

## COMPARISON OF PHYSICAL ACTIVITIES AMONG BENINESE ADOLESCENTS ATTENDING SCHOOLS IN RURAL, SUBURBAN AND URBAN AREAS

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### ABSTRACT

The main objective of this study was to compare the daily physical activities of secondary school students living in South- West Benin Republic, depending on whether they live in rural, suburban or urban areas. An investigation through a written and self-administered questionnaire was carried out from April to June 2004 on 678 students made up of 467 boys and 211 girls, aged 13 to 23 years old, regarding their movement modes, physical sports practices and other utilitarian activities. The data were analysed using descriptive and inferential statistics. The results showed that the percentages of students who go on foot or ride bicycles for long distances or a long time duration, and those who participate in physical training as well as practice utilitarian activities on weekly basis respectively, are far higher for students in the rural locations than for students in the other two locations, that is, suburban and urban areas. On the whole the highest proportion of students who engage in physical activities consisting of riding bicycles, traveling on foot, doing physical sports and utilitarian activities are found among students living in rural areas, followed by students in suburban and urban locations. These results are discussed in terms of their relationships with atherogenous risk factors.

**Key words:** Benin Republic, physical activities, physical sports and utilitarian activities, atherogenous risk factors.

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### INTRODUCTION

Physical inactivity constitutes one of the factors of modifiable atherogenous risk. Some studies have shown some relationships between the level of regular physical activity and atherogenous risk (Feinstein, Francs & Lorish, 1991; Pieron, 2001). Many approaches have been proposed by specialists to evaluate the level of the physical activity and to appreciate the processes of atherogenous risk prevention. Those approaches go from the use of sophisticated techniques which combine modern technology and direct measurement (tomodensitometry, absorptiometry with X rays, impedancemetry, direct calorimetry, etc.), to indirect methods such as the use of questionnaires.

Those questionnaires show a good level of reliability (Brigard *et al*, 1992) and have been used in Europe and in North America (Sjolie & Thuen, 2002) and recently in Africa (Sobowgni *et al*, 2001), to evaluate the level of physical activity of adults and teenagers living in urban area (Washburn, Cook & Laporte, 1989) or in rural areas (Mayer *et al*, 1991; Dufour, Reina & Spurr, 2003). They allow one to compare the physical activity levels of teenagers and adults of the urban area to those of teenagers and adults of rural area (Umezaki Yamuachi & Ohtsuka, 2002; Loucaides, Chedzoy & Bennett, 2004). These studies are no more interested in the physical activity used per se as a practice. In other words, the interest now focuses on physical activity which has a permanent value and used for utilitarian purpose (for individuals subsistence, to affirm his cultural identity, maintain his home and good health, etc). Except for that dimension of physical practice, the other aspects associated with leisure and competitions in an institutional frame are not often taken into account at the same time (Andersen *et al*, 1992; 2000) or not designed yet, for the majority but only for adults population (Borcham *et al*,

1997). No doubt it has been established that the level of physical training during childhood and adolescence influences the atherogenous risk at adulthood (Piéron, 2001).

As Beninese rural, suburban and urban life surroundings are different and don't offer to students the same life conditions, the daily physical activities of those teenagers attending schools shouldn't then be similar. To the best of our knowledge no research has been carried out yet in Benin Republic regarding the differences, in the daily physical activities of youth attending secondary schools in rural, suburban and urban areas. This study therefore aims at comparing the daily physical activities of the students of the South-West Benin Republic, depending on whether they reside in a rural, suburban or urban area.

## **METHODOLOGY**

### *Nature of the study and techniques used*

This is a cross-sectional and analytic study which was conducted in urban, suburban and rural school areas in the South-West Benin Republic (Ouémé-Province). It was undertaken from April to June 2004.

It is a questionnaire based study, focusing on students within their respective schools and locations.

