








# Time trends of physical activity in Curitiba, Brazil: 2006–2015

## *Tendência temporal da participação em atividade física no lazer na cidade de Curitiba, Brasil (2006–2015)*

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**ABSTRACT:** *Objective:* The identification of the time trend of physical activity can help in the evaluation of the effectiveness of programs aimed at the promotion of physical activity at the population scope. To analyze the temporal trend of leisure time physical activity in adults living in the city of Curitiba (Brazil), from 2006–2015. *Methods:* This is a cross-sectional study with 19,183 adults, obtaining information on duration, intensity and weekly frequency of leisure-time physical activity from the Surveillance System of Risk and Protection Factors for Chronic Diseases by Telephone Inquiry. Adults who reported participating in leisure time physical activity at least once a week in the three months prior to the survey were considered active. *Results:* Men's leisure-time physical activity was stable overtime ( $p = 0.28$ ), while it increased significantly among women (1.86% per year, 95%CI 0.55; 3.37;  $p = 0.02$ ). Men reported less activities with weekly frequency of one to two times (-3.75% per year, 95%CI -6.72; -0.67;  $p = 0.03$ ) but more with weekly frequencies of five to six times (7.42% per year, 95%CI 4.54; 10.38;  $p = 0.001$ ). No changes were observed in the frequency of physical activity among women. *Conclusion:* Monitoring indicators of physical activity in the city of Curitiba can assist legislators in building policies to promote physical activity

**Keywords:** Exercise. Public health surveillance. Time series studies. Epidemiology. Sedentary lifestyle.

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**RESUMO:** *Introdução:* A tendência temporal da participação em atividade física pode auxiliar na avaliação da efetividade de programas voltados à sua promoção no âmbito populacional. O estudo analisou a tendência temporal da participação em atividade física no lazer de adultos residentes na cidade de Curitiba, Paraná, Brasil, no período de 2006 a 2015. *Métodos:* Estudo transversal com dados secundários de 19.183 participantes, obtidos junto ao Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico (2006 a 2015). Foram considerados ativos no lazer os adultos que referiram participar de atividades físicas no tempo livre pelo menos uma vez por semana nos três meses anteriores à realização do inquérito. *Resultados:* A tendência temporal da prática de atividade de lazer foi estacionária em homens e crescente em mulheres (1,86% ao ano; IC95% 0,55 – 3,37). Os homens reduziram a participação em atividades realizadas 1 a 2 vezes por semana (-3,75% ao ano; IC95% -6,72 – -0,67) e aumentaram a participação em atividades realizadas de 5 a 6 vezes por semana (7,42% ao ano; IC95% 4,54 – 10,38). *Conclusão:* A continuidade da monitoração dos indicadores de atividade física na cidade de Curitiba pode auxiliar gestores a direcionarem políticas de promoção da atividade física.

**Palavras-chave:** Exercício. Vigilância em saúde pública. Estudos de séries temporais. Epidemiologia. Estilo de vida sedentário.

## INTRODUCTION

Presently, the lifestyle of populations is changing, with reduced levels of participation in physical activity (PA) and increased time spent on sedentary behaviors. The transition to reduced levels of PA is admitted as one of the main contributors to the increase in the global burden of chronic diseases<sup>1-3</sup>.

Physical inactivity is a risk factor for chronic diseases, which account for over 60% of all deaths worldwide, predominantly in underdeveloped countries<sup>4</sup>. Recent estimates suggest that nearly 5.3 million deaths per year worldwide<sup>5</sup> and 300,000 deaths per year in Brazil<sup>6</sup> are attributed to physical inactivity. Despite global concerns regarding the population's physical inactivity and rapidly changing patterns of work, transport and recreation, monitoring PA participation is only carried out in some countries and is restricted to specific locations, creating gaps in knowledge in relation to the temporal trends of this practice within and between countries<sup>7</sup>. Tracking the trends in relation to PA participation is particularly important in developing countries as they suffer from the double burden of communicable and noncommunicable diseases and face the additional costs of treating both.

In order to provide the country with an effective instrument to monitor determinants of chronic noncommunicable diseases, the Brazilian Ministry of Health implemented the Surveillance of Risk Factors and Protection for Chronic Noncommunicable Diseases by Telephone Inquiry (Vigitel) in 2006. Since then, Vigitel has actively provided data from the federal and state capitals of Brazil and the Federal District on the main determinants of chronic diseases in the country, including indicators related to the practice of PA<sup>8</sup>.

Some national time series analyses of PA participation have already been conducted<sup>9,10</sup>, but little emphasis has been given to investigations in each Brazilian capital. Comprehensive studies of the temporal trend of leisure-time PA participation in the city of Curitiba were not found in the literature.

