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Original Article

Physical Activity Levels and Their Determinants Among Adolescents in Public and Private High Schools in Urban and Rural Rawalpindi, Pakistan

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ABSTRACT

Objective: To determine the physical activity levels and their determinants among adolescents in public and private high schools in rural and urban Rawalpindi, Pakistan.

Study Design: Analytical cross-sectional study.

Place and Duration of Study: Mehran Degree College Boys Campus Kalar Syedan, Mehran Degree College Girls Campus Kalar Rawat, Girls Higher Secondary School and College Sagri, Boys Higher Secondary School and College Sagri, Dr. AQ Khan College for Boys Main Harley Street Rawalpindi, Dr. AQ Khan College for Girls Main Harley Street Rawalpindi, Government Post Graduate College Satellite Town Rawalpindi, and Government High School Loco Shed Rawalpindi, Pakistan, from Jan to May 2020.

Methodology: A total of 324 adolescent boys and girls were selected through multistage random sampling. Data on physical activity levels were collected using the validated International Physical Activity Questionnaire - Long Form (IPAQ-L). We used descriptive statistics to summarize socio-demographic characteristics. Chi-square tests were applied to assess associations between physical activity levels and independent variables. Logistic regression analysis was conducted to identify significant predictors of physical activity. Data were analyzed using SPSS version 24.

Results: Among 324 adolescents, most were aged 15–17 years (69.4%), underweight (49.4%), lived at home (97.2%), and attended public (52.5%) or rural (51.9%) colleges. Although 91.7% reported enjoying physical activity, only 10.2% had sports club memberships. Screen-based activities were the most common leisure preference. Low physical activity was more prevalent among females (69.4%) than males (62.2%), rural students (54.9%) than urban students (45.1%), and public college students (51.2%) than private (48.8%). Significant associations were found between physical activity levels and basal metabolic index ($\chi^2 = 12.47$, $p = 0.001$), parental physical activity ($\chi^2 = 4.87$, $p = 0.03$), sports facility membership ($\chi^2 = 15.57$, $p = 0.001$), park proximity ($\chi^2 = 11.87$, $p = 0.001$), and leisure-time activity preference ($\chi^2 = 16.88$, $p = 0.001$). Watching TV was the strongest predictor of low activity, while outdoor games were associated with higher activity levels.

Conclusion: Adolescents in public and private colleges of rural and urban Rawalpindi exhibited low physical activity levels.

Keywords: Adolescents, Pakistan, Physical Activity, Sedentary Behavior

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INTRODUCTION

Physical activity (PA) is an essential aspect of health promotion and disease prevention.[1] Meeting recommended physical activity levels reduces the risk of arthritis, cardiovascular diseases, atherosclerosis, diabetes, osteoporosis, and certain cancers.[2] Globally, insufficient physical activity accounts for 0.83 million deaths annually, making it the fourth leading risk factor for mortality.[3] As per the study on global trends in insufficient physical activity among adolescents, 81% of school-going children aged 11–17 and 28% of adults aged 18 and above failed to meet recommended activity levels.[4] Adolescence is the optimal time to instill physical activity habits, as behaviors formed during this period are more likely to persist into adulthood. Furthermore, many chronic disease risk factors, such as obesity and sedentary behavior, originate in adolescence, underscoring the importance of early intervention for effective primordial prevention. Alarmingly, global physical activity levels among adolescents are insufficient.[5] Only 16% of adolescents engage in one hour of physical activity four times a week in Pakistan, and that is far below international recommendations.[6]

Schools and colleges play a pivotal role in promoting physical activity.[7] In Pakistan, where 29% of the population is aged 15–29, promoting physical activity among adolescents is critical to addressing the growing burden of non-communicable diseases (NCDs).[8] In the context of Pakistan, with its significant youth population, there is a unique opportunity to

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foster physical activity habits and reduce the future burden of chronic diseases.[9] Addressing insufficient physical activity aligns with international commitments to ensure the highest attainable standards of health for children and adolescents.[10]

This study aims to assess the PA levels of adolescents in private and public colleges across rural and urban Rawalpindi. By exploring socio-demographic determinants, the study seeks to inform targeted interventions that promote physical activity and contribute to a healthier future for Pakistan's youth.