#### *Target Population and Study Sample*

The target population was the youth attending secondary schools at Porto-Novo and its neighbouring rural, suburban and urban areas. The study sample consisted of 678 secondary school youth (467 boys and 211 girls) aged 13 to 23 years randomly selected from the entire school youth population in the areas of study. The urban area was represented by the students of four (4) public schools in Porto-Novo selected because of their geographical position in the city (CEG AKPASSA, in the South, DAVIE in the East, DJASSIN in the West and DJEGAN KPEVI in the North) and their important heterogeneous number from the socio-economic point of view.

The suburban area was represented by students selected only from the following public secondary schools: Avrankou and Adjarra. The rural area was represented by schools located at about 10 km from Porto-Novo. Within the schools, classes choice was made

randomly and that of the students on a voluntary basis. The students had to reside in the area for at least two years, be volunteers, and be recognized to be healthy following school medical examination before they were included in the study sample. Table 1 shows the physical characteristics of students studied according to their sex and their place of residence.

#### *Study Variables*

Three (03) dimensions of physical activities have been identified to represent the physical practices in the three (03) areas of study. They movement by foot, bicycles, or cars, educational sports trainings and utilitarian practices. These activities constitute a variety of physical practices which are likely to influence the risk of cardiovascular disease in the different areas. The movement activities were evaluated in relation to: 1) the usual movement patterns and according to two modalities (on foot or by bicycle and by motorbike or by car); 2) the mean distance covered on foot per day going school or any other mode of movement for 6 km or less or more than 6 km;

3) the mean duration of moving by bicycle per day, for at least 30 minutes or more.

The educational sports practices were evaluated using the activities related to school sports competitions. They were evaluated in terms of how much time is spent on competitions and training weekly. Utilitarian activities consist of all the activities which are usually practised, outside the school, with the intention to ensure one's subsistence (such as rustic labour "manoeuvring", firewood splitting, etc), activities to take care of one's health (such as gymnasium activities or to participate in the house maintenance (household chores). They were evaluated in terms of how much time was spent doing these activities.

#### *Data Collection Tools*

The physical activities were determined using a self-administered questionnaire. The questions and items were adapted from the works of Sobowgni *et al* (2001), and Sjolie and Thuen (2002). The adapted instrument was pilot-tested on 62 randomly selected students who were not part of the final study in the three study areas. The test-retest (15

days interval) produced a correlation coefficient of 0.97.

#### *Data Analysis*

The data were processed using the word-processing software Statistic Stat Soft Inc (version 5.5) and SPSS (version 11.5). The differences in the physical activities of participants in the three groups were evaluated using t test. The significant level was settled at  $p < 0.05$ .

## **RESULTS**

#### *Physical Characteristics*

The physical characteristics of the participants are presented in Table 1 according to their residence and by their sex. In terms of age, there are significant differences between suburban and urban girls ( $p < 0.05$ ) and between suburban and rural boys ( $p < 0.05$ ). Significant difference was also noticeable in weight between suburban and rural boys ( $p < 0.05$ ). There are also significant differences in height between suburban and rural boys and between suburban and rural girls ( $p < 0.05$ ), while significant differences was shown in height between suburban and urban boys and between urban and rural girls ( $p < 0.05$ ).

Table 1: Physical characteristics of the students according to their sex and their areas of residence

Variable	Boys						Girls					
	RG		SG		UG		RG		SG		UG	
AGE (years)	15.3	2.3	17.2	3.0 *	16.0	2.4	15.3	1.7	16.0	2.4	15.4	2.5 ‡
Weight (kg)	49.7	10.4	53.9	9.7 *	52.2	10.5	51.8	6.3	52.2	10.5	49.0	8.9
Height (cm)	163.0	0.1	165.0	0.1 *	163.6	0.1 ‡	159.9	0.06	163.6	0.1 *	155.7	0.07 †

The values are means standard deviations; † : Significant difference at  $p < 0.05$  between urban and rural areas; ‡  $p < 0.05$  between suburban and urban areas; \*  $p < 0.05$  between suburban and rural areas ; RG : Rural Group ; SG : Suburban Group ; UG : Urban Group ; cm : centimetre ; kg : kilogramme.

