Global Physical Activity, Active Commuting to School, and Sedentary Behavior Among Latin American Adolescents: Global School-Based Student Health Survey and the National School Health Survey

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Background: This study aimed to compare the overall prevalence, stratified by sex and age group of global physical activity (GPA), active commuting to school (ACS), and sedentary behavior (SB) among adolescents from ten Latin American countries, and to assess the correlation of Development Index with the indicators. Methods: This research is grounded on data from the Global School-Based Student Health Survey (2009–2015) and the 2015 Brazilian National School Health Survey. The prevalence and 95% confidence intervals for GPA (≥5 d/wk), ACS (≥1 dwk), and SB (>2 h/d) were calculated using the chi-square test to compare the sexes (male; female) and age group (≤13 y; 14 y; 15 y; ≥16 y). We also performed Pearson correlation analysis with the Human Development Index. Results: The prevalence of indicators ranged from 16.1% to 28.2% for GPA, from 56.7% to 71.2% for ACS, and from 20.7% to 62.6% for SB. Boys generally had a higher prevalence of GPA and ACS, and girls had a higher prevalence of SB. The prevalence of the indicators by age group varied between countries, with significant differences observed in some, depending on each indicator. A positive correlation was observed between Human Development Index, GPA, and SB. Conclusion: Health promotion policies must include guidelines that encourage and promote a more active and less sedentary lifestyle among young people in Latin America, considering specific groups, the local socioeconomic context, and differences between countries.

Keywords: lifestyle, motor activity, human development index, surveillance

The increasing prevalence of insufficient physical activity and sedentary behavior (SB) in adolescents is a public health issue worldwide due to its adverse health effects.1 Not adopting an active lifestyle compromises people’s quality of life and health,2 including adolescents,3 and has an economic impact on the public system.4 SB, in turn, is a risk factor for chronic noncommunicable diseases in adolescents3 and increased symptoms of depression and anxiety in adults.5 Active commuting to school (ACS) can help to increase daily levels of physical activity among adolescents, thus increasing the likelihood of meeting physical activity recommendations.6

However, evidence indicates that insufficient physical activity7 and SB levels among adolescents are high8 globally, including in Latin America.8,9 These estimates may be influenced by the demographic characteristics of individuals, such as gender and age groups in adolescence,7–12 and the country’s context, such as the Human Development Index (HDI).9,12,13 That way, monitoring these behaviors in adolescents may highlight significant disparities within, and between, and support the formulation of programs and policies dedicated to improving the health and well-being of youths.1

Recognizing this importance and the urgency of increasing physical activity levels and decreasing SB, among the surveillance actions on the lifestyle of adolescents, the World Health Organization (WHO) has been implementing the Global School-Based Student Health Survey (GSHS) since 2003 in several countries from all regions of the world, including Latin America.14 Despite the high regional representativeness of GSHS data, this research has not included large countries, such as Brazil.15

In Brazil, the National School Health Survey (PeNSE, an acronym in Portuguese) performs adolescent assessment and monitoring.16 Since 2009, the Brazilian Ministry of Health has diligently conducted this survey at approximately 3-year intervals. It was designed to allow greater comparability with international indicators, especially those from GSHS.

The monitoring of global physical activity (GPA), ACS, and SB contributes to strengthening surveillance and formulating policies to promote physical activity at the regional level and in each country. However, previous studies that evaluated the group of Latin American countries using the GSHS focused on evaluating GPA and SB.7,9,11,12,15,17 Furthermore, studies that evaluated different national surveys, including PeNSE, did not evaluate ACS7,12,17

This study advances in relation to previous studies to jointly analyze the 3 indicators GPA, ACS, and SB in 10 Latin American countries, 9 with national samples from the GSHS survey and Brazil with data from PeNSE. The analysis for the group of Latin American countries is necessary, given the disparities in urbanization, population growth, socioeconomic development, demographic characteristics, rates of violence, and other characteristics that can influence the prevalence of physical activity indicators among countries.18–22
In this context, this study aimed to (1) compare the overall prevalence and stratified by sex and age group of GPA, ACS, and SB among adolescents from ten Latin American countries, and (2) assess the correlation of HDI with these indicators.