METHODOLOGY

An analytic, cross-sectional study was conducted in the public and private colleges of rural and urban Rawalpindi, Pakistan, from Jan to May 2020.

The sample size was calculated using the Open Epi Software. A physical activity prevalence of 27.4% was used, and a 5% margin of error at a 95% confidence interval was assumed to reach a final sample size of approximately 308 ± 5%.[11] A total of 371 students from the study setting were offered to participate. With a response rate of 87.3%, 324 students participated in this study.

A list of public and private colleges in rural and urban Rawalpindi was obtained from the Punjab Education Department. A simple random sampling technique was used to select the colleges. The sampled colleges included Mehran Degree College Boys Campus Kalar Syedan, Mehran Degree College Girls Campus Kalar Rawat, Girls Higher Secondary School and College Sagri, Boys Higher Secondary School and College Sagri, Dr AQ Khan College for Boys, Main Harley Street, Rawalpindi, Dr AQ Khan College for Girls, Main Harley Street, Rawalpindi, Government Post Graduate College, Satellite Town, Rawalpindi, Government High School Loco Shed, Rawalpindi, Pakistan. Adolescent boys and girls were then selected from these colleges by random sampling after getting formal ethical approval from the Institutional Ethical Review Board of Al-Shifa School of Public Health, Pakistan Institute of Ophthalmology, Al-Shifa Trust, Rawalpindi.

The participants received study details and were assured of data confidentiality for research purposes only. Informed consent was obtained from parents of participants under 18, whereas those 18+ gave their own consent.

Inclusion Criteria: The study included male and female students aged 15-19 from selected public and private colleges in rural and urban Rawalpindi.

Exclusion Criteria: The study excluded students who declined participation, were absent on the day of data collection, had traveled in the past week, or were currently taking any medications.

Table-I: Socio-Demographic Profile of Respondents (n = 324)

Variable	Category	n (%)
Age	15–17 years	225(69.4)
	18–20 years	99(30.6)
Gender	Female	164(50.6)
	Male	160(49.4)
Basal Metabolic Index	Underweight	160(49.4)
	Normal weight	137(42.3)
	Overweight	27(8.3)
Residence	Home	315(97.2)
	Hostel	9(2.8)
Park near residence	Yes	71(21.9)
	No	253(78.1)
College category	Public	170(52.5)
	Private	154(47.5)
College site	Rural	168(51.9)
	Urban	156(48.1)
Enjoy physical activity	Yes	297(91.7)
	No	27(8.3)
Membership of sports club	Yes	33(10.2)
	No	291(89.8)
Free time activity preference	Laptop/Mobile	115(35.5)
	TV	61(18.8)
	Video Games	25(7.7)
	Reading	66(20.4)
	Outdoor Games	57(17.6)
Smoking status	Smoker	24(7.4)
	Non-smoker	300(92.6)
Tuition	Yes	105(32.4)
	No	219(67.6)
Father's education	Under Matric	85(26.2)
	Matric	141(43.5)
	Intermediate	59(18.2)
	Graduate	32(9.9)
	Postgraduate	7(2.2)
Mother's education	Under Matric	141(43.5)
	Matric	114(35.2)
	Intermediate	46(14.2)
	Graduate	18(5.6)
	Postgraduate	5(1.5)
Father's work status	Private Job	133(41.0)
	Government Job	89(27.5)
	Businessman	87(26.9)
	Unemployed	15(4.7)
Mother's work status	Private Job	14(4.3)
	Government Job	6(1.9)
	Businesswoman	5(1.5)
	Housewife	299(92.3)
Total family income (PKR)	Less than 50,000	238(73.5)
	50,000–100,000	69(21.3)
	More than 100,000	17(5.2)
Parents physically active	Yes	96(29.6)
	No	228(70.4)

A structured questionnaire, comprising a socio-demographic section and the 24-item IPAQ-L, was used to collect data from college students. Socio-demographic data collected from participants included age, gender, basal metabolic index, parents' educational and occupational backgrounds, total family income, family car ownership, residence type,

parental physical activity levels, sports club membership, preferred leisure activities, access to a nearby park, perception of physical activity, tuition status, and smoking habits.