The capital of Paraná is an avant-garde city, recognized on a global level for its public policies in the area of public transport and urban planning<sup>11</sup>. The temporal trend of participation in PA can help to evaluate the effectiveness of programs aimed at promoting PA in the population context for the city of Curitiba. Therefore, the present study analyzed the trend of participation in PA during leisure time of adults living in the city of Curitiba, Brazil, from 2006 to 2015.

## METHODS

### STUDY SAMPLE AND DESIGN

Curitiba is the capital of the state of Paraná and has a high level of human development (0.823)<sup>12</sup>. Its population is estimated at 1,893,997 inhabitants, making it the most populous city in the southern region and the eighth most populous city in Brazil<sup>13</sup>. It is internationally known as the “ecological capital” and has several appropriate spaces destined to the practice of PA.

This serial cross-sectional study examined Vigitel secondary data from 2006 to 2015 for the adult population ( $\geq 18$  years) living in Curitiba. The methodology employed by Vigitel to obtain the analyzed information can be accessed in previous publications<sup>14</sup>.

The sampling procedures employed by Vigitel aim to obtain, in each capital of the Brazilian states and the Federal District, probabilistic samples of the adult population residing in households served by at least one fixed telephone line. As this was a telephone interview, free and informed consent was replaced by verbal consent obtained during telephone contacts with the interviewees. The Vigitel project was approved by the National Committee of Ethics in Research for Human Beings of the Ministry of Health, under protocol No. 749/2006.

In the segment from 2006 to 2011, Vigitel established a minimum sample size of 2,000 individuals aged 18 and over for the city of Curitiba to estimate, with a 95% confidence coefficient and a maximum error of about 2 percentage points, the frequency of any risk factor in the adult population. From 2012 to 2014, due to technical adjustments related to data collection, the system chose to reduce the minimum sample size to 1,600 individuals, raising the maximum estimate error to about 3 percentage points for the population as a whole and 4 percentage points in specific estimates<sup>15</sup>.

The team responsible for the interviews involved approximately 40 interviewers, 2 supervisors and 1 coordinator; received prior training and was supervised during the operation of the system by researchers from the Center for Epidemiological Research on Nutrition

and Health at the University of São Paulo and technicians from the Health Surveillance Secretariat of the Ministry of Health<sup>8</sup>.

## VARIABLES

The variables of central interest of this study were related to the participation of adults in leisure-time PA. To determine the frequency of this participation, the Vigitel survey question was used: “In the last three months, did you practice any kind of physical exercise or sport? (Yes No).” The weekly frequency was determined by the sum of the days in which there was PA participation, based on the question: “How many days per week do you usually practice physical exercise or sports?”. The answers to the weekly frequency were divided into four categories:

- every day;
- 5 to 6 days;
- 3 to 4 days;
- 1-2 days a week.

The concept of “active in leisure time” was attributed to the participant who confirmed performing any amount of leisure-time PA at least once a week in the three months prior to the survey; “Inactive” was attributed to the respondent who did not perform any amount of leisure-time PA at least once a week in the three months prior to the survey.

The term “temporal tendency” was used according to Antunes and Cardoso’s definition<sup>16</sup>, as a behavior of the historical series that affects the variable of interest over time and can be positive when it indicates growth, negative when it indicates reduction or stationary when there is no statistically significant variation.

## DATA ANALYSIS

In order to infer reliable estimates for the total adult population of the city of Curitiba, the post-stratification weight calculated by the rake method was used, allowing the use of population estimates in the inter-census period. This method uses interactive procedures that take into account successive comparisons between estimates of the distribution of each sociodemographic variable in the Vigitel sample and the total population of the city. These comparisons culminate in the finding of weights that, when applied to the Vigitel sample, equate the sociodemographic distribution with the estimated distribution for the total city population for the same year<sup>8</sup>.

The first analyzes of the data were descriptive in order to provide the base reference for the variables under study. The temporal variation was analyzed by Prais-Winsten regression, using the prevalence rates of PA indicators as dependent variables and the year as the

independent variable. Annual variation rate and 95% confidence intervals (95%CI) were calculated for each variable. Significant changes in PA indicators were indicated when regression coefficients were significantly different from zero ( $p < 0.05$ ). All analyzes were performed using the Stata MP statistical package (version 13.0).

## ETHICAL ASPECTS

The Vigitel project was approved by the National Commission of Ethics in Research for Human Beings of the Brazilian Ministry of Health. Free and informed consent was obtained orally at the time of telephone contact with the interviewees. The database is public, available online at [http://svs.aids.gov.br/bases\\_vigitel\\_viva/vigitel.php](http://svs.aids.gov.br/bases_vigitel_viva/vigitel.php) and does not allow interviewees to be identified.

