

Time spent by Brazilian students in different modes of transport going to school: changes over a decade (2001-2011)

Tempo gasto em diferentes meios de transporte escolar por estudantes brasileiros: mudanças após uma década (2001-2011)

Tiempo empleado en los diferentes medios de transporte para ir a la escuela en estudiantes brasileños: cambios después de una década (2001-2011)

Kelly Samara Silva ¹
 Adair da Silva Lopes ¹
 Rosane Carla Rosendo da Silva ¹
 Filipe Ferreira Costa ¹
 Maria Alice Altenburg de Assis ¹
 Markus Vinicius Nahas ¹

Abstract

To examine changes in the time spent in each mode of transportation used for going to school by gender and age among adolescents from Santa Catarina State, Brazil. Two school-based surveys were performed in 2001 (N = 5,028) and 2011 (N = 6,529) in high school students (15-19 years old). The mode of transportation (on foot; by bicycle; by bus; car/motorcycle) and the time spent for commuting to school were assessed. Active commuting increased for short trips in both genders (male: 25.1% to 36.7%; female: 18.8% to 29.2%) and in all ages (15-16 years: 21% to 32.7%; 17-19 years: 21.9% to 32.4%), and declined for longer trips in males (30.5% to 21.9%) and in 15-16 years old students (25.7% to 34.7%). Car/motorcycle use has doubled for short trips in males (38.1% to 65.9%) and in 17-19 years old students (37.7% to 62.7%), while the use of buses remained stable in both genders. Our findings contribute to discussions on public policy focusing on the design of safe environments to promote active commuting to schools, particularly to decrease the use of motorized transport for short trips.

Pendular Migration; Motor Activity; Students

Resumo

Identificar mudanças no tempo gasto em cada modo de transporte para ir à escola por sexo e idade, em adolescentes de Santa Catarina, Brasil. Dois levantamentos de base escolar foram realizados, em 2001 (N = 5.028) e 2011 (N = 6.529), com estudantes de 15-19 anos de idade. O modo de transporte (a pé, de bicicleta, de ônibus, carro/moto) e o tempo gasto para ir à escola foram analisados. O deslocamento ativo aumentou para viagens curtas em rapazes (25,1% para 36,7%) e moças (18,8% para 29,2%) e em todas as idades (15-16 anos: 21% para 32,7%; 17-19 anos: 21,9% para 32,4%); e diminuiu para viagens longas nos rapazes (30,5% para 21,9%) e adolescentes de 15-16 anos (25,7% para 34,7%). O uso de carro/moto dobrou para viagens curtas em rapazes (38,1% para 65,9%) e em estudantes de 17-19 anos (37,7% para 62,7%). Nossos resultados contribuem em discussões com foco em políticas públicas sobre ambiente seguro para promover deslocamento ativo à escola, especialmente para diminuir o uso de transporte motorizado em curtas distâncias.

Migração Pendular; Atividade Motora; Estudantes

¹ Programa de Pós-graduação em Educação Física, Universidade Federal de Santa Catarina, Florianópolis, Brasil.

Correspondence

K. S. Silva
 Programa de Pós-graduação em Educação Física, Universidade Federal de Santa Catarina, Campus Universitário Trindade, Florianópolis, SC 88040-900, Brasil.
 kelly.samara@ufsc.br

Introduction

Active commuting to school is an alternative way to promote an active and healthy lifestyle among children and adolescents ¹; however it has decreased over time ². Among the factors that have affected the journey to school in the last seven decades, researchers have highlighted the change in the availability of transportation technologies and an expectation to travel greater distances in a shorter time ³.

Identification of changes in the proportion of time spent in each type of transportation for commuting to school is important for clarifying some issues like the contribution of time spent in commuting to school for physical activity level proposed in the guidelines ⁴ or evaluated in intervention ⁵. Nevertheless, there are limited data examining changes in time spent in different types of transportation used for going to school. The rationale of this study is to answer some questions, such as how many students used walking/bike or car/motorcycle or bus to school for short, middle and long distance trips? Overall, it is expected that people choose motorized transport for long trips, and active commuting as a strategy for short trips. This study analyses changes in the time spent in each mode of transportation to school in two surveys conducted with high school students living in Santa Catarina, Brazil. We also evaluated whether the trend between 2001 and 2011 differed according to gender and age.