IPAQ-L has demonstrated acceptable validity and reliability in population-based studies.[12] The reliability in this study was supported by a Cronbach's alpha of 0.7. Validity was assessed through pilot testing. Necessary adjustments to the questionnaire included clearer wording and culturally relevant physical activity examples.

After carrying out a pilot study from a relatively small sample of the same population, which was 10% (n=33) of the total sample size, and adjusting for the changes required in the data collection procedure (sports options that are not played in Pakistan were replaced with nationally played sports), data collection was carried out. The data collection instrument was translated into Urdu. The entire questionnaire was read and explained in front of all participants before they filled the questionnaires. Once all questionnaires were filled by the participants, the data were then safely secured for further analysis and interpretation.

After testing the questionnaire with a small pilot group of 10% of the total sample (n=33), we updated the sports options to include only those popular in Pakistan. The questionnaire was translated into Urdu, and before participants filled it out, we explained each section clearly to everyone. Once completed, all responses were collected and stored securely for analysis.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 23.00. Frequencies and percentages were calculated for each categorical variable, including age, gender, BMI category, residence type, college type and location, physical activity preferences, parental education and employment status, family income, and smoking habits. This approach provided a clear overview of the distribution of respondents across various demographic and lifestyle factors, enabling a foundational understanding of the sample's composition before any inferential or analytical procedures were applied. To examine associations between physical activity levels and categorical independent variables, the chi-square (χ^2) test of independence was used. Moreover, univariate and multivariate logistic regression analyses were used to identify significant predictors of physical activity, with results expressed as odds ratios (OR) and 95% confidence intervals (CI). A *p*-value of less than or equal to 0.05 was considered statistically significant throughout the analysis.

RESULTS

Among 324 adolescents, most were aged 15–17 years (69.4%). Table-I shows the detailed socio-demographic profile of the study. Nearly half are underweight (49.4%), and most live at home (97.2%) without access to nearby parks (78.1%). Public and private college attendance is fairly balanced, with a slight rural majority (51.9%). A large majority enjoy physical activity (91.7%), though only 10.2% are sports club members. Free time is mostly spent on digital devices (35.5%), with outdoor games being less preferred (17.6%). Smoking is rare (7.4%), and most do not attend tuition (67.6%). Parents' education levels are generally low, especially among mothers, with 43.5% under matric. Fathers are mostly employed in private jobs (41%), while mothers are predominantly housewives (92.3%). Family income is generally low, with 73.5% earning less than PKR 50,000 monthly. Lastly, only 29.6% of parents are physically active, indicating limited modeling of active lifestyles at home.

Table-II illustrates the percentage of adolescents reporting low physical activity across gender, college type, and area of residence. Female adolescents reported a higher prevalence of low physical activity (69.4%) compared to males (62.2%), indicating a gender disparity in physical activity levels. Public college students showed slightly higher levels (51.2%) than private college students (48.8%), suggesting minimal influence of college type. Adolescents from rural areas reported a higher percentage (54.9%) of low physical activity than those from urban areas (45.1%), possibly due to limited access to structured recreational facilities in rural settings.

Table-II: Frequency of Low Physical Activity Among Respondents (n=324)

Category	Frequency (%)
Gender Male Female	 102(62.2%) 111(69.4%)
College Public Private	 109(51.2%) 104(48.8%)
Area Rural Urban	 117(54.9%) 96(45.1%)

Table-III analysis revealed significant associations between physical activity levels and several independent variables. Significant associations were found between physical activity levels and basal metabolic index (χ^2 = 12.47, p = 0.001), parental physical activity (χ^2 = 4.87, p = 0.03), sports facility membership (χ^2 = 15.57, p = 0.001), park proximity (χ^2 = 11.87, p = 0.001), and leisure-time activity preference (χ^2 = 16.88, p = 0.001). Watching TV was the strongest predictor of low activity, while outdoor games were associated with higher activity levels. Adolescents with normal BMI were more likely to report high physical activity compared to those who were underweight or overweight. Parental physical activity was positively associated with adolescent activity levels, as those with active parents reported higher physical activity. Membership in sports clubs, gyms, or swimming pools, as well as the presence of a park near the residence, were also significantly linked to higher physical activity. Regarding leisure-time preferences, adolescents who preferred outdoor games were more active, while those who spent their free time watching TV were significantly more likely to report low physical activity. These findings emphasize the influence of environmental, familial, and behavioral factors on adolescent physical activity patterns.

