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Socio-demographic patterns of physical activity and sedentary behaviour in Chile: results from the National Health Survey 2009–2010

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ABSTRACT

Background Surveillance of physical activity (PA) is essential for the development of health promotion initiatives. The aim of the present study was to examine the prevalence of PA and sedentary behaviour with respect to socio-demographic factors in Chile.

Methods A representative sample of 5434 adults aged ≥15 years (59% women) who participated in the Chilean National Health Survey (2009–2010) were included. Socio-demographic data (age, sex, environment, education level, income level and smoking status) were collected for all participants. PA levels were assessed using the Global Physical Activity Questionnaire.

Results 19.8% [95% CI: 18.1–21.6] of the Chilean population did not meet PA recommendations (≥600 MET min week^{-1}). The prevalence of physical inactivity was higher in participants aged ≥65 years, compared with the youngest age groups and was higher in women than in men. However, it was lower for participants with high, compared with low, education or income levels. The overall prevalence of sedentary risk behaviour (spending >4 h sitting per day) was 35.9% [95% CI: 33.7–38.2].

Conclusion Physical inactivity correlates strongly with socio-demographic factors such as age, gender and educational level. Results identify social and economic groups to which future public health interventions should be aimed to increase PA in the Chilean population.

Keywords physical activity, sedentary behaviour, sitting time

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Introduction

Nutritional and epidemiological transition in Latin America has been shaped by parallel processes of economic growth, migration and urbanization which have led to a socio-demographic shift characterized by an increased life expectancy and burden of non-communicable diseases (NCDs).[1–3] For the last two decades, cardiovascular disease has been the main cause of mortality in southern Latin American countries (LACs).[4,5]

Compared with other LACs, the prevalence of risk factors for NCDs has tended to be higher in Chile than the average

prevalence for the whole region.[3] This could be explained by the rapid progression of nutritional transition in Chile.[6–9] Malnutrition, highly prevalent in the Chilean population in the 1970s, was almost completely eradicated by the end of the 1980s. This was followed by an accelerated modernization phase in the 1990s as a consequence of strong economic growth. The Chilean population's diet has become progressively westernized and is now characterized by high levels of processed food, fat, salt and sugar.[6,9] Concurrently, a decrease in physical activity (PA) levels has been observed due to urbanization and greater use of home appliances, cars and TVs.[6,7,9] These changes have contributed to an increased prevalence of major risk factors for NCDs,[6,7,9] placing Chile in a classical post-nutritional transition stage.

Strong evidence supports the link between increasing physical inactivity and the risk of many adverse health outcomes. Recent estimations place physical inactivity as the fourth leading cause of death,[10] equating to 5.3 million annual deaths worldwide.[11,12] Lee *et al.* presented persuasive evidence that 6–10% of all deaths from NCDs worldwide can be attributed to physical inactivity[12] and this percentage is even higher for specific diseases (e.g. 30% for ischaemic heart disease).[10] Notwithstanding, a large proportion of the world's population (31.1%) remains physically inactive,[13] presenting a major public health problem.

Observation of population-level PA is necessary for the development of health promotion initiatives and public health policy formulation. Given the rapid epidemiological transition and high prevalence of NCDs in Chile, risk factor surveillance, including PA, is essential. The aim of the present study was to examine the prevalence of PA and sedentary behaviour by socio-demographic factors in Chile.

Methods

Study population

This cross-sectional study was based on data from participants aged ≥15 years from the 2009–2010 Chilean National Health Survey (CNHS). The CNHS is a large, nationally representative population-based study of risk factors, dietary status and health conducted every 6 years in Chile. Complex random stratified sampling was used to cover a nationally representative sample based on statistics from the 2002 Chilean National Census, which included strata from administrative regions (county) and urban/rural locations, as described in detail elsewhere.[14]

Data collection took place in two stages: the first stage ($n = 5434$) comprising face-to-face interviews to collect information on self-reported health, household characteristics and living conditions. In the second stage ($n = 4956$), anthropometric measurements and biological samples were collected. The response rate from the eligible population to the CNHS was 85%. In total, 5276 (97%) participants provided data on PA behaviours collected with the Global Physical Activity Questionnaire (GPAQ), version 2. Participants aged <18 years ($n = 224$) were excluded from the current analysis (results will be reported elsewhere). In addition, 121 participants (3%) with PA data were excluded based on the GPAQ protocol for outlier detection (48% women and 83% urban). Complete data were available for 5155 participants for the present analysis.