Methods

This study is part of a school-based panel survey entitled *Comportamento do Adolescente Catarinense* (COMPAC Project). Data were collected in 2001 (N = 5,028) and 2011 (N = 6,529) and included 15 to 19 years old students from public schools. Detailed sampling procedures have been published elsewhere ⁶.

The data collection was conducted in the classroom, and the students completed the questionnaire in a guided session by the researchers. We assessed the mode of transportation students typically used to go to school (on foot/by bicycle; by bus; car/motorcycle) and the time spent in commuting (< 10min/day: short trips; 10-19min/day: medium trips; ≥ 20min/day: long trips).

Comparisons across surveys and variables studied (sex and age) were based on the prevalence and its 95% confidence interval (95%CI), according to procedures for studies with complex sample in Stata version 11 (Stata Corp., College Station, USA).

Results

In 2001, 5,028 students participated in the survey. Of these, 4,801 responded to the questions on type and time spent in commuting to school (response rate = 95.5%). In 2011, 6,379 adolescents provided valid data (response rate = 97.7%). In 2001 and 2011, there was a greater proportion of females (59.7%; 55.7%) and of students aged 15-16 years (51.1%; 58.7%), respectively. In general, there was a significant increase in commuting by car/motorcycle over ten years (from 6.4% in 2001 to 12.6% in 2011). Active transport (from 56.3% to 51.3%) and the use of the bus (from 37.3% to 36.1%) remained stable over a decade.

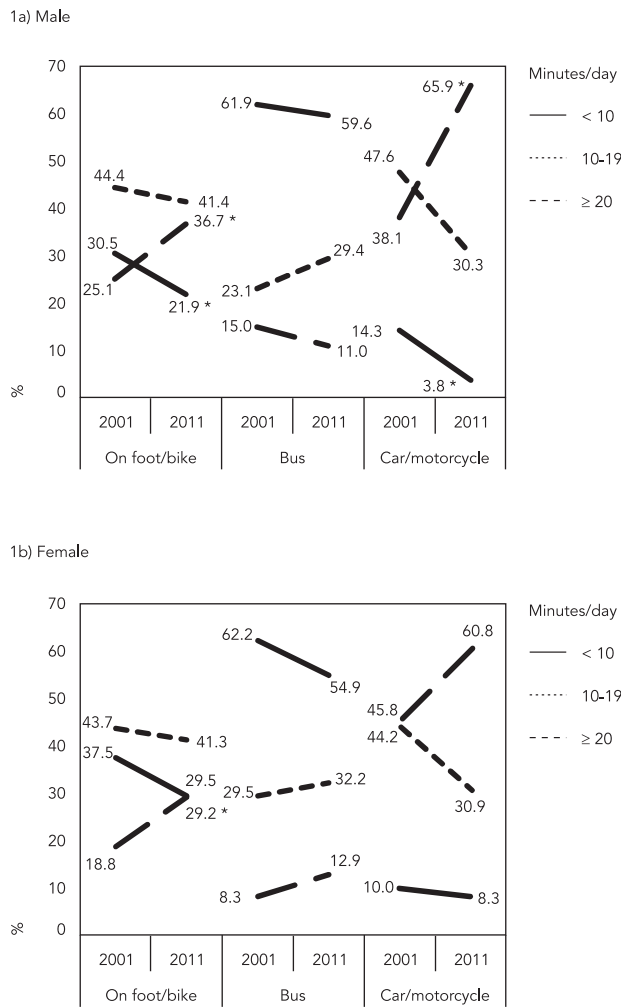
In both surveys, almost 45% of the students actively commuted to school for medium length trips. The proportion of males who used active transport for long trips decreased (from 30.5%, 95%CI: 26.4-34.5 in 2001 to 21.9%, 95%CI: 17.8-26.1 in 2011), while the proportion of subjects who used walking/bike for short trips increased (males: from 25.1%, 95%CI: 20.0-30.2 to 36.7%, 95%CI: 30.5-42.8; females: from 18.8%, 95%CI: 15.7-21.8 to 29.2%, 95%CI: 23.9-34.5). There was no difference in commuting by bus to school over a decade. In addition, a reduction in the proportion of males who commuted by car/motorcycle in longer trips (2001: 14.3%; 95%CI: 6.7-21.8; 2011: 3.8%, 95%CI: 1.9-5.7) was observed and an increase for short trips (2001: 38.1%, 95%CI: 27.3-48.9; 2011: 65.9%, 95%CI: 58.6-73.2). For this outcome, no significant differences were found among females (Figures 1a and 1b).