Table-III: Association Between Physical Activity Levels and Independent Variables Among Adolescents (n = 324)

Variables	High % (n)	Low % (n)	*p*-value
Basal Metabolic Index			
Underweight	12.3 (40)	37.0 (120)	0.001
Normal Weight	17.9 (58)	24.4 (79)	
Overweight	4.0 (13)	4.3 (14)	
Parents Physically Active			
Yes	32.0 (42)	16.7 (54)	0.03
No	21.3 (69)	49.1 (159)	
Membership of Sports Club, Gym, or Swimming Pool			
Yes	6.8 (22)	3.4 (11)	0.001
No	27.5 (89)	63.3 (202)	
Park Near Residence			
Yes	11.4 (37)	10.5 (34)	0.001
No	22.8 (74)	55.2 (179)	
Free Time Activity Preference			
Laptop and Mobile	3.1 (10)	23.1 (75)	0.001
TV	12.3 (40)	15.7 (51)	
Video Games	3.4 (11)	4.3 (14)	
Reading	6.5 (21)	13.9 (45)	
Outdoor Games	9.0 (29)	8.6 (28)	

Table IV shows several factors significantly associated with low physical activity levels among adolescents. Having a park near the residence was associated with nearly twice the odds of higher physical activity (Adjusted OR = 1.95, 95% CI: 1.06–3.56, p = 0.03). Membership in a sports club, gym, or swimming pool showed a strong positive association (Adjusted OR = 3.45, 95% CI: 1.47–8.08, p < 0.001), indicating that adolescents with access to such facilities were over three times more likely to be physically active. Watching TV during free time was the strongest predictor of low physical activity (Adjusted OR = 5.17, 95% CI: 2.09–12.79, p < 0.001), suggesting a significant sedentary influence. Underweight adolescents were nearly twice as likely to report low physical activity (Adjusted OR = 1.96, 95% CI: 1.15–3.34, p = 0.01). Other variables, including parental physical activity, reading, video games, laptop/mobile use, and BMI, did not show statistically significant associations in the adjusted model.

Table-IV: Factors Affecting Physical Activity Levels (n = 324)

Parameters	Univariate			Multivariate		
	p-value	Unadjusted OR	95% CI	*p*-value	Adjusted OR	95% CI
Park near residence	0.03	1.95	1.06 – 3.56	0.03	1.95	1.06 – 3.56
Physically active parents	0.11	1.57	0.91 – 2.70	0.11	1.57	0.91 – 2.70
Membership of sports club	0.00	3.45	1.47 – 8.08	0.00	3.45	1.47 – 8.08
Free time activity: Reading	0.13	1.84	0.84 – 4.04	0.13	1.84	0.84 – 4.04
Free time activity: Video Games	0.95	1.03	0.38 – 2.83	0.95	1.03	0.38 – 2.83
Free time activity: TV	0.00	5.17	2.09 – 12.79	0.00	5.17	2.09 – 12.79
Free time activity: Laptop/Mobile	0.12	1.74	0.87 – 3.47	0.12	1.74	0.87 – 3.47
BMI: Underweight	0.01	1.96	1.15 – 3.34	0.01	1.96	1.15 – 3.34
BMI: Overweight	0.14	0.45	0.15 – 1.31	0.14	0.45	0.15 – 1.31
BMI: Obese	0.41	1.90	0.41 – 8.72	0.41	1.90	0.41 – 8.72

DISCUSSION

A significant 65.7% of participants in this study demonstrated low physical activity. Our study found that 62.2% of boys and 69.4% of girls had low physical activity. The observed difference in physical activity between male and female participants is aligned with global literature. Insufficient physical activity is even more prevalent among adolescents, with a pooled analysis by Zhang *et al.*, showing rates of 78% for boys and 84% for girls.[13]