**Methods**

This cross-sectional study is based on data from 2 school-based surveys that investigate behaviors and risk factors and health protection for adolescents, the GSHS, and PeNSE, along with secondary data sources on the sociodemographic characteristics of the countries. The WHO developed the GSHS with technical and financial assistance from the US Centers for Disease Control and Prevention. Countries from different world regions conducted the GSHS. However, in this study, only the Latin American countries that provided national samples were evaluated, using the last edition carried out in each country (Argentina-2012; Bolivia-2012; Chile-2013; Costa Rica-2009; El Salvador-2013; Guatemala-2015; Honduras-2012; Peru-2010; Uruguay-2012). The GSHS was conducted primarily among students aged 13–17 years. Therefore, eligible schools were those with classes of students in the respective age group. This was a 2-stage cluster sampling: selection of schools and classes covering the age group of interest. More details on the GSHS can be obtained from the WHO and Centers for Disease Control and Prevention website.

PeNSE is a health survey carried out in Brazil with a design of 2 samples in its 2015 edition. The second sample was planned to aim at comparability with international indicators, especially those from the GSHS. It has a representation of students aged 13–17 years who attended the sixth to ninth year of elementary school (former fifth to eighth grades) and from the first to third grades of high school (morning, afternoon, and evening shifts) in Brazil and from the 5 major regions: North, Northeast, Southeast, South, and Midwest. A 2-stage cluster design was adopted to select the sample: schools and classes are the primary and secondary sampling units, respectively. A detailed description of the sampling process can be found in the previously published research report.

Regarding ethical aspects, informed consent was obtained for adolescents’ participation in both studies. PeNSE 2015 was approved by the National Research Ethics Committee. All countries followed a standard protocol in the GSHS. Its methodology and question database were reviewed by research ethics experts, with subsequent approval by the Centers for Disease Control and Prevention, the WHO, and the national governments of each participating country.

For data collection, the GSHS and PeNSE employed self-administered questionnaires in Spanish/English and Portuguese, respectively, developed for each country and divided into thematic modules. Among these is 1 on physical activity, which was similar between the surveys. The physical activity module includes questions regarding the dependent variables analyzed in this study: GPA, ACS, and SB.

GPA was measured from the globally estimated physical activity indicator, resulting from a single question that investigates engaging in physical activity for at least 60 minutes (1 hour) daily in the last 7 days before the survey, adding all the time the adolescent spent on any physical activity daily (Supplementary Material [available online]). Adolescents who engaged in at least 60 minutes of GPA in 5 days or more were considered sufficiently active, according to the WHO.

At PeNSE, the ACS variable was created from the combination of 2 questions: “In the last 7 days, on how many days did you walk or cycle to school?” and “In the last 7 days, on how many days did you walk or cycle back from school?” In the GSHS, this variable was collected through a single question: “During the past 7 days, how many days did you walk or ride a bicycle to or from school?” The response categories were similar in both, ranging from none to 7 days in the last 7 days (Supplementary Material [available online]). In the analysis of the PeNSE data, those who answered positively to one of the 2 questions on at least 1 day of the week, regardless of the duration, were considered ACS. For the GSHS data, those who positively reported at least 1 day in the last week were considered ACS.

The adolescents were asked to report the time (in hours, on a typical weekday) they spent watching television (TV), using a computer, playing video games, talking with friends, or engaging in other sitting activities to obtain the SB variable. Although the PeNSE and GSHS questions are similar, the number of answer categories differs (Supplementary Material [available online]). For analysis, in both surveys, adolescents were considered sedentary if they spent >2 hours a day sitting for recreational activities identified above (variable dichotomized into ≤2 h or >2 h).

The following were evaluated among the independent variables: sex (male and female), categorized age in years (13 y or less; 14 y; 15 y; 16 y and over), and the HDI of each country. The HDI is a composite index created and calculated by the United Nations Development Program, which measures mean achievements in 3 basic dimensions of human development: education, life expectancy, and gross national income per capita. The HDI ranges from 0 to 1, and the continuous index and classification of human development were used for this analysis: low = HDI values below 0.550; medium = 0.550 to 0.699; high = 0.700 to 0.799; and very high = ≥0.800. It was used the from 2010 index for Costa Rica and Peru and the 2015 index for the other countries.

Moreover, information on each country’s total population and the adolescent population was collected from the Economic Commission for Latin America and the Caribbean, considering the year 2010 for Costa Rica and Peru and the year 2015 for the other countries.

Data were analyzed with the statistical software Stata (version 16.0), and a significance level of 5% was adopted. In this study, estimates for Brazil were calculated considering the design and sampling weight of PeNSE. For the other countries, estimates were calculated considering the design and sampling weight of the GSHS. Each estimate was calculated independently for every country using the survey module to analyze complex sample data. The sample distribution by sex and age group represented in the age pyramids was calculated for each country evaluated. Prevalences and respective 95% confidence intervals were estimated for GPA, ACS, and SB, overall and according to gender and age group. The chi-square test was applied, with second-order Rao-Scott correction for the sample design to compare the proportions. Correlation analyses were performed for each outcome with the HDI, and Pearson correlation coefficient was calculated.