The prevalence of adolescents, aged 15-16 years, who actively commuted to school increased from 21% (95%CI: 16.8-25.1) in 2001 to 32.7% (95%CI: 26.9-38.4) in 2011 for short trips and decreased from 34.7% (95%CI: 30.1-39.5) in 2001 to 25.7% (95%CI: 20.8-30.6) in 2011 for longer trips (Figure 2a). There was an increase in the proportion of 17-19 years old adolescents who used to walk/bike to school for short trips (21.9%, 95%CI: 17.9-25.9 in 2001 to 32.4%, 95%CI: 27.2-37.6 in 2011), as well as in using car/motorcycle to school over short trips (Figure 2b).

We found an increase in active commuting for short distances (from 20.5%, 95%CI: 15.8-25.3 to 33.6%, 95%CI: 27.7-39.5) and a reduction in long distances (from 40.7%, 95%CI: 36.0-45.4 to 28.1%, 95%CI: 22.2-33.9) among adolescents whose families had low incomes (1st tertile). Those who were middle-income showed an increase in car/motorcycle use for short distances (from 29.4%, 95%CI: 19.5-39.3 to 63.9%, 95%CI: 57.0-70.8) and a decline in medium distances (from 54.8%, 95%CI: 44.0-65.6 to 30.6%, 95%CI: 24.3-36.9), while those in the upper income ter-

Figure 1

Changes in the proportion of time spent in each mode of transportation used for going to school, by gender. Santa Catarina State, Brazil, 2001 and 2011.



* Significant difference based on 95% confidence interval.

tile, increased active commuting from 25.3% (95%CI: 20.5-30.1) to 37.9% (95%CI: 30.9-44.8) for short distances (data not shown in figures).

Discussion

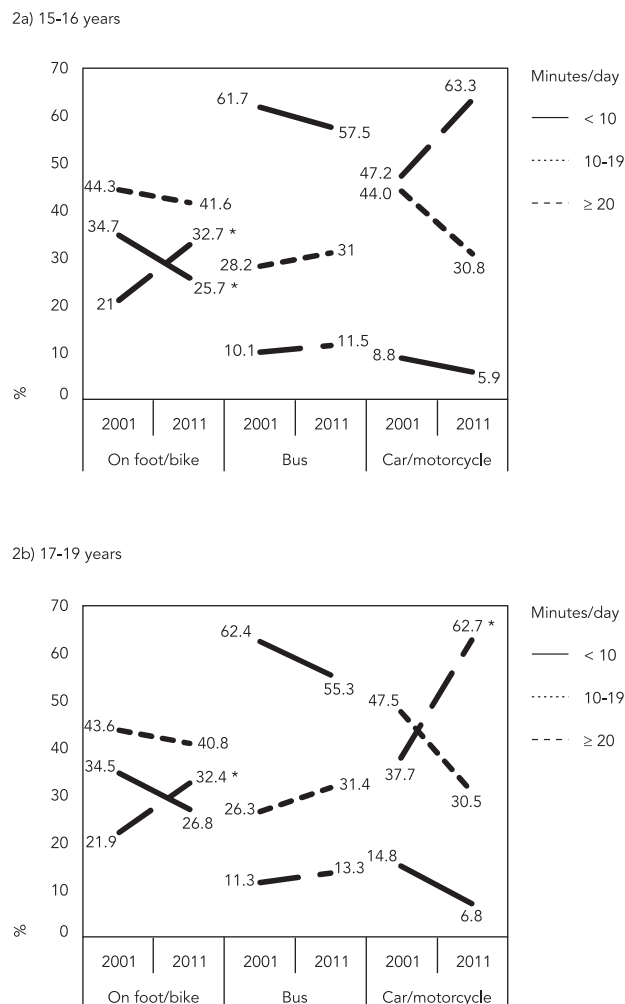
Our findings indicated changes in short versus long trips by foot/bike over a ten-year period. These changes occurred for both genders and among students aged 15-16 years. Active commuting for at least 10 minutes has been commonly recommended as a strategy by govern-