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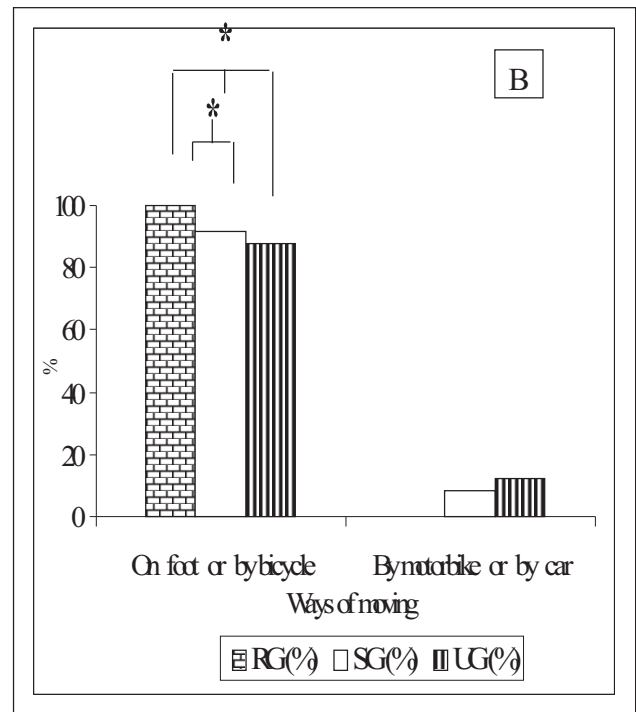
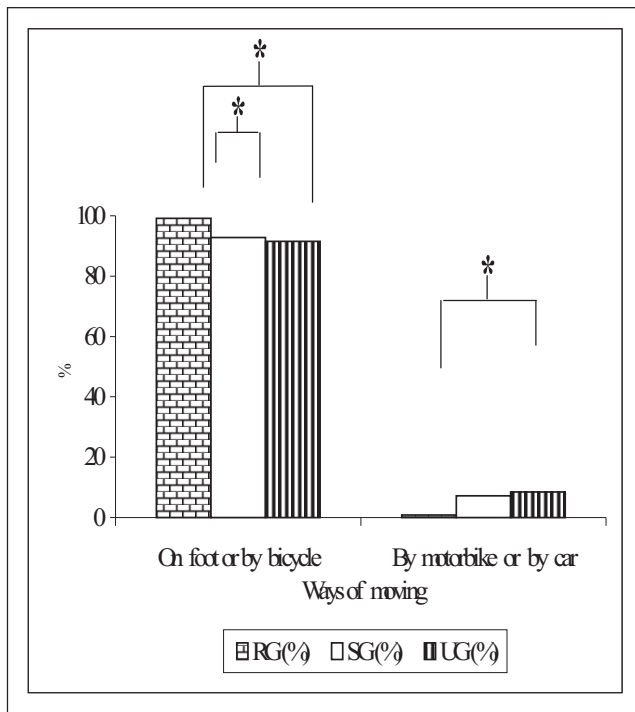


Figure 1: Responses of participants regarding the most popular means of mobility- on foot or by bicycle, on motor-bike or by car by sex and residential locations.

### *Physical Activities*

Figure 1 illustrates the expressions of the participants regarding the most popular means of mobility- on foot or by bicycle, on motor-bike or by car by sex and residential locations. The highest percentage of boys and girls in the rural locations travelled by foot or bicycle to school on daily basis, while only a small proportion indicated travelling by car or motorbike.