**Results**

This study evaluated 64,478 adolescents from ten Latin American countries from the last GSHS edition, ranging from 2009 to 2015, and the 2015 edition of PeNSE. Brazil had the highest total population and adolescents among the countries included, followed by Argentina, while Uruguay was the least populous country, followed by Costa Rica. In 5 countries, namely Guatemala, Honduras, Bolivia, El Salvador, and Peru, the adolescent population...
corresponded to approximately 20.0% of the total population, ranging from 14% to 16% in the other countries (Table 1).

Chile, Argentina, and Uruguay were classified as very high HDI, and Peru, Brazil, and Costa Rica had a high level of this indicator. On the other hand, Bolivia, El Salvador, Guatemala, and Honduras comprise the group of countries with a medium HDI level (Table 1). The distribution of samples by sex and age group showed that Argentina, Bolivia, Costa Rica, El Salvador, Guatemala, Honduras, Peru, and Uruguay had a lower percentage of adolescents aged 16 years and over of both sexes, unlike Brazil and Chile (Figure 1).

The prevalence of GPA ranged from 16.1% to 28.2% among the countries included in this study. Argentina, Uruguay, and Costa Rica had the highest prevalence of assets, around 28.0%, followed by Chile, with 26.0%. The lowest prevalence levels of GPA were observed in Guatemala and Brazil. The prevalence of active adolescents was higher among boys than girls in the countries evaluated, except Guatemala and Peru. Adolescents aged 16 years and over in Brazil and Uruguay had lower GPA prevalence than adolescents in the youngest age groups. In contrast, in El Salvador, adolescents aged 13 years and younger were less active than adolescents in older age groups (Table 2).

ACS prevalence ranged from 56.7% in Costa Rica to 71.2% in Peru. When comparing the sexes, prevalence of ACS was significantly higher in male adolescents from Uruguay, Honduras, and Brazil. Among age groups, a significant difference was observed in Costa Rica, Peru, Argentina, and Brazil. Higher prevalence levels of ACS were observed in younger adolescents (under 14 y old) for Brazil and among 14–15 years old age group for Argentina, while for Costa Rica and Peru the prevalence increased with age (Table 3).

Brazil had the highest percentage of SB, followed by Uruguay and Chile. The lowest SB percentages were observed in Guatemala and Bolivia. SB prevalence was significantly higher among girls from Argentina, Chile, Costa Rica, and Uruguay. When analyzing age groups, adolescents younger age group (up to 13 y old) in Argentina, Brazil, Costa Rica, El Salvador, and Uruguay had a significantly lower SB prevalence. Specifically in Uruguay, there was an increase in the prevalence of SB with increasing age (Table 4).

We observed that the higher the country’s HDI, the greater the prevalence of GPA and SB (significant positive correlation), with no significant correlation with the prevalence of active commuting (Figure 2).

**Discussion**

In this study, the prevalence of the GPA, ACS, and SB showed variations among Latin American countries. Likewise, the prevalence of these indicators by sex and age group varied between countries, with significant differences observed in some, depending on each indicator. The HDI was significantly associated with GPA and SB.

Children and adolescents aged 5–17 years are advised to engage in at least 60 minutes of moderate to vigorous physical activity per day.1,28 However, less than a third of students in the 10 countries evaluated met this recommendation (16.1%–28.2%), with lower prevalence in Guatemala and Brazil and higher in Argentina, Uruguay, Costa Rica, and Chile. Previous studies covering a more significant number of countries using OSHS data found prevalence of GPA ranging from 6.0% to 43.0%,3,29 like Ricardo et al30 who evaluated 64 countries, and the study by Xu et al,8 which involved 54 low- and middle-income countries, could explain the more significant variation in these studies.