## RESULTS

43,200 telephone number were initially drawn for Vigitel surveys for the years 2006 to 2015. Following pre-established criteria, 26,330 eligible numbers were computed, among which 19,183 participants answered the interview, totaling 7,458 men and 11,724 women with completed interviews. Sample weights attributed to each participant corrected this inequality. The average age of respondents was 47.2 years, with standard deviation (SD) of 16.8 years. There was an increase in the average age of respondents of both sexes. The average male age ranged from 41.7 years in 2006 to 47.3 years in 2015; and female from 44.6 years in 2006 to 50.9 years in 2015. Among the sample as a whole, 51.3% of adults (58.4% of men and 46.4% of women) reported performing some type of physical exercise or sport in their leisure-time.

For the sample as a whole, participation in leisure-time PA ranged from 49.9% in 2006 to 53.7% in 2015 ( $p = 0.10$ ), from 61.4% in 2006 and 54.1% in 2005 for men and 42.7% in 2006 and 49.2% in 2015 for women.

The average percentage was 12.9% higher for men ( $p = 0.03$ ). The percentage of active adults fluctuated in age for both sexes, with a tendency for the number of active to decrease with increasing age. However, in some periods, such as in 2007, 2009 and 2010, leisure-time PA in women 60 years and older was more prevalent.

Overall, the rate of change in active people during leisure-time in the city of Curitiba resulted in a steady trend (Table 1). Regarding men, when the analysis was stratified by age groups, they tended to grow for the age groups of 18 to 39 years and 60 years or older, with a growth of 1.70% per year (95%CI 0.18 – 3.23) and 1.93% per year (95%CI 0.35 – 3.5), respectively.

Figure 1 shows the relative distribution of participation in leisure-time PA by adults living in Curitiba. A higher prevalence of leisure-time PA among men (58%) is noticed when compared to women (46%); trend of stability of the prevalence rates of leisure-time for the

population as a whole; trend of stability of the prevalence rates of leisure-time PA for the population as a whole; stationary trend among men and growth trend for women.

Figure 2 shows the prevalence of leisure-time PA according to the weekly frequency distribution of activities which is stratified by sex. Most active women (39%) and most active men (30%) performed activities 3-4 times a week. Activities with a minimum frequency of 1 to 2 times a week were proportionally lower in active women (31%) than in men (39%) ( $p = 0.04$ ), but there was a tendency to reduce activity for the weekly frequency of activities (-3.75% per year; 95%CI -6.72 – -0.67) and increase in daily activities (7.42% per year; 95%CI 4.57 – 10.38). There was a steady tendency for weekly activity frequency in all categories among women.

## DISCUSSION

Temporal evidence suggests changes in leisure-time PA participation behavior in the city of Curitiba from 2006 to 2015. In the stratification according to sex, the temporal trend

Table 1. Annual variation rate of prevalence of active adults in leisure time according to gender and age range of Vigitel System samples. Curitiba, 2006 to 2015.

		Prevalence <sup>a</sup> (%)			Rate of change / year (%)	95%CI	p*
		2006	2010	2015			
Participation in leisure-time PA (general)	Total	51.21	47.39	53.7	1.16	-0.25 – 2.57	0.09
	18 - 39 years	57.77	49.09	60.60	2.09	0.30 – 4.18	0.03
	40 - 59 years	47.13	46.64	52.46	2.02	0.44 – 3.68	0.02
	≥ 60 years	41.20	45.75	48.70	1.46	0.60 – 2.31	0.004
Participation in leisure-time PA (men)	Total	61.40	58.14	60.12	0.69	-0.71 – 2.21	0.28
	18 - 39 years	69.61	67.27	74.06	1.70	0.18 – 3.23	0.03
	40 - 59 years	55.97	54.47	52.79	0.65	-1.94 – 3.32	0.58
	≥ 60 years	45.46	48.73	54.85	1.93	0.35 – 3.50	0.02
Participation in leisure-time PA (women)	Total	43.89	41.11	49.15	1.86	0.55 – 3.37	0.01
	18 - 39 years	48.00	38.92	48.85	2.68	0.42 – 5.20	0.03
	40 - 59 years	41.52	41.50	52.23	2.83	1.39 – 4.28	0.002
	≥ 60 years	38.45	44.23	45.31	1.13	-0.32 – 2.31	0.05

<sup>a</sup> 2007, 2008, 2009, 2011, 2012, 2013 and 2014 values omitted only for descriptive characteristics; 95%CI: 95% confidence interval; \*Prais-Winsten regression; PA: physical activities.

behaved differently between men and women. An annual growth trend was observed among women and a steady trend among men.

