yrs		
35—44	1.00	1.00
45—54	0.91 (0.77, 1.06)	0.97 (0.81, 1.16)
55—64	0.86 (0.74, 1.01)	0.95 (0.79, 1.15)
65—74	0.59 (0.50, 0.70)	0.77 (0.60, 0.98)
Sex		
Men	1.00	1.00
Women	0.56 (0.50, 0.63)	0.63 (0.54, 0.72)
Hypertension		
No	1.00	1.00
Yes	0.88 (0.78, 0.99)	1.05 (0.91, 1.21)
Body weight		
Normal weight	1.00	1.00
Overweight	0.91 (0.78, 1.07)	0.86 (0.72, 1.03)
Obese	0.66 (0.56, 0.77)	0.69 (0.57, 0.82)
Diabetes		
No	1.00	1.00
Yes	0.67 (0.57, 0.79)	0.84 (0.70, 1.01)
Smoking status		
Never/former	1.00	1.00
Current	1.04 (0.91, 1.19)	0.96 (0.82, 1.12)
Educational level		
Primary school or lower	1.00	1.00
Middle or high school	0.93 (0.82, 1.06)	0.86 (0.75, 0.99)
University	0.80 (0.68, 0.94)	0.78 (0.65, 0.94)
Occupation		
Manual labor	1.00	1.00
Office or clerical work	0.46 (0.39, 0.56)	0.60 (0.49, 0.73)
Retired	0.37 (0.32, 0.44)	0.50 (0.40, 0.62)
Unemployed	0.36 (0.28, 0.47)	0.41 (0.32, 0.54)
Homemaker	0.32 (0.27, 0.39)	0.45 (0.37, 0.56)
Physical limitations		
No	1.00	1.00
Yes	0.51 (0.43, 0.60)	0.68 (0.56, 0.83)

Values are OR (95% CI).
OR, odds ratio.
*Adjusted for all variables in table. Sufficiently active: ≥600 metabolic equivalent minutes per week. Normal weight: body mass index ≥18.5 and <25; Overweight: body mass index ≥25 and <30 kg/m^{2}Obese: body mass index ≥30 kg/m^2; Hypertension: systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥90 mm Hg and/or use of antihypertensive medication; Diabetes: fasting glucose ≥126 mg/dl or self-reported history of diabetes.

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APPENDIX

ONLINE TABLE 1. Physical activity score distribution by sex

Variable	Metabolic Equivalent Minutes Per Week		
	Overall	Men	Women
Total	1,439 (187, 4,600)	2,763 (444, 6,581)	989 (0, 3,592)
Age, yrs			
35—44	1,978 (217, 5,200)	3,569 (485, 7,878)	1,373 (0, 3,958)
45—54	1,848 (267, 5,036)	3,581 (492, 7,394)	1,029 (53, 3,798)
55—64	1,352 (184, 4,303)	1,979 (351, 5,189)	983 (125, 3,230)
65—74	780 (0, 2,465)	1,260 (193, 3,358)	590 (0, 1,740)
Location			
Marcos Paz, Argentina	1,475 (665, 4,310)	2,319 (781, 7,665)	1,356 (581, 2,756)
Bariloche, Argentina	2,757 (477, 5,039)	4,146 (877, 7,163)	1,699 (380, 4,300)
Temuco, Chile	1,093 (0, 4,122)	1,768 (123, 5,829)	691 (0, 3,002)
Barros Blancos, Uruguay	1,427 (186, 5,014)	3,064 (365, 7,567)	964 (82, 3,402)
Educational level			
Primary school or lower	1,485 (275, 4,912)	3,588 (534, 7,795)	1,033 (174, 3,545)
Middle or high school	1,675 (183, 4,895)	2,961 (467, 6,884)	1,034 (0, 3,686)
University	1,298 (0, 4,099)	1,439 (241, 4,792)	954 (0, 3,508)
Occupation status			
Manual labor	4,073 (855, 7,162)	4,588 (1,362, 8,619)	2,856 (568, 4,857)
Office or clerical work	1,181 (0, 4,127)	1,535 (157, 4,389)	985 (0, 3,467)
Retired	841 (0, 2,625)	1,194 (189, 3,176)	682 (0, 2,083)
Unemployed	920 (0, 3,368)	1,170 (0, 4,318)	699 (0, 2,579)
Homemaker	743 (0, 2,377)	1,761 (797, 4,070)	702 (0, 2,375)
Physical limitations			
To moderate intensity activities	672 (0, 3,796)	954 (0, 5,012)	492 (0, 3,156)
No limitation	1,580 (260, 4,788)	2,850 (476, 6,697)	1,088 (91, 3,594)
Activity domain			
Transportation	336 (0, 1,183)	310 (0, 1,330)	346 (0, 1,166)
Leisure time	0 (0, 0)	0 (0, 469)	0 (0, 0)
Occupation	0 (0, 3,407)	0 (0, 4,810)	0 (0, 770)

Values are median (25th, 75th percentiles).