Although many questions can be asked to explain the low percentage of active adolescents, the rapid urbanization in this region may have played a considerable role in the estimates. Latin America is a small region, containing around 14% of the world’s population. It is among the most urbanized regions in the world, with 80% of the population residing in cities.30 This growing urbanization process comprises determinants of habits and behaviors of individuals, including physical inactivity.31 Additionally, we observe gaps concerning the actual physical activity levels achieved by adolescents, and the perception of levels of physical activity performed, with an overestimation either by the adolescents themselves or their parents,32 which can also contribute to prolonging unhealthy lifestyles. Thus, policies and actions to promote and encourage physical activity and intersectoral efforts to increase physical activity levels should be directed at young people and parents.28

The promotion of physical activity in the context of Latin America is a complex process and is influenced by the attributes of urban environments, which are unevenly distributed as a result

<table>
<thead>
<tr>
<th>Countries</th>
<th>Research year</th>
<th>Sample</th>
<th>Total population</th>
<th>Adolescent population</th>
<th>% of adolescent</th>
<th>HDI</th>
<th>HDI (classification)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>2012</td>
<td>28,368</td>
<td>43,075,416</td>
<td>7,033,303</td>
<td>16.3</td>
<td>0.75</td>
<td>High</td>
</tr>
<tr>
<td>Bolivia</td>
<td>2012</td>
<td>3696</td>
<td>10,869,730</td>
<td>2,241,941</td>
<td>20.6</td>
<td>0.68</td>
<td>Medium</td>
</tr>
<tr>
<td>Brazil</td>
<td>2015</td>
<td>16,556</td>
<td>204,471,769</td>
<td>33,510,380</td>
<td>16.4</td>
<td>0.75</td>
<td>High</td>
</tr>
<tr>
<td>Chile</td>
<td>2013</td>
<td>2049</td>
<td>17,969,353</td>
<td>2,556,329</td>
<td>14.2</td>
<td>0.83</td>
<td>Very high</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>2009</td>
<td>2679</td>
<td>4,577,378</td>
<td>819,176</td>
<td>17.9</td>
<td>0.75</td>
<td>High</td>
</tr>
<tr>
<td>El Salvador</td>
<td>2013</td>
<td>1915</td>
<td>6,325,124</td>
<td>1,295,176</td>
<td>20.5</td>
<td>0.66</td>
<td>Medium</td>
</tr>
<tr>
<td>Guatemala</td>
<td>2015</td>
<td>1030</td>
<td>16,252,429</td>
<td>3,787,044</td>
<td>23.3</td>
<td>0.64</td>
<td>Medium</td>
</tr>
<tr>
<td>Honduras</td>
<td>2012</td>
<td>1779</td>
<td>9,112,916</td>
<td>2,076,946</td>
<td>22.8</td>
<td>0.61</td>
<td>Medium</td>
</tr>
<tr>
<td>Peru</td>
<td>2010</td>
<td>2882</td>
<td>29,027,674</td>
<td>5,767,852</td>
<td>19.9</td>
<td>0.72</td>
<td>High</td>
</tr>
<tr>
<td>Uruguay</td>
<td>2012</td>
<td>3524</td>
<td>3,412,009</td>
<td>504,096</td>
<td>14.8</td>
<td>0.80</td>
<td>Very high</td>
</tr>
</tbody>
</table>

Abbreviation: HDI, Human Development Index.

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**Table 1** Sampling, Demographic and Socioeconomic Characteristics of 10 Selected Latin American Countries

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(Ahead of Print)
of regional historical, political, and socioeconomic factors. The region is characterized as the most unequal in the world, not only because the income distribution, but also in terms of access to housing, public spaces, and education and health services. Among the 10 countries analyzed, Brazil has the highest Gini index, followed by Honduras. Income inequalities are associated with lower levels of physical activity and the availability of green areas and public spaces.

The region is one of the most violent in the world, responsible for more than a third of all homicides in 2012. A study carried out with a group of cities in Latin America (Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru, Panama, and El Salvador) observed a positive association between the GINI index and homicide rates among young people and young adults from 2010 to 2016. Studies have shown that violence has a negative effect on the practice of physical activity.

This study identified high variability in the prevalence of ACS in the 10 Latin American countries (56.7% [Costa Rica]—71.2% [Peru]). Findings from other studies also show high variations among 27 Asia-Pacific countries, and in 54 low- and middle-income countries. Even if the source of information is the same, differences in the ACS cutoff point may affect comparability, which may be overestimated or underestimated. Therefore, it is necessary to develop a standardized measure to overcome heterogeneity and overestimate or underestimate results, facilitating comparability between studies.

However, individual, political, social, and environmental characteristics can influence these estimates regardless of methodological differences. Distance to school, parental support for commuting, safety related to traffic and crime, built environment, and school policies are relevant determinants of this behavior. Furthermore, Peralta et al showed that in low- and middle-income countries, boys and girls who actively commuted to school were 42% and 66% more likely to meet physical activity recommendations, which reinforces the importance of using the ACS as a public health strategy to promote physical activity, which can help to consolidate this behavior throughout life.