### *Mean Time Duration Of Physical Activities Per Day Using The Bicycle*

The result in Table 2 shows that 64.5 % of boys and 69.2% of girls living in rural areas use the bicycles as a mode of travelling for >30 minutes per day. Only 45.1% of the sub-urban boys and 38.4% of the sub-urban girls ride bicycles for >30 minutes a day. A small percentage (20.6% boys and 13.1% girls) of the respondents living in urban areas use bicycles as a mode of travelling. There is therefore a significant difference in the mean time duration of the physical activity using the bicycle between suburban and rural boys and girls ( $p < 0.05$ ) and between suburban and urban boys and girls ( $p < 0.05$ ).

### *Mean Distance Covered On Foot Per Day*

Table 2 also shows that 51.4% of boys and 51.3 % of girls in the rural areas cover a mean distance of >6 km per day on foot. These values are higher than the 36.4% of boys and 24.7% of girls in the sub-urban areas. Among students in the urban areas, 32.7% and 32.3% of boys and girls respectively cover a distance >6km per day on foot. Significant differences ( $p < 0.05$ ) were observed between the mean travelling distance of boys and girls in the rural versus sub-urban, between urban and sub-urban girls ( $p < 0.05$ ). There is however, no significant difference in the distance covered between boys and girls in the rural areas ( $p > 0.05$ ). Suburban boys (36.4%) travel more distance on foot than urban boys (32.7%). This difference is however not statistically significant ( $p > 0.05$ ). Among the three groups, the rural boys (51.4%) are comparable with rural girls (51.3%), the urban boys (32.7%) compare very well with urban girls (32.3%). The proportion of suburban boys (36.4%) is however higher than that of suburban girls (24.4%).

The results are observable in the mean distances of <6km per day on foot by each of the groups.

#### *The Weekly Mean Duration of Sports Practices*

Table 3 shows that the percentages of boys who participate in sports practice for higher than or equal 6 weekly hours are far higher than those of girls in all the three locations. A higher percentage of rural boys (44.9%) as compared to 25.6% of rural girls ( $p<0.05$ ), 41.0% of suburban boys compared to 26% suburban girls ( $p<0.05$ ) and 33% urban boys compared to 15.2% urban girls ( $p<0.05$ ) participate for  $\geq 6$  weekly hours in sports practice. The highest proportion of urban girls (84.8%), rural girls (74.4%) and suburban girls (74%) participate in  $\geq 6$  weekly hours of sport practice, compared with 66.1% urban boys, 59.0% suburban boys and 55.1% rural boys. The differences are significant at  $p<0.05$ .

#### *Weekly Average Involvement in Utilitarian Physical Practices*

Table 3 shows that the percentage of students who are involved in 3 hours or more of utilitarian practices per week, is

the highest among boys (72.9%) and girls (64.1%) in the rural areas. The lowest percentage is observed among boys (33.3%) and girls (31.3%) in urban area. A very low percentage of boys (3.7%) and a low percentage of girls (12.8%) in the rural areas do not involve themselves in utilitarian physical practices. The highest percentages of 43.4% and 34.5 of boys and girls respectively in the urban areas are not involved in utilitarian physical practices.

#### **DISCUSSION**

The assessment of the physical activities, as it has been realised in this investigation, is only based on the responses given by the students interrogated through a self-administrated written questionnaire. Mc Murrey *et al* (2004) noticed, in a study on the different techniques of physical activities evaluation, that the investigation through self-administered questionnaire (as it is the case in this study), underestimates the levels of physical activity. These authors have come to the conclusion that the information given by the individuals should be verified by other more objective measures.