ment agencies to promote physical activity and to achieve health benefits ⁷. However, after a decade, we observed a decrease in the proportion of adolescents in this commuting group, which, in turn, substantially reduces the contribution of this domain to the total physical activity level.

Several correlates of active commuting to school are described in the literature, including personal and socio-demographic factors ⁸, and physical environment ⁹. Many factors were investigated, including traffic and neighborhood aesthetics; however, the distance from home to school remained the main determinant of active

Figure 2

Changes in the proportion of time spent in each mode of transportation used for going to school by age. Santa Catarina State, Brazil, 2001 and 2011.



* Significant difference based on 95% confidence interval.

commuting ¹⁰. In a previous study of Brazilian adolescents, the distance, crime/safety concerns and traffic were associated with passive commuting ¹¹. These factors may partially explain the rise in the use of motorized transport for short trips found in our study.

Our findings may be a result of recent socio-economic improvements in Brazil. Between 2001 and 2011, there was an increase of 78% in the number of cars and buses in Brazil. In the same period, the number of cars and buses almost doubled (95.3%) in Santa Catarina (Departamento Nacional de Trânsito. *Frota de Veículos*. [http://](http://www.denatran.gov.br/frota.htm)

www.denatran.gov.br/frota.htm, accessed on 01/ Jun/2012). Census data indicated an increase in the proportion of households with cars in Santa Catarina from 50.3% in 2000 to 64% in 2010 ¹². Regarding the number of buses, we are unsure if the increase aimed to serve more people along the same routes or if new ones were made available as an extension of services to accommodate more users in the public transport system.

Our study showed that for all types of transportation, the proportion of youth who travelled for more than 20 minutes decreased over time. An explanation for this result is the growth of

17.5% in the number of high schools over this decade, from 598 in 2001 to 725 in 2011. This probably resulted in closer distances between home and school, thus decreasing the proportion of long trips over time. In this study, no evidence for decreased time for travel to school by bus was observed for long trips, mainly because the majority of students who use this mode of transportation lived in rural areas.

In summary, our findings indicated a stable pattern of commuting by bus in the two surveys. However, there was a rise in the proportion of males who actively traveled or commuted by car/

motorcycle to school for short trips and a decrease for longer trips over a ten-year period. These findings could reflect the decrease of overall physical activity levels of young people. A systematic review on the association between active travel to school and physical activity levels in youth found that active commuters tend to be more physically active than passive commuters¹³.

The findings of the present study contribute to the discussion in public policy on the design of safe environments to promote active commuting to schools, especially to decrease the use of motorized transport for short trips.