Ethics approval

The study was funded by the Chilean Ministry of Health and led by the Department of Public Health, The Pontificia Universidad Católica de Chile. The CNHS followed international guidelines in its design[15,16] and was approved by the Ethics Research Committee of the Faculty of Medicine at the Pontificia Universidad Católica de Chile. All participants provided written informed consent.

Measurements

Socio-demographics

To ensure quality of data collection, standardized protocols were used and nurses and technicians underwent joint training sessions prior to the survey. Socio-demographic data were collected for all participants, including age, gender, education level (primary, secondary or beyond secondary), years of schooling, monthly household income and smoking status (non-smoker, ex-smoker or smoker).

Anthropometrics

Height was measured to the nearest 0.1 cm using a portable stadiometer and weight was measured to the nearest 0.1 kg using a digital scale (Tanita HD313) with participants removing their shoes and wearing light clothing. Body mass index was calculated as [weight/height^2] and classified using the World Health Organization (WHO) criteria (<18.5 kg m^{-2}, underweight; 18.5–24.9 kg m^{-2}, normal; 25.0–29.9 kg m^{-2}, overweight; ≥30 kg m^{-2}, obese).[17]

Physical activity

The GPAQ (version 2) was used to measure PA and sedentary behaviour in the CNHS. Developed by the WHO to measure population-level PA behaviours, the GPAQ uses standardized protocols shown to be valid and reliable and adaptable to incorporate cultural and other differences.[18,19] The GPAQ assesses sedentary behaviour (total time spent sitting) and three domains of PA: occupational (PA at work),

active-commuting (PA from travel) and recreational (PA at leisure). Occupational, active-commuting and recreational PAs were assigned a metabolic-equivalent value (MET) using recommendations made by the GPAQ protocol (4-METs were used for moderate and transport-related activities and 8-METs for vigorous activities).[20] The GPAQ uses algorithms to categorize weekly PA into two categories: inactive individuals ($<$600 MET min week^{-1}) and active individuals ($\geq$600 MET min week^{-1}).[20] Sedentary behaviour was derived using the following question: how much time do you usually spend sitting or reclining on a typical day? The GPAQ specified that this question is about sitting or reclining at work or at home, getting to and from places, or with friends. It includes time spent sitting at a desk, sitting with friends, travelling in a car, bus or train, reading, playing cards or watching television, but does not include time spent sleeping.[20]

Statistical analysis

Survey-weighted descriptive characteristics are presented as adjusted means with standard deviation (SD) for quantitative variables or as a proportion for categorical variables. Quantitative data were checked for normality using skewness and kurtosis normality tests. For statistical analysis, age was stratified into four categories (18–24, 25–44, 45–64 and $\geq$65 years). Years of education were classified into three categories ($<$8, 8–12 and $>$12 years of formal education). Monthly household income was stratified into four categories: $\leq$US $247.00 (lowest), US $248.00–452.00 (medium lowest), US $453.00–1180.00 (medium highest) and $>$US $1180.00 (highest). The medium lowest is equivalent to the individual minimum wage in Chile.

To investigate whether PA levels differed between socio-demographic groups, the General Linear Model (GLM) was used. Increasing age, education and income level, and gender and environmental (rural versus urban) differences were tested by fitting PA variables as a main outcome and socio-demographic factors as the ordinal exposure. All models were adjusted for age, gender, environment and education level, as appropriate. Bonferroni adjustment was used for multiple testing corrections.

To investigate differences in the prevalence of physical inactivity and sitting time between socio-demographic categories, GLM was used. 'Inactive' and 'active' individuals were categorized as described above, and sedentary risk behaviour was defined as spending $\geq$4 h per day sitting. Dichotomized PA and sedentary risk behaviour variables were used as a main outcome, and socio-demographic groups were fitted into the model as the exposure. Wald test was performed on model parameters. All models were adjusted for covariates. To account for the differential probability of selection, all percentages and means were weighted using the sample weights provided by CNHS.[14] Statistical analyses were conducted using STATA 13 (StataCorp; College Station, TX, USA). A two-sided α-level of 0.05 was used and all analyses accounted for the complex sample design of CNHS data.