The catalysts for changes in the level of PA in the female population of Curitiba can be partly attributed to national and local PA promotion incentive programs. An example of local intervention is the implementation of the *CuritibaAtiva* 2008 Program<sup>17</sup>, proposed by the government of Paraná to encourage the practice of PA and develop educational

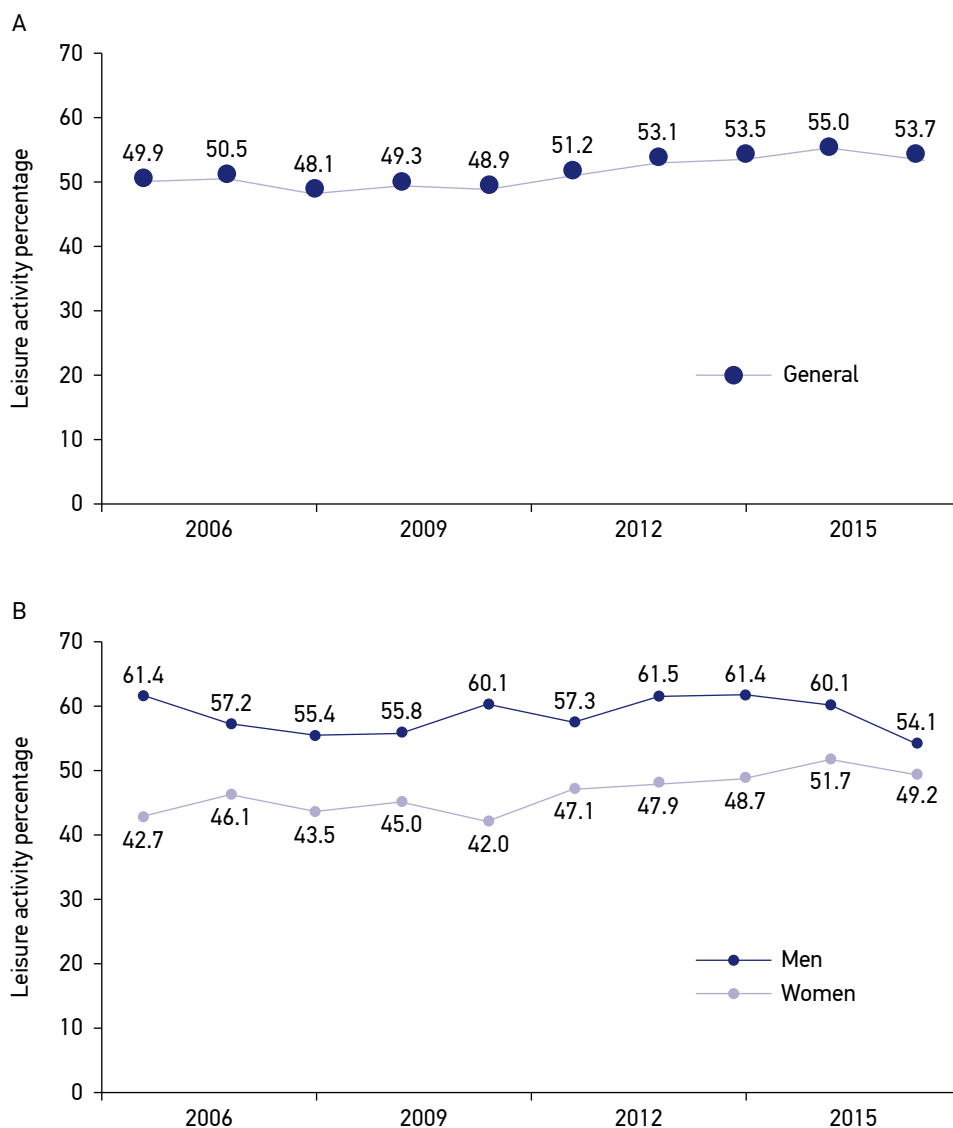


Figure 1. Relative distribution of leisure activity in the city of Curitiba. (A) Stationary trend for the general population; (B) Comparison between sexes, with a steady trend among men and growing among women, from 2006 to 2015.