Menschik *et al.*, examined physical inactivity risk factors and found that males were more active than females, with females demonstrating double the inactivity rate of males. This pattern is consistent with findings from studies in Canada, Hong Kong and Copenhagen.14 Despite 95.1% of participants acknowledging the health benefits of physical activity, only 65.7% actually met recommended activity levels. This discrepancy is also reflected in a study by the Centers for Disease Control and Prevention indicating that participants often lack sufficient opportunities, motivation, and external support for physical activity, both during and after school.[15] Regression analysis identified several factors linked to physical activity in our study, including Body Mass Index (BMI), sports

club membership, preferred free-time activities, and proximity to parks. Results showed that 37% of participants were both underweight and exhibited low physical activity. Given that adequate nutrition, healthy weight, and physical capacity are all important for activity levels, low BMI may be a key contributor to insufficient physical activity within this population.[15]

Our study revealed a positive correlation between sports club membership, proximity to parks, and higher physical activity levels. This aligns with previous research demonstrating that access to recreational centers and nearby green spaces promotes increased physical activity.[16] A large portion of our participants reported spending significant time engaging in sedentary behaviors, which was also reported in a study conducted by Kokkinos *et al.*[17] Specifically, watching TV was the strongest predictor of low physical activity in our study, reinforcing findings of Serrano *et al.,* that adolescents often favor inactive pastimes like TV and computer use.18 Furthermore, participants with physically active parents were more likely to be physically active themselves. This correlation was highlighted by Hartman *et al.,* who emphasized the importance of parental role modeling in shaping children's activity habits.[19]

Addressing physical inactivity requires action on multiple fronts. Colleges can play a vital role by implementing physical activity programs, including physical education and regular sports events, and by incorporating weekly physical training.[8] Moreover, communities also require accessible opportunities for fitness. Governments can promote physical activity by establishing community sports events, jogging tracks, parks, and affordable gyms, as well as by educating the public on the health benefits of exercise.[18] These combined efforts can help reduce the prevalence of obesity and sedentary lifestyles, two key contributors to non-communicable diseases.[15]

This study provides valuable insight into socio-demographic factors influencing adolescent physical activity in Rawalpindi. Its strength lies in the comprehensive data gathered from multiple colleges in both the public and private sectors, as well as urban and rural areas. To the best of our knowledge, this research represents the first of its kind to assess adolescent physical activity levels across the urban and rural areas of Rawalpindi.

LIMITATIONS OF THE STUDY

This research relied on cross-sectional self-assessment data to evaluate physical activity patterns. While the quantitative aspect of this study provides foundational insights, integrating qualitative methodologies in future studies could deepen understanding of barriers and motivators influencing adolescent behaviors. Our study focused exclusively on one administrative subdivision (tehsil) within Rawalpindi District, excluding 6 other subdivisions due to time constraints. Future investigations across multiple tehsils could strengthen the study's generalizability.

CONCLUSION

Our study showed inadequate physical activity levels among mid-to-late adolescents attending higher secondary schools across rural and urban Rawalpindi. Key determinants positively correlated with PA levels included BMI, parental physical activity habits, access to sports facilities, proximity to green spaces, and leisure-time priorities. Notably, institutional affiliation (public/private schools) and residential classification (rural/urban) demonstrated no statistically significant association with physical activity levels.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

US & ABK: Data acquisition, data analysis, critical review, approval of the final version to be published.

AR: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Shaw I, Mathunjwa ML, Shaw BS. Physical activity and health promotion: a public health imperative. IntechOpen eBooks. 2023. https://doi.org/10.5772/intechopen.111927
2. Posadzki P, Pieper D, Bajpai R, Makaruk H, Könsgen N, Neuhaus AL, et al. Exercise/physical activity and health outcomes: an overview of Cochrane systematic reviews. BMC Public Health 2020; 20(1): 1724. https://doi.org/10.1186/s12889-020-09855-3
3. Xu YY, Xie J, Yin H, Yang FF, Ma CM, Yang BY, et al. The global burden of disease attributable to low physical activity and its trends from 1990 to 2019: an analysis of the Global Burden of Disease study. Front Public Health 2022; 10: 1018866. https://doi.org/10.3389/fpubh.2022.1018866
4. Guthold R, Stevens GA, Riley LM, Bull FC. Global trends in insufficient physical activity among adolescents: a pooled analysis of 298 population-based surveys with 1·6 million participants. Lancet Child Adolesc Health 2020; 4(1): 23-35. https://doi.org/10.1016/S2352-4642(19)30323-2
5. Ahmed KR, Uddin R, Kolbe-Alexander TL, Khan A. The effectiveness of physical activity interventions in Asian children and adolescents: a systematic review. Public Health 2021; 194: 48-59. https://doi.org/10.1016/j.puhe.2021.02.023