Results

Socio-demographic characteristics

Descriptive characteristics, stratified by gender are presented in Table 1. The cohort comprised 5155 adults aged 18–100 years (mean age 46.4 years [SD 18.6]); 87.1% were adults living in an urban setting and 59.6% were women. Education and income levels were similar for men and women. The prevalence of overweight and obesity (BMI $\geq$25 kg m^{-2}) was also similar for both men and women (64.5 and 64.3%

Table 1 Characteristics of the Chilean National Health Survey cohort

Variable	*Total*	*Females*	*Males*
n	5155	3073	2082
Age group (%)			
$<$25 years	21.6	21.2	22.0
25–44 years	37.5	36.2	39.0
45–64 years	28.9	29.3	28.6
$\geq$65 years	11.9	13.3	10.4
Environment (%)			
Urban	87.1	87.5	86.6
Rural	12.9	12.5	13.4
Education (%)			
Up to primary ($\leq$8 years)	18.6	20.3	16.8
Up to secondary ($\leq$12 years)	56.8	54.9	58.9
Beyond secondary	24.6	24.8	24.3
Income (%)			
Lowest	15.7	18.6	12.6
Medium lowest	33.7	34.2	33.3
Medium highest	37.0	35.9	38.1
Highest	13.6	11.3	16.0
Smoking status (%)			
Never	36.5	41.5	31.1
Ex-smoker	23.4	21.2	25.6
Current smoker	40.2	37.3	43.3
BMI categories (%)			
$<$18.5 kg m^{-2}	1.8	2.4	1.1
18.5–24.9 kg m^{-2}	33.8	33.3	34.4
25.0–29.9 kg m^{-2}	39.3	33.6	45.3
$\geq$30.0 kg m^{-2}	25.1	30.7	19.2

Data presented as frequency proportions (%). No formal comparisons were made for the categorical variables.

respectively). Current smokers were more frequent in men (43.3%) than women (37.3%).

Physical activity patterns

PA behaviours by socio-demographic factors are presented in Table 2. Of the study population, 46.4% reported no moderate to vigorous physical activity (MVPA) (women 44.2% and men 49.5%), while 36% of women and 32% of men reported no active-commuting PA. Overall, 70.6% of the population (women 74.8% and men 63.1%) reported no vigorous intensity PA. Levels of recreational and active-commuting MVPA represented only 8.3 and 19.3% of the total self-reported PA, respectively. Overall 19.8% of the study population did not meet WHO PA recommendations of $\geq$600 MET min week^{-1}. Physical inactivity prevalence increased with age and was higher in women and in participants with lower education and income levels (Table 2).

PA levels differed significantly between age groups, with an important decline in occupational and recreational PA after the age of 65 years (Table 2). Men reported significantly higher levels of total PA, occupational and recreational MVPA and active-commuting PA than women. Compared with urban males, total PA and occupational MVPA among rural males were significantly higher. Similarly, total PA and occupational MVPA differed significantly between education and income groups, but not active-commuting or recreational PA. Highly educated participants spent on an average 33% less time on MVPA at work, whereas participants with a medium-low income level reported more time on MVPA at work (ranging between 13 and 23%), compared with their counterparts in other income categories.

Sedentary behaviour

Total time spent sitting per day was lowest in the middle age groups (25–64 years) compared with the youngest (18–24 years) and oldest ($\geq$65 years) participants; age-related differences in daily sitting time ranged from 26 to 32% (Table 3). Although there was a significant gender difference in sitting time, men reported only 9% more sitting time per day than women. The difference in sitting time per day between urban- and rural-based participants was significant, with urban participants reporting 29% more sitting time than rural participants. Similarly, increasing levels of education and income were associated with a significant increase in sitting time per day. These differences varied from 29 to 32% and 11 to 30% for education and income levels, respectively. Analysis of sedentary risk behaviour showed that 35.9% of the population spend more than 4 h sitting per day. The prevalence of sedentary risk behaviour by socio-demographic factors is presented in Table 3.

Discussion

Main finding of this study

The main findings of this study are (i) 19.8% of the Chilean population did not meet international PA recommendations and (ii) 35.9% spent more than 4 h sitting per day. Physical inactivity and sitting time differed significantly by age, sex and education level. In addition, sitting time also differed significantly by environment (rural versus urban) and income.

What is already known on this topic?