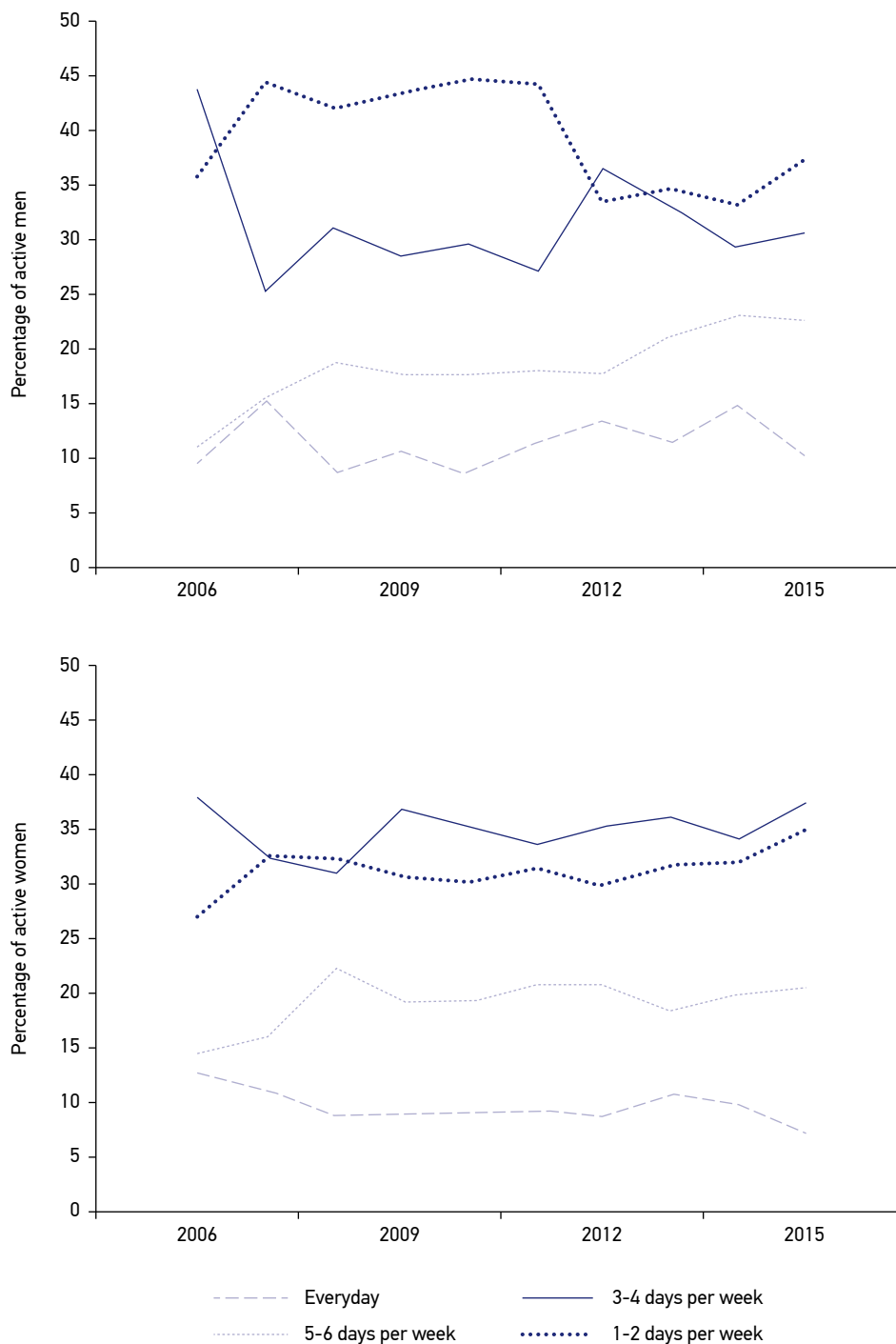


Figure 2. Percentage of weekly frequency of leisure-time physical activity in the city of Curitiba by the Surveillance System of Risk and Protection Factors for Chronic Diseases by Telephone Inquiry, stratified by sex, (A) male and (B) female, in the period 2006 to 2015.



campaigns aimed at the adoption of healthy lifestyle habits. However, the confirmation of aspects related to changes in lifestyle requires specific approaches.

Although the analyzes highlighted the trend of leisure-time PA growth among women, men still make up the majority of the active population in this city. This higher male prevalence is in agreement with previous studies<sup>18-21</sup>. Thus, even in view of the positive growth trend of women active during leisure-time, the results of the present study suggest disparities regarding the opportunities offered to them in relation to spending their leisure time on PA, and may even infer that women need greater encouragement and opportunities to spend their free time on AF, without affecting what is offered to men.

The results found in the literature for the association between PA level and age are in agreement with the results of this study, which revealed consensus with the occurrence of an inverse relationship of this phenomenon<sup>4,9,10,22</sup>. It is possible that chronic diseases, typical of aging, increase functional limitations, physical dependence and the need for care to perform daily activities, creating a vicious circle where diseases and disabilities reduce participation in PA and, in turn, have adverse effects on functional capacity, aggravating deficiencies and dependencies caused by chronic diseases<sup>23</sup>.

The current scenario of aging of the Brazilian population shows that women have a tendency for greater longevity when compared to men<sup>12</sup>. Thus, the annual growth rate of participation in leisure-time PA among women is in line with the guidelines of the World Health Organization, which recommends maintaining PA for the healthy transition from adult to elderly<sup>23</sup>.