6. Imtiaz A, ul Haq Z, Afaq S, Khan MN, Gillani B. Prevalence and patterns of physical activity among school-aged adolescents in Pakistan: a systematic review and meta-analysis. Int J Adolesc Youth 2020; 25(1): 1036-1057. https://doi.org/10.1080/02673843.2020.1831561
7. Jabeen I, Zuberi R, Nanji K. Physical activity levels and their correlates among secondary school adolescents in a township of Karachi, Pakistan. J Pak Med Assoc 2018; 68(5): 737-743.
8. World Health Organization. Adolescents: health risks and solutions [Internet]. Geneva: World Health Organization; 2020. Available from: https://www.who.int/news-room/fact-sheets/detail/adolescents-health-risks-and-solutions [Accessed on October 28, 2026].
9. Wang Y, Zhang Y, Li J, Liu X, Wang H, Li Y, et al. Factors influencing mental health during the COVID-19 pandemic: a cross-sectional study in China. BMC Public Health 2024; 24(1): 20322. https://doi.org/10.1186/s12889-024-20322-1
10. Brown CEB, Richardson K, Halil-Pizzirani B, Atkins L, Yücel M, Segrave RA. Key influences on university students' physical activity: a systematic review using the Theoretical Domains Framework and the COM-B model of human behavior. BMC Public Health 2024; 24(1): 418. https://doi.org/10.1186/s12889-024-17885-4
11. Samir N, Mahmud S, Khuwaja AK. Prevalence of physical inactivity and barriers to physical activity among obese attendants at a community health-care center in Karachi, Pakistan. BMC Res Notes 2011; 4: 174. https://doi.org/10.1186/1756-0500-4-174
12. Haase A, Steptoe A, Sallis JF, Wardle J. Leisure-time physical activity in university students from 23 countries: associations with health beliefs, risk awareness, and national economic development. Prev Med 2004; 39(1): 182-190. https://doi.org/10.1016/j.ypmed.2004.01.028
13. Zhang CQ, Chung PK, Cheng SS, Yeung VW, Zhang R, Liu S, et al. An update on physical activity research among children in Hong Kong: a scoping review. Int J Environ Res Public Health 2020; 17(22): 8521. https://doi.org/10.3390/ijerph17228521
14. Menschik D, Ahmed S, Alexander MH, Blum RW. Adolescent physical activities as predictors of young adult weight. Arch Pediatr Adolesc Med. 2008; 162(1): 29-33. https://doi.org/10.1001/archpediatrics.2007.13
15. Centers for Disease Control and Prevention. Healthy People 2020: leading health indicators at a glance [Internet]. Atlanta (GA): Centers for Disease Control and Prevention; 2019. Available from: https://www.cdc.gov/nchs/healthy_people/hp2020/hp2020_indicators.htm [Accessed on October 28, 2026].
16. Cláudia A, Pinheiro R. Prevalence and factors related to low level physical activity among university students in a public university in the northeast region of Brazil. Rev Bras Epidemiol 2009; 12(1): 20-29. https://doi.org/10.1590/S1415-790X2009000100003
17. Kokkinos P, Sheriff H, Kheirbek R. Physical inactivity and mortality risk. Cardiol Res Pract 2011; 2011: 924945. https://doi.org/10.4061/2011/924945
18. Serrano-Sanchez JA, Martí-Trujillo S, Lera-Navarro A, Dorado-García C, González-Henríquez JJ, Sanchís-Moysi J. Associations between screen time and physical activity among Spanish adolescents. PLoS One 2011; 6(9): e24453. https://doi.org/10.1371/journal.pone.0024453
19. Hartman MA, Hosper K, Stronks K. Targeting physical activity and nutrition interventions towards mothers with young children: a review on components that contribute to attendance and effectiveness. Public Health Nutr 2011; 14(8): 1364-1381. https://doi.org/10.1017/S136898001000350X