Resumen

El trabajo examina los cambios en el tiempo empleado para ir a la escuela en cada tipo de transporte, según el género y la edad de adolescentes pertenecientes al estado de Santa Catarina, Brasil. Se realizaron dos estudios epidemiológicos en 2001 (N = 5.028) y 2011 (N = 6.529) en estudiantes de instituto (15-19 años). Se midió el modo de transporte (a pie; en bicicleta; en autobús; en coche/moto) y el tiempo empleado en ir a la escuela. El transporte activo aumentó en las distancias cortas en ambos géneros (hombre: de 25,1% a 36,7%; mujer: de 18,8% a 29,2%) y en todas las edades (15-16 años: de 21% a 32,7%; 17-19 años: de 21,9% a 32,4%) y descendió en las distancias más largas en hombres (de 30,5% a 21,9%) y en estudiantes de 15-16 años (de 25,7% a 34,7%). El uso de coche/moto se duplicó en las distancias cortas en hombres (de 38,1% a 65,9%) y en estudiantes de 17-19 años (de 37,7% a 62,7%), mientras que el uso de autobús permaneció estable en ambos géneros. Nuestros resultados contribuyen a los debates de políticas públicas para disminuir el uso de transporte motorizado en viajes cortos.

Migración Pendular; Actividad Motora; Estudiantes

Contributors

K. S. Silva, R. C. R. Silva, F. F. Costa and M. A. A. Assis participated in all phases of the preparation of the manuscript. A. S. Lopes and M. V. Nahas critically revised this study with important contributions and gave their final approved of the version to be published.

Acknowledgments

We would like to pass on our thanks to the Department of Physical Education of the Federal University of Santa Catarina for approval of the COMPAC Project to be done in both years, the chairpersons of the Regional Education Boards, the directors of the selected schools, the teachers who kindly gave up their class time, and all the students who participated in this study. We thank all members of the Research Center on Physical Activity and Health who participated in the data collection.

References

1. World Health Organization. Transport, environment, and health. Vienna: WHO Regional Publications; 2000. (European Series, 89).
2. Costa FC, Silva KS, Schomoelz CB, Campos VC, Assis MAA. Longitudinal and cross-sectional changes in active commuting to school among Brazilian schoolchildren. *Prev Med* 2012; 55:212-4.
3. Pooley CG, Turnbull J, Adams M. The journey to school in Britain since the 1940s: continuity and change. *Area* 2005; 37:43-53.
4. World Health Organization. Global recommendation on physical activity for health. Geneva: World Health Organization; 2010.
5. Chillon PP, Evenson KR, Vaughn A, Ward DS. A systematic review of interventions for promoting active transportation to school. *Int J Behav Nutr Phys Act* 2011; 8:1-17.
6. Silva KS, Lopes AS, Hoefelmann LP, Cabral LGA, De Bem MFL, Barros MVG, et al. Projeto COMPAC (comportamentos dos adolescentes catarinenses): aspectos metodológicos, operacionais e éticos. *Rev Bras Cineantropom Desempenho Hum* 2013; 15:1-15.
7. International Physical Activity Questionnaire: guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ) – short and long forms. <http://www.ipaq.ki.se/scoring.pdf> (accessed on 11/Feb/2013).
8. Reimers AK, Jekauc D, Peterhans E, Wagner MO, Woll A. Prevalence and socio-demographic correlates of active commuting to school in a nationwide representative sample of German adolescents. *Prev Med* 2013; 56:64-9.
9. Trapp G, Giles-Corti B, Christian H, Bulsara M, Timperio A, McCormack G, et al. On your bike! A cross-sectional study of the individual, social and environmental correlates of cycling to school. *Int J Behav Nutr Phys Act* 2011; 8:123.
10. Wong BY, Faulkner G, Buliung R. GIS measured environmental correlates of active school transport: a systematic review of 14 studies. *Int J Behav Nutr Phys Act* 2011; 8:39.
11. Silva KS, Vasques DG, Martins CD, Williams LA, Lopes AS. Active commuting: prevalence, barriers, and associated variables. *J Phys Act Health* 2011; 8:750-7.
12. Instituto Brasileiro de Geografia e Estatística. Censo demográfico 2000 e 2010: características das famílias e dos domicílios: resultados da amostra. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística; 2012.
13. Lee MC, Orenstein MR, Richardson MJ. Systematic review of active commuting to school and children's physical activity and weight. *J Phys Act Health* 2008; 5:930-49.

Submitted on 12/Sep/2013

Final version resubmitted on 30/Dec/2013

Approved on 18/Aug/2014