The Chilean population shows a lower prevalence of physical inactivity than that estimated worldwide (31.1%) and for the Americas (43.3%), Eastern Mediterranean countries (43.2%), Europe (34.8%) and the Western Pacific (33.7%), but a similar prevalence to Africa (27.5%) and a higher prevalence than that reported in Southeast Asia (17.0%).[13] Our results are similar to the average prevalence of physical inactivity reported for LACs (22.7%)[21] and for countries experiencing an epidemiological transition (Paraguay 20.3%, Ecuador 22.6%, Peru 24.5%, Uruguay 26.6%, Brazil 27.8% and Mexico 16.8%), except Guatemala where physical inactivity is lower (3.9%) and Dominican Republic, where physical inactivity is higher (40.8%) than in Chile.[21] The prevalence of physical inactivity by gender in this study was lower than that estimated worldwide (27.9 and 33.9%)[13] and to that estimated for LACs (21.0 and 24.8%)[21] for men and women, respectively.[13]

We observed that the prevalence of physical inactivity in the Chilean population increased with age, which is a pattern known to have a strong biological basis.[22] Our findings are in agreement with physical inactivity and age trends reported worldwide,[21] where the prevalence of physical inactivity fluctuates from ~15 to ~38% in young adults (15–29 years) and from ~28 to ~60% in older adults ($\geq$60 years).[12,13] Despite the linear association reported in all regions of the world by Hallal *et al.* heterogeneity was substantial across the regions.[13] The prevalence of physical inactivity between age groups <65 years in our study is similar to those reported by Guthold *et al.*[21] in a survey performed in 51 countries worldwide. Retirement age in Chile is 65 years and this could explain differences around this age. Occupational PA accounts for 73% total PA reported by the population, reinforcing the suggestion that retirement explains the doubling of inactivity prevalence after the age of 65 years.

Education and income levels are a proxy of socio-economic status in the Chilean population. We found that the prevalence of physical inactivity was highest for adults with low education or incomes. However, our results contrast with those reported in previous studies in Mexico[23] and Brazil[24] where higher socio-economic status (46.6%) was associated with a higher

Table 2 Physical activity patterns by socio-demographic factors

Variable	n	*Total PA (MET min day^{-1})*		*MVPA at work* (MET min day^{-1})*		*MVPA at leisure time* (MET min day^{-1})*		*Transport PA (MET min day^{-1})*		*Prevalence of physical inactivity†*	
		Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*%*	*95% CI*
Total	5155	1014.1	17.2	732.5	15.8	84.9	3.3	196.5	4.7	19.8	18.1–21.6
Age group (years)											
18–24[a]	781	956.3[b,c,d]	47.9	614.2[b,c,d]	44.0	103.4[d]	9.8	238.6[c,d]	13.7	13.4	10.7–16.7
25–44[b]	1685	1298.9[a,d]	34.8	998.1[a,d]	31.9	90.6[d]	7.1	210.1[d]	9.9	17.2	14.4–20.4
45–64[c]	1691	1168.1[a,d]	34.4	874.0[a,d]	31.6	89.9[d]	7.0	204.2[a,d]	9.8	19.0	16.2–22.3
≥65[d]	998	581.7[a,b,c]	45.9	366.5[a,b,c]	42.2	63.8[a,b,c]	9.4	151.3[a,b,c]	13.1	37.2	32.2–42.4
P-value (age)		<0.0001		<0.0001		0.016		<0.0001		<0.0001	
Sex											
Men[a]	2082	1310.3[b]	32.4	997.3[b]	29.9	96.4[b]	6.5	216.4[b]	9.1	15.4	13.1–18.0
Women[b]	3073	841.2[a]	28.6	577.2[a]	26.3	77.9[a]	5.8	186.0[a]	8.1	22.9	20.7–25.4
P-value (sex)		<0.0001		<0.0001		0.007		0.002		<0.0001	
Environment											
Rural[a]	762	1180.8[b]	45.5	888.4[b]	41.9	87.7	9.2	204.6	12.8	20.4	16.5– 24.9
Urban[b]	4393	970.6[a]	20.0	686.1[a]	18.4	86.6	4.1	197.8	5.6	19.1	17.3–21.0
P-value (environment)		0.0002		<0.0001		0.912		0.621		0.797	
Education											
Up to primary (≤8 years)[a]	1368	1107.0[b]	37.8	838.9[b,c]	34.8	76.1	7.6	191.9	10.6	27.9	24.2–31.8
Up to secondary (≤12 years)[b]	2805	1228.9[a,c]	29.8	934.4[a,c]	27.4	89.4	6.1	204.9	8.4	15.3	13.5–17.2
Beyond secondary (>12 years)[c]	982	891.3[b]	45.5	588.5[a,b]	41.9	95.9	9.2	206.8	12.8	21.6	17.4–26.5
P-value (education)		<0.0001		<0.0001		0.211		0.559		<0.0001	
Income‡											
Lowest[a]	1026	981.1[b,c]	43.3	689.3[b,c]	39.7	96.6	8.7	207.9	12.1	22.9	19.2–27.1
Medium lowest[b]	1725	1203.8[a,c,d]	35.8	901.6[a,c,d]	32.8	89.3	7.2	201.8	9.9	17.1	14.8–19.7
Medium highest[c]	1630	1072.9[a,b]	37.8	782.3[a,b]	34.6	84.4	7.6	201.7	10.5	18.4	15.6–21.6
Highest[d]	536	1050.4[b]	59.3	771.8[b]	54.2	80.0	11.9	205.0	16.5	22.0	16.7–28.2
P-value (income)		0.0003		<0.0001		0.639		0.967		0.313	