There is strong evidence that older, more physically active people have lower all-cause mortality rates, better organ function, greater personal independence, better cognitive function, and benefits in the control, treatment, and prevention of chronic noncommunicable diseases<sup>22</sup>.

Thus, some national public policies were implemented to promote the health of the Brazilian population through the practice of PA. The Health Academy and Outdoor Academies programs are examples of health promotion and care production strategies that work with the implementation of public spaces equipped with infrastructure, equipment and qualified professionals to promote the practice of PA. However, as these actions are carried out in fixed locations, they often make it impossible for users to join due to their distance from their homes.

In this study, an increased tendency or activities performed with daily frequency and a decrease of activities performed once or twice a week in men was observed. This behavior is characteristic of the increased regularity of PA and positively reflects the increase in the weekly volume of activities and, consequently, the increase in health benefits<sup>22</sup>. However, it is necessary to highlight that in Curitiba's adult population as a whole, the percentage (38%) of PA participants with minimum weekly frequency (1-2 times / week) is still high.

A study conducted by Lima<sup>21</sup>, interested in the behavior of sociodemographic and personal factors that determine the level of PA of 52,779 adult Brazilians, showed that people with PA classified as "insufficient" had a low weekly frequency as a common characteristic.

In addition, according to the author<sup>21</sup>, the hypothetical increase of one session per week without changing the duration and type of activity was enough to raise the PA level from 90% of participants from “insufficient” to “sufficient”. Thus, efforts to increase the weekly frequency of leisure-time activities appear to be plausible to achieve global PA goals. However, a more important step than meeting the goals recommended by PA guidelines seems to be to motivate inactive people to become minimally active<sup>22-24</sup>. Compared to other studies, it was observed that the analysis of PA temporal trends in the city of Porto Alegre, from 2006 to 2012<sup>25</sup>, showed a 3.5% ( $p = 0.03$ ) growth among men and a reduction of -1.8% ( $p = 0.03$ ) among women in relation to leisure-time PA. In that study, activity during leisure-time was the condition given to people who reached or exceeded the PA goal of 5 days or more per week with 30 minutes or more per day.

More recently, time series analyses of PA in adults from southern Brazil from 2006 to 2013<sup>26</sup> showed an increase in leisure-time PA from 32.6% in 2009 to 38.3% in 2013 ( $p < 0.05$ ). In the same period, there was a reduction from 16.6 to 11.4% among women ( $p < 0.05$ ). The methodological description of that study did not make it possible to identify the analysis model employed, and active during leisure-time was the condition given to people who reached or exceeded 150 minutes per week of mild or moderate intensity PA or at least 75 minutes of vigorous intensity PA. According to Hallal et al.<sup>9</sup>, the temporal trend of leisure-time PA in the Brazilian capitals and the Federal District between 2006 and 2009 was stationary, ranging from 14.7 to 15.2% ( $p = 0.36$ ) for the period. Subsequently, they redid the analysis by extending the examination period (2006 to 2012) and detected an increase in the participation of leisure activity for the same population<sup>27</sup>. The differences found in the comparison between these studies and this one can be explained, in part, due to the methodological variations, thus the direct comparison between the studies should be treated with caution.

Internationally, data on time trends in PA in developing countries are scarce. Recently, a systematic review<sup>28</sup> proposing to verify the temporal trend of PA in sub-Saharan African countries did not find any representative or temporarily sequenced data for the region that would allow direct comparisons with this study.

On the other hand, another systematic review<sup>29</sup> of temporal PA trends found that over the past decade, adults from developed countries have tended to increase leisure-time PA levels. In this context, the female stratum living in the city of Curitiba is aligned with the international trends of more developed countries.

Another reason for this growth trend among women may be related to the development of policies and actions of the Ministry of Health<sup>6</sup> aimed at monitoring and reducing the prevalence of chronic noncommunicable diseases, whose incidence is accentuated in older people. Nevertheless, health-promoting PA recommendations are not the only reason people should be active. People should be encouraged to be active for any reason that is meaningful to them<sup>21</sup>.

Some methodological limitations are inherent in population PA analyzes. In particular, the measurement error is considerable when it is associated with the volume of self-reported PA,

since PA encompasses different modes of execution and the ability to meet recall demands is limited<sup>30</sup>. In order to minimize this occurrence, Vigitel established information quality control with inquiry management<sup>31</sup>. It can be confirmed that fixed telephone network coverage is not universal, which may influence the sample representativeness. The use of post-stratified weights seeks to minimize possible sociodemographic differences in the population of Curitiba. The timing of this historical series may not have allowed the detection of some time variations of uniformity or small magnitude.