In Latin America, initiatives developed to improve the urban environment and reduce sociospatial segregation in cities in different countries (Argentina, Brazil, Chile, Peru, Mexico, Ecuador, Colombia, and Venezuela) may be favorable to active commuting. These initiatives include, for example, the Ciclovía Program and other policies and programs aimed at promoting the bicycle as a means of transport. Although the coverage and

![Figure 1](image_url) — Distribution of the sample of 10 Latin American countries by sex and age, for the year of the last edition of the respective survey carried out in each country. PeNSE, GSHS, Latin America, 2009–2015. GSHS indicates Global School-Based Student Health Survey; PeNSE, National School Health Survey.
### Table 2 Prevalence and 95% CI of Global Physical Activity (≥5 d/wk) According to Sex and Age Group

<table>
<thead>
<tr>
<th>Variables/countries</th>
<th>Overall % (95% CI)</th>
<th>Male % (95% CI)</th>
<th>Female % (95% CI)</th>
<th>≤13 % (95% CI)</th>
<th>14 % (95% CI)</th>
<th>15 % (95% CI)</th>
<th>≥16 % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>28.2 (26.9–29.6)</td>
<td>35.5 (33.7–37.4)</td>
<td>21.4 (20.1–22.9)</td>
<td>27.9 (24.7–31.4)</td>
<td>27.9 (26.0–29.8)</td>
<td>28.7 (26.9–30.5)</td>
<td>28.9 (26.4–31.5)</td>
</tr>
<tr>
<td>Bolivia</td>
<td>23.2</td>
<td>28.0 (20.7–25.9)</td>
<td>19.2 (16.4–22.3)</td>
<td>22.9 (18.7–27.6)</td>
<td>23.1 (18.8–28.0)</td>
<td>24.3 (20.4–28.7)</td>
<td>24.7 (20.3–29.7)</td>
</tr>
<tr>
<td>Brazil</td>
<td>19.8 (19.0–20.7)</td>
<td>26.7 (24.6–31.6)</td>
<td>12.8 (14.6–23.1)</td>
<td>21.8 (18.7–23.1)</td>
<td>19.4 (17.2–21.9)</td>
<td>19.8 (17.8–22.0)</td>
<td>18.5 (17.1–20.0)</td>
</tr>
<tr>
<td>Chile</td>
<td>26.0</td>
<td>34.0 (23.2–29.0)</td>
<td>18.3 (14.3–23.1)</td>
<td>30.3 (26.4–34.5)</td>
<td>26.7 (21.6–32.7)</td>
<td>25.4 (18.2–34.3)</td>
<td>23.8 (20.0–28.0)</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>28.0</td>
<td>35.5 (25.0–31.1)</td>
<td>20.2 (31.5–39.7)</td>
<td>28.8 (25.0–32.9)</td>
<td>28.3 (23.2–34.0)</td>
<td>25.4 (21.4–29.9)</td>
<td>30.4 (25.2–36.1)</td>
</tr>
<tr>
<td>El Salvador</td>
<td>20.8 (17.9–24.0)</td>
<td>26.6 (22.9–30.8)</td>
<td>14.8 (12.4–17.6)</td>
<td>15.4 (11.3–20.7)</td>
<td>15.9 (18.0–25.5)</td>
<td>15.4 (19.2–27.9)</td>
<td>24.8 (19.0–31.7)</td>
</tr>
<tr>
<td>Guatemala</td>
<td>16.1 (12.8–20.0)</td>
<td>17.3 (12.3–23.7)</td>
<td>15.0 (12.2–18.3)</td>
<td>15.9 (11.9–20.9)</td>
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<td>15.0 (9.9–22.1)</td>
<td>17.4 (11.0–26.4)</td>
</tr>
<tr>
<td>Honduras</td>
<td>21.5 (19.3–23.9)</td>
<td>25.8 (22.2–29.9)</td>
<td>17.5 (15.2–20.2)</td>
<td>20.6 (16.4–25.7)</td>
<td>21.6 (17.6–26.4)</td>
<td>20.2 (15.6–25.8)</td>
<td>26.5 (21.7–32.0)</td>
</tr>
<tr>
<td>Peru</td>
<td>24.8 (22.5–27.3)</td>
<td>26.3 (23.2–29.7)</td>
<td>23.5 (20.8–26.4)</td>
<td>27.0 (21.9–32.6)</td>
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<td>22.1 (19.6–24.8)</td>
<td>26.2 (22.2–30.7)</td>
</tr>
<tr>
<td>Uruguay</td>
<td>28.0 (25.3–30.8)</td>
<td>41.5 (38.2–44.9)</td>
<td>16.3 (14.2–18.6)</td>
<td>29.0 (24.8–33.8)</td>
<td>30.7 (27.4–34.3)</td>
<td>27.0 (23.6–30.8)</td>
<td>23.0 (20.0–26.4)</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; GSHS, Global School-Based Student Health Survey; PeNSE, National School Health Survey. Note: PeNSE, GSHS, Latin America, 2009–2015.