Data are presented as survey-weighted means (SD) for continuous variables and as prevalence (95% CI) for categorical variables. Adjusted means comparison of continuous PA variables between categories for each socio-demographic factor (age group, sex, environment, education and income) were tested with GLM. Main effect *P*-values are given for each socio-demographic factor and *post hoc* Bonferroni test was used for assessing differences within categories for each of the socio-demographic factors. Differences are denoted with letters [a, b, c, d]. Unadjusted prevalence for sedentary risk behaviour is presented and Walt test was used to estimate significant trends.

Significance differences were accepted at $P < 0.05$.

*MVPA was estimated based on the GPAQ protocol and expressed as MET min day^{-1}.

†Physically inactive individuals were identified as participants with total PA <600 MET min week^{-1} as suggested by the GPAQ protocol.

‡Income data were only available for 4917 participants.

Table 3 Sitting time patterns by socio-demographic factors

Variable	n	*Time spent sitting (min day^{-1})*		*Prevalence of sedentary risk behaviour*†	
		Mean	*SD*	*%*	*95% CI*
Total	5155	211.3	2.4	35.9	33.7–38.2
Age group (years)					
18–24[a]	781	236.3[b,c]	7.0	45.3	40.4–50.3
25–44[b]	1685	188.1[a,c,d]	5.1	33.2	29.4–37.2
45–64[c]	1691	179.8[a,b,d]	5.1	30.2	26.2–34.4
≥65[d]	998	237.4[b,c]	6.7	41.2	36.0–46.7
P-value (age)		<0.0001		<0.0001	
Sex					
Men[a]	2082	219.7[b]	4.7	37.2	33.7–40.7
Women[b]	3073	201.2[a]	4.2	34.7	31.9–37.6
P-value (sex)		0.0001		0.329	
Environment					
Rural[a]	762	183.8[b]	6.6	21.3	17.3–26.0
Urban[b]	4393	237.0[a]	3.0	38.1	35.6–40.6
P-value (environment)		<0.0001		<0.0001	
Education					
Up to primary (≤8 years)[a]	1368	188.6[c]	5.4	28.1	24.4–32.2
Up to secondary (≤12 years)[b]	2805	193.1[c]	4.4	33.9	31.0–36.9
Beyond secondary (>12 years)[c]	982	249.5[a,b]	6.7	46.9	41.6–52.3
P-value (education)		<0.0001		<0.0001	
Income*					
Lowest[a]	1026	183.5[c,d]	6.2	26.1	21.8–30.9
Medium lowest[b]	1725	187.8[c,d]	5.1	28.0	24.6–31.6
Medium highest[c]	1630	215.3[a,b,d]	5.4	41.7	37.8–45.7
Highest[d]	536	238.6[a,b,c]	8.5	50.2	43.3–57.0
P-value (income)		<0.0001		<0.0001	

Data are presented as survey-weighted means (SD) for continuous variables and as prevalence (95% CI) for categorical variables. Adjusted means comparison of continuous variables between categories for each socio-demographic factor (age group, sex, environment, education and income) were tested with GLM. Main effect *P*-values are given for each socio-demographic factor and *post hoc* Bonferroni test was used for assessing differences within categories for each of the socio-demographic factors. Differences are denoted with letters [a, b, c, d]. Unadjusted prevalence of sedentary risk behaviour is presented and Walt test was used to estimate significant trends.

Significance differences were accepted at $P < 0.05$.

*Income data were only available for 4917 participants.