The strong points of this study include temporal sequence information from a large sample of Curitiba's population and their participation in leisure-time PA, detailing temporal movements from 2006 to 2015 regarding the amount of people active in leisure-time and the characteristics of the activities practiced. This study provides relevant evidence, especially for health professionals and agents interested in planning and promoting leisure-time PA for the population of Curitiba, in order to reinforce actions designed to encourage people to be more active in their free time and reduce inequalities regarding access between the sexes and different age groups. Last but not least is the maintenance of monitoring services for population participation in leisure-time PA in the city of Curitiba, as a necessary service for health promotion and prevention of chronic diseases of Curitiba.

## CONCLUSION

The results of this study highlight a growing trend in the prevalence of leisure-time PA among women and a steady trend among men in the city of Curitiba from 2006 to 2015. Despite this positive outlook for leisure-time PA growth in women, there is still a need to broaden the incentive policies for leisure-time PA participation. Worryingly, approximately 50% of Curitiba's resident population still needs to be reached. The success of the indicators facing the problem can be monitored through the continuity and periodicity of Vigitel, allowing the implementation of actions based on the observed changes.

## REFERENCES

1. Bauman AE. Updating the evidence that physical activity is good for health: an epidemiological review 2000-2003. *J Sci Med Sport* 2004; 7(1 Supl.): 6-19.
2. Franklin BA. Physical activity to combat chronic diseases and escalating health care costs: the unfulfilled prescription. *Curr Sports Med Rep* 2008; 7(3): 122-5. <https://doi.org/10.1097/01.CSMR.0000319709.18052.e8>
3. Cerin E, Leslie E, Sugiyama T, Owen N. Perceived barriers to leisure-time physical activity in adults: an ecological perspective. *J Phys Act Health* 2010; 7(4): 451-9.
4. World Health Organization. World Health Statistics 2016: Monitoring health for the SDGs [Internet]. World Health Organization; 2015 [acessado em 23 jan. 2017]. Disponível em: [http://www.who.int/gho/publications/world\\_health\\_statistics/2016/en/](http://www.who.int/gho/publications/world_health_statistics/2016/en/)
5. Lee IM, Shiroma EJ, Lobero F, Puska P, Blair SNB, Katzmarzyk PT. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* 2012; 380(9838): 219-29. [https://doi.org/10.1016/S0140-6736\(12\)61031-9](https://doi.org/10.1016/S0140-6736(12)61031-9)