Values in bold indicate statistical significance at the 5% level.

### Table 3 Prevalence and 95% CI of Active Commuting to School According to Sex and Age Group

<table>
<thead>
<tr>
<th>Variables/countries</th>
<th>Overall % (95% CI)</th>
<th>Male % (95% CI)</th>
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<th>≤13 % (95% CI)</th>
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<th>15 % (95% CI)</th>
<th>≥16 % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>68.4 (65.6–71.0)</td>
<td>68.7 (59.4–68.6)</td>
<td>67.9 (61.3–64.2)</td>
<td>64.8 (59.8–69.6)</td>
<td>70.4 (67.0–73.5)</td>
<td>70.4 (67.4–73.2)</td>
<td>67.3 (63.8–70.7)</td>
</tr>
<tr>
<td>Bolivia</td>
<td>64.7 (60.9–68.4)</td>
<td>63.6 (59.5–67.5)</td>
<td>66.0 (61.4–70.3)</td>
<td>60.0 (54.4–65.3)</td>
<td>63.2 (57.2–68.7)</td>
<td>67.4 (61.2–73.1)</td>
<td>68.2 (62.2–73.8)</td>
</tr>
<tr>
<td>Brazil</td>
<td>65.0 (64.0–66.0)</td>
<td>67.2 (65.8–68.6)</td>
<td>62.8 (61.3–64.2)</td>
<td>65.4 (64.0–66.8)</td>
<td>71.8 (69.0–74.4)</td>
<td>63.6 (61.1–66.0)</td>
<td>62.8 (61.0–64.7)</td>
</tr>
<tr>
<td>Chile</td>
<td>63.1 (57.7–68.2)</td>
<td>64.1 (59.4–68.6)</td>
<td>61.6 (53.2–69.3)</td>
<td>65.6 (59.8–70.9)</td>
<td>66.5 (57.8–74.2)</td>
<td>68.9 (60.6–76.1)</td>
<td>58.2 (47.6–68.2)</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>56.7 (51.8–61.6)</td>
<td>56.9 (51.4–62.2)</td>
<td>56.7 (51.2–62.1)</td>
<td>49.2 (43.1–55.4)</td>
<td>57.8 (50.9–64.4)</td>
<td>60.7 (54.9–66.2)</td>
<td>62.5 (54.1–70.1)</td>
</tr>
<tr>
<td>El Salvador</td>
<td>58.5 (52.2–64.6)</td>
<td>60.5 (52.2–68.2)</td>
<td>56.5 (50.2–62.6)</td>
<td>59.5 (51.7–66.8)</td>
<td>54.3 (46.0–62.3)</td>
<td>59.0 (50.1–67.4)</td>
<td>65.8 (58.2–72.7)</td>
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<td>Guatemala</td>
<td>57.2 (53.2–61.0)</td>
<td>58.8 (54.4–63.0)</td>
<td>56.7 (50.6–62.6)</td>
<td>54.7 (49.2–60.1)</td>
<td>60.8 (54.2–67.0)</td>
<td>56.8 (47.3–65.8)</td>
<td>59.6 (49.9–68.6)</td>
</tr>
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Abbreviations: CI, confidence interval; GSHS, Global School-Based Student Health Survey; PeNSE, National School Health Survey. Note: PeNSE, GSHS, Latin America, 2009–2015.

Values in bold indicate statistical significance at the 5% level.
The highest prevalence of SB was found in Brazil, Uruguay, and Chile (above 50%) and the lowest among adolescents in Guatemala (20.7%) and Bolivia (24.4%). National and international guidelines recommend interrupting prolonged SB, limiting children’s and adolescents’ recreational screen time to no >2 hours a day. Despite the recommendations, the assessment of SB in adolescents must still be standardized, either by the methods and tools used in its assessment or by different ways of operationalizing it, which makes hindering comparability between studies.