†Risk sedentary behaviour was defined as reporting ≥4 h of sitting time per day.

prevalence of physical inactivity compared with the lowest status (38.7%). These differences in the direction of the relationship could be explained by the hypothesis that social patterns are shifting, characterized by falling occupational PA (usually higher among lower income and education levels) and increasing recreational PA (more common among higher education and income levels).

Evidence suggests that adopting an active method of transport (such as walking or cycling) has important health benefits for all-cause mortality[25,26] and that these benefits could be increased by increasing the intensity of active-commuting.[27] However, our study shows that 34% of the Chilean population reported no active-commuting. On average, men reported 54 min and women 46 min of daily active-commuting. The proportion of adults who reported active-commuting in Chile is above that reported in Australia (4.7%), Canada (7.8%), UK (14.5%), USA (10.4%), The Netherlands (37.9%) and China (46.1%).[13] Unfortunately, data from other developing countries are scarce.

Another PA-related domain that has been extensively studied over the last decade is sedentary-related behaviour,[28] which is usually defined as activities with an equivalent energy expenditure of $\leq$1.5 MET min day^{-1} (i.e. sitting time). Sedentary behaviour has been defined previously[28] and it should be considered different to physical inactivity because physical inactivity refers to not meeting the PA guidelines (150 min of MVPA a week), while sedentary behaviour refers to sitting or reclining activities such as watching TV, sitting at a desk, etc.

Increasing sedentarism is strongly associated with an increased risk of NCDs and mortality, independent of PA levels.[29–32]. Spending $\geq$4 h a day sitting may be considered a proxy for the presence of sedentary risk behaviour detrimental for health.[13] In Chile, this prevalence is slightly lower (35.9%) than that reported worldwide (41.5)[13] and for Argentina (52.8%), but it is higher than that reported for Brazil (28.2%) and Colombia (27.2%).[33] The prevalence of sedentary risk behaviour by education and income level in Chile agrees with those found in Brazil, where adults with higher education and income spend more time sitting.[34] Average self-reported total sitting time per day was higher in Brazil (288 min day^{-1})[34] but lower in Mexico (178 min day^{-1})[35] than in Chile (211.3 min day^{-1}). The 20-country sitting time study reported an overall median [interquartile range] for sitting time of 300 [180–480] min day^{-1} and a country-specific median of 180 [90–300] min day^{-1} for Colombia, 300 [180–480] min day^{-1} for Argentina and 180 [120–270] min day^{-1} for Brazil.[33] The median sitting time for Brazil and Colombia is identical to that found in the Chilean population in the present study (180 [90–300]) which is lower than that reported for Argentina and the all-countries median.[33]

Limitations of this study

Methodological issues related to the self-reported nature of the GPAQ questionnaire are noted. Our estimates were adjusted for covariates in order to reduce potential bias previously reported in the Chilean population.[36] It is possible that measurement errors could be differential by education level within environment, however, validation of the GPAQ in multiethnic cohorts,[18,19] repeated interviewer training and standardization of measurement protocols mitigate against potential sources of bias. Although the results presented in this study can be generalized to the Chilean population, as the survey was applied in a representative sample of the country, we cannot make any inference or causal association regarding the results due to the cross-sectional nature of the survey.

What this study adds

Rapid Latin American urbanization has contributed to an increasing burden of NCDs.[37] This has resulted in important changes in modes of daily transportation, in particular a major shift from public to individual motorized transport systems.[38] This has played a role in reducing PA in the region.[13,21] Surveillance data on PA (socio-demographically patterned) in Chile will further increase understanding of the potential health burden the country may face in the future, as well as strengthen the evidence already available on PA patterns in LACs and worldwide. In addition, our results could help the national authorities in Chile to implement tailored PA programmes tackling inequalities related to socio-demographic factors in order to promote healthy and active lifestyles in sections of the population who are most in need of it.

In conclusion, 19.8% of the population in Chile did not meet international PA recommendations and more than one-third of the Chilean population spend $\geq$4 h sitting per day, which is a strong risk factor for NCDs and all-cause mortality. Our findings suggest that a PA transition is already underway. Given the known impact of low PA on the risk of developing NCDs and the strong association between urbanization and reduced PA/increased sedentary behaviour reported in this study, we suggest that Chile could face an increasing burden of NCDs if no clear population-level PA policies are implemented.

Authors' contribution

C.C.-M., C.S. and A.A. analysed the data. C.C.-M. and N.D.W. wrote the paper. R.S., M.A.M., A.L., X.D., C.M., C.A., J.L. C.A.M. and M.S. critically revised the manuscript.

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