6. Malta DC, Silva Jr. JB. O Plano de Ações Estratégicas para o Enfrentamento das Doenças Crônicas não Transmissíveis no Brasil e a definição das metas globais para o enfrentamento dessas doenças até 2025: uma revisão. *Epidemiol Serv Saúde* 2013; 22(1): 151-64. <http://dx.doi.org/10.5123/S1679-49742013000100016>
7. Gebruers N, Vanroy C, Truijien S, Engelborghs S, De Deyn PP. Monitoring of Physical Activity After Stroke: A Systematic Review of Accelerometry-Based Measures. *Arch Phys Med Rehabil* 2010; 91(2): 288-97. <https://doi.org/10.1016/j.apmr.2009.10.025>
8. Bernal RTI, Iser BPM, Malta DC, Claro RM. Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico (Vigitel): mudança na metodologia de ponderação. *Epidemiol Serv Saúde* 2017; 26(4): 701-12. <http://dx.doi.org/10.5123/s1679-49742017000400003>
9. Hallal PC, Knuth AG, Reis RS, Rombaldil AJ, Malta CD, Iser BPM, et al. Tendências temporais de atividade física no Brasil (2006-2009). *Rev Bras Epidemiol* 2011; 14(Supl. 1): 53-60. <http://dx.doi.org/10.1590/S1415-790X2011000500006>
10. Rech C, Reis R, Hino A, De Sá G, Stopa S, Malta D. Tendências temporais de atividade física e comportamento sedentário nas capitais da Região Sul do Brasil: 2006-2013. *Rev Bras Ativ Fís Saúde* 2015; 20(1): 47-56. <https://doi.org/10.12820/rbafs.v.20n1p47>
11. Firkowski OLCF, Baliski P. Curitiba: os impactos da copa do mundo. Curitiba: Kairós; 2014.
12. Programa das Nações Unidas para o Desenvolvimento. Atlas de Desenvolvimento Humano no Brasil [Internet]. Programa das Nações Unidas para o Desenvolvimento [acessado 17 ago. 2016]. Disponível em: [http://www.atlasbrasil.org.br/2013/pt/o\\_atlas/o\\_atlas/](http://www.atlasbrasil.org.br/2013/pt/o_atlas/o_atlas/)
13. Instituto Brasileiro de Geografia e Estatística (IBGE). Censo demográfico 2010: características da população e dos domicílios - resultados do universo. Rio de Janeiro: IBGE; 2012.
14. Moura EC, Morais Neto OL, Malta DC, Moura L, Silva NN, Bernal R, et al. Vigilância de fatores de risco para doenças crônicas por inquérito telefônico nas capitais dos 26 estados brasileiros e no Distrito Federal (2006). *Rev Bras Epidemiol* 2008; 11(Supl. 1): 20-37. <http://dx.doi.org/10.1590/S1415-790X2008000500003>
15. Brasil. Ministério da Saúde. Banco de dados do Vigitel [Internet]. [acessado em jan. 2016]. Disponível em: <http://svs.aids.gov.br/download/Vigitel/>
16. Antunes JLF, Cardoso MRA. Uso da análise de séries temporais em estudos epidemiológicos. *Epidemiol Serv Saúde* 2015; 24(3): 565-76. <http://dx.doi.org/10.5123/S1679-49742015000300024>
17. Grande D, Siqueira JE, Cassou JC, Rauchbach R, Kruchelski S. Curitiba: política pública de atividade física e qualidade de vida de uma cidade: avaliação, prescrição, relato e orientação da atividade física em busca da promoção da saúde e de hábitos saudáveis na população de Curitiba. Curitiba: Ed. Venezuela; 2008.
18. Gómez LF, Duperly J, Lucumí DI, Gámez R, Venegas AS. Nivel de actividad física global en la población adulta de Bogotá (Colombia): prevalencia y factores asociados. *Gac Sanit* 2005; 19(3): 206-13.
19. Santos R, Santos MP, Ribeiro JC, Mota J. Physical activity and other lifestyle behaviors in a Portuguese sample of adults: results from the Azorean Physical Activity Study. *J Phys Act Health* 2009; 6(6): 750-9.
20. Pan SY, Cameron C, DesMeules M, Morrison H, Craig CL, Jiang XH. Individual, social, environmental, and physical environmental correlates with physical activity among Canadians: a cross-sectional study. *BMC Public Health* 2009; 9: 21-33. <https://dx.doi.org/10.1186/2F1471-2458-9-21>
21. Lima DF. Atividade física de adultos nas capitais brasileiras e no Distrito Federal: um estudo transversal [tese]. São Paulo: Faculdade de Medicina, Universidade de São Paulo; 2014.
22. Centers for Disease Control and Prevention. Physical Activity for Everyone – Recommendations. Atlanta: Centers for Disease Control and Prevention; 2008.
23. World Health Organization. Global recommendations on physical activity for health. Geneva: World Health Organization; 2010.
24. United States of America. Department of Health and Human Services. Physical Activity Guidelines for Americans. Washington, D.C.: Department of Health and Human Services; 2008.
25. Souza AAS, Silva SG, Mielke GI, Hallal PC. Tendências temporais de atividade física e comportamento sedentário em Porto Alegre, Brasil: 2006-2012. *Rev Bras Ativ Fís Saúde* 2014; 19(4): 514-22. <http://dx.doi.org/10.12820/rbafs.v.19n4p514>
26. Rech CR, Reis RS, Hino AAFH, Sá GBAR, Stopa SR, Malta DC. Tendências temporais de indicadores de atividade física e comportamento sedentário nas capitais da Região Sul do Brasil: 2006-2013. *Rev Bras Ativ Fís Saúde* 2015; 20(1): 47-56.
27. Mielke GI, Hallal PC, Malta DC, Lee IM. Time trends of physical activity and television viewing time in Brazil: 2006-2012. *Int J Behav Nutr Phys Act* 2014; 11: 101-9. <https://doi.org/10.1186/s12966-014-0101-4>

28. Muthuri SK, Wachira LJM, Leblanc AG, Francis CE, Sampson M, Onywera VO, et al. Temporal Trends and Correlates of Physical Activity, Sedentary Behaviour, and Physical Fitness among School-Aged Children in Sub-Saharan Africa: A Systematic Review. *J Environ Res Public Health* 2014; 11(3): 3327-59. <https://doi.org/10.3390/ijerph110303327>
29. Knuth AG, Hallal PC. Temporal trends in physical activity: a systematic review. *J Phys Act Health* 2009; 6(5): 548-59.
30. Dollman J, Norton K, Norton L. Evidence for secular trends in children's physical activity behavior. *J Sports Med* 2005; 39(12): 892-7. <https://doi.org/10.1136/bjism.2004.016675>
31. Monteiro CA, Florindo AA, Claro RM, Moura EC. Validade de indicadores de atividade física e sedentarismo obtido por inquérito telefônico. *Rev Saúde Pública* 2008; 42(4): 575-81. <http://dx.doi.org/10.1590/S0034-89102008000400001>

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