The results by sex show that male adolescents were more physically active in 8 countries, more active in commuting to school in 3 countries, and more sedentary girls in 4 countries. Consistent with other studies, these results show that boys tend to be more active, while girls adopt a more sedentary lifestyle. These differences between the sexes are one of the main obstacles to reaching the recommended physical activity levels. The barriers to girls’ adherence to an active lifestyle are numerous and complex, but some assumptions can be made. One of them concerns the sociocultural context influencing gender inequality, including the home, community, and school. Boys, since childhood, tend to be more stimulated to play games and other activities that involve sports, while girls are more encouraged to do domestic activities and to dedicate themselves to studies. More barriers perceived by girls, such as less social support, self-efficacy, time, and confidence in their abilities for physical activity also contribute to the differences in these behaviors between the sexes. Moreover, some countries may encourage school physical education and community club structures more, with activities predominantly for boys. Changing these behaviors among girls requires proportionally, with approximately 30.0% and 20.0% of households owning computers, respectively. In 2016, Brazil and Chile had comparable rates with internet access at home, both hovering around 50.0%. Uruguay showcased a more advanced digital landscape with a rate of approximately 70.0%. However, Bolivia and Guatemala faced challenges in terms of connectivity, as only slightly over 20.0% and 10.0% of their populations, respectively, had access to the internet from their homes.

<table>
<thead>
<tr>
<th>Variables/countries</th>
<th>Overall % (95% CI)</th>
<th>Male % (95% CI)</th>
<th>Female % (95% CI)</th>
<th>Male % (95% CI)</th>
<th>Female % (95% CI)</th>
<th>Male % (95% CI)</th>
<th>Female % (95% CI)</th>
<th>Male % (95% CI)</th>
<th>Female % (95% CI)</th>
<th>Male % (95% CI)</th>
<th>Female % (95% CI)</th>
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<td>55.3 (48.1–62.2)</td>
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<td>28.6 (25.3–32.2)</td>
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<td>28.8</td>
<td>25.7 (21.0–31.0)</td>
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<td>Uruguay</td>
<td>59.1 (56.4–61.7)</td>
<td>56.1 (52.8–59.3)*</td>
<td>61.8 (58.2–65.3)*</td>
<td>54.0 (48.3–59.5)*</td>
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Abbreviations: CI, confidence interval; GSHS, Global School-Based Student Health Survey; PeNSE, National School Health Survey. Note: PeNSE, GSHS, Latin America, 2009–2015. Values in bold indicate statistical significance at the 5% level.
specific interventions and promotion programs considering differences and similarities between the sexes.\textsuperscript{50,52}

The lower GPA prevalence of among adolescents aged 16 years and over in Brazil and Uruguay observed in this study is aligned with national and international studies.\textsuperscript{12,53} The literature shows that physical activity levels begin to decrease in childhood and continue with advancing age.\textsuperscript{54} Older adolescents can acquire greater autonomy and tend to be involved in occupational activities, especially in the transition from adolescence to adulthood, which could contribute to their lower physical activity frequency. Furthermore, as also observed in this study, older adolescents in Brazil and Uruguay may be dedicating more time of their day to sedentary activities.

Specifically, in El Salvador, adolescents aged 13 years or younger had a lower GPA prevalence than those in older age groups. This finding may reflect the high youth violence levels in northern Central America, which limits school participation and physical education. In El Salvador, 40\% of children are out of school due to the violence and nearly 1 in 3 children drop out of school before completing high school. There is an exceptionally high dropout rate among 11-year-olds,\textsuperscript{55} coinciding with this study’s least active age group. Dropping out of school interferes with the educational opportunities and practice of physical activity, leaving slim opportunities to participate in physical education and other activities\textsuperscript{55} that, in turn, contribute to reaching the recommended physical activity levels at this life stage.\textsuperscript{8}

In Brazil and Argentina, the highest prevalence of ACS was found to be highest among younger adolescents, which aligns with previous studies.\textsuperscript{56,57} Additionally, the lower prevalence among adolescents aged 16 years and over could be attributed to factors such as night shifts or night classes,\textsuperscript{58} which may lead these students to prefer alternative modes of transportation, such as public transportation. Another result observed in this study was that adolescents aged 13 years or younger had lower ACS percentages in Costa Rica and Peru. One possible explanation for lower ACS among younger adolescents is that older adolescents have a greater tendency to engage in active commuting, while younger adolescents may face barriers such as safety concerns when crossing streets or perceived crime, which may lead parents to choose alternative transportation methods for their children.\textsuperscript{42} In situations where alternative transportation options are available, parents may opt for these alternatives to ensure the safety of their younger children.

\textbf{Figure 2} — Correlation analysis between HDI and prevalence of global physical activity (≥5 d/wk), active commuting to school, and sedentary behavior. PeNSE, GSHS, UNDP, Latin America, 2009–2015. \textsuperscript{*}P value < .05. HDI indicates Human Development Index; GSHS, Global School-Based Student Health Survey; PeNSE, National School Health Survey; UNDP, United Nations Development Programme.
The distribution of ACS prevalence is not so established between age groups in adolescence, differing by context of each country. Central American countries have higher demographic densities, and along with Peru and Bolivia, they have lower percentages of urbanization compared with the other Latin American countries analyzed in this study. This profile may contribute to the lack of well-developed public transport infrastructure, as well schools located further away from residential areas. Additionally, limited availability of automobiles among the poorer segments of the population may lead older adolescents to actively commute to school. Regardless of these results, it is noteworthy that adolescents who undergo ACS are more likely to reach the recommended physical activity levels, especially older adolescents. Thus, country-specific efforts to encourage ACS as a means of increasing physical activity must also focus on subgroups of adolescents who would most benefit from such interventions and programs.

The results indicate that younger adolescents (13 y and under) in Argentina, Brazil, Costa Rica, El Salvador, and Uruguay spend less time watching TV, using a computer, playing video games, or other seated activities, corroborating previous studies. There is a trend that older teenagers prefer to watch TV and play video games at home, compared with engaging in physical games in their spare time. In countries such as Brazil, Costa Rica, and Uruguay, the use of cell phones and other multidevices (including PC, notebook, tablet-iPad, video game console, and TV on smart TV) outside the home (eg, at a friend’s or relative’s house, school, public place, or while traveling) is most commonly observed among late adolescents. This trend is likely associated with their growing independence and the ability to use these devices autonomously. Moreover, despite having more free time available, younger adolescents are more susceptible to parental rules, limiting their time to recreational activities. At the same time, sitting would explain less time spent in sedentary activities.

This study identified an increased GPA and SB prevalence with higher country HDI. This result can be explained from the perspective of 2 aspects. First, countries with higher HDI reflect more education and income, suggesting cities and individuals with better socioeconomic status. The socioeconomic level impacts social inequalities in cities, where lower-income areas tend to have worse conditions in the built and social environment, including the lack of functional and safe public spaces. Furthermore, in contrast to less developed regions, students in more developed regions tend to spend more time on physical activity during physical education classes and those who attend more physical education classes per week are more likely to engage in physical activity outside of school. Additionally, individuals with higher socioeconomic status are more likely to have access to facilities for physical activity, and if they have access and time to use electronic devices and the internet for leisure (interaction on social networks) and other sedentary activities.

The results of this study have limitations, such as the use of self-reported data, which may present information bias. However, self-reporting is still the most feasible method in surveillance studies such as the national surveys, PeNSE, and GSHS. Also, some differences were observed between PeNSE and GSHS regarding the ACS and SB constructs. Regarding the ACS, there are differences in the GSHS and PeNSE questions. In the GSHS, the construct is evaluated from a single question that considers going to and from school, while in PeNSE, 2 questions are adopted for this construct, regarding the journey to and from school. Therefore, to ensure greater comparability of the indicator between countries, only the presence and absence of ACS were assessed, without considering frequency, in alignment with a previous study. Finally, although we used the data released more recently, the surveys were held in different years, depending on the country, with a very long period (2009–2015), and therefore estimates are not fully comparable between countries and may have influenced the differences in estimates.

Among the strengths of this study is the possibility of analyzing data from Brazil GPA, ACS, and SB among adolescents in other Latin American countries. We can also mention the large sample size and scope, with a national representation of adolescents who attend school.

Latin American countries evidence significant heterogeneity in terms of social and environmental determinants, as well as political and economic influences, which combine to reinforce substantial social inequalities in the urban space and, consequently, in individuals' lifestyles. Thus, economic development, changes in transport patterns, use of technology, security, infrastructure, urban design, housing, availability of leisure facilities, and cultural context may be interrelated with physical activity and SB, reflected in the results identified in this study.

Conclusions

Latin American countries have a low prevalence of GPA and ACS. On the other hand, the prevalence of SB for >2 hours is high, with variation between countries. In general, boys are more active than girls, who, in turn, are more sedentary. The distribution of the prevalence of GPA, ACS, and SB by age group shows different profiles among the analyzed countries. The prevalence of GPA and SB in adolescents is positively correlated with HDI.

The results reinforce that health promotion policies in Latin American countries must include guidelines that encourage and promote increased practice of physical activity and less time in SB among young people, considering specific groups and the local socioeconomic context. Furthermore, it is essential to understand the multiple factors that influence physical activity and their respective domains and SB of adolescents in each country/region, including characteristics of their living environment. We emphasize the need for elaborating and using a standardized instrument to evaluate indicators, thus providing greater comparability between studies.

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