Table 2: Mean duration of physical activities per day using the bicycle

Variable		Boys			Girls		
		RG (%)	SG (%)	UG (%)	RG (%)	SG (%)	UG
Mean distance covered on foot per day	> 6 km per day	51.4	36.4	32.7‡	51.3	24.7	32.3† ‡
	< 6km per day	48.6	63.6	67.3	48.7	75.3	67.7†
Meantime duration riding bicycle per day	> 30 min per day	64.5	45.1*	20.6† ‡	69.2	38.4*	13.1† ‡
	< 30 min per day	35.5	54.9*	79.4†	30.8	61.6	86.9†

RG: Rural Group; SG: Suburban Group; UG: Urban Group; Min: Minutes; †  $p < 0.05$  between urban and rural areas ; ‡: Significant difference at  $< 0.05$  between suburban and urban areas; \* $p < 0.05$  between suburban and rural areas.

Table 3: Percentages of students in rural, suburban and urban areas showing weekly duration of utilitarian and sports practices

Variables		Boys			Girls		
		RG (%)	SG (%)	UG (%)	RG (%)	SG (%)	UG (%)
Sports practices	>6 weekly hours	44.9	41.0	33.9 ‡	25.6	26.0	15.2 ‡
	< 6 weekly hours	55.1	59.0	66.1	74.4	74.0	84.8
Utilitarian physical practices	> 3 weekly hours	72.9	58.5 *	33.3 †‡	64.1	54.8	31.3 † ‡
	< 3 weekly hours	23.4	26.2	32.1	23.1	24.7	25.3
	No practice	3.7	15.4	34.5 ‡	12.8	20.5	43.4 ‡

RG: Rural group; SG: Suburban group; UG: Urban group; min: minutes; †  $p < 0.05$  between urban and rural areas; ‡  $p < 0.05$  between suburban and urban areas ; \*  $p < 0.05$  between suburban and rural areas.



In such a case, the process could consist for instance, of evaluating the energy cost of the practised activities, as advised by Ainsworth *et al* (1993). The study of the physical activity by means of a written questionnaire constitutes, however a practical method and is often used by some researchers (Boisvert *et al*, 1988).

In the present study, the highest percentage of the students who walk or ride the bicycle observed for a longer time have been observed in the rural area. The presence of a hundred bicycles belonging to students in the school yard of the secondary schools supports this result. Despite the presence of a few taxi or “Zemidjan” in some areas, the students living there and those whose residences are located at more than 3 to 5 km from the schools, come to school on foot. They remain within the premises of the school between 12 o'clock a.m and 3 p.m, in order to avoid an extra return journey. That's in fact exactly the same thing with most of the students who come by bicycle and who reside in the neighbouring villages.

A recent investigation on some Canadian teenagers by Allison *et al.* (2005) revealed that obstacles to the engagement in regular physical activity include both some intrinsic factors (e.g. individual characteristics, low level importance attached to physical activity, use of technology and extrinsic ones (e.g. influences of colleagues/ comrades and the family, lack of time, non availability and high cost of the infrastructures).

Except for the low standard of living among the Beninese rural population, an additional factor to those reported above by Allison *et al.* (2005) could be helpful in explaining our results. It concerns activities in rural area that are essentially agricultural labour, cattle breeding, illicit trafficking of oil (the petroleum) and manufactured goods. Very few students engage in the last activity which is generally reserved for parents, men, and women. On the other hand, the students participate in the agricultural labour and supply the family with firewood and drinking water from the pond or the river.

The results reported for the urban areas in this study do not agree with those obtained in Canada by Mo, Turner, Krewski and Mo (2005). The level of physical activity seems to be higher for people who have a high social-economic status. For these authors, Canadian teenagers coming from poor family were physically less active than those whose families had high income. The remark was the same in USA as reported by Gordon-Larsen *et al.* (2005). They observed in a representative sample of national inhabitants that the active mode of moving on foot or by bicycle is more frequent within individuals having high social and economical status. The majority of adults, especially white men and Hispanic people don't nevertheless go to work or school using an active mode of mobility.

According to Jago, Anderson, Baranoski and Watson (2005) the sitting time spent in front of television and electronic games must be reduced in order to raise the physical activities level of young Americans. Jago *et al* (2005) observed an increase of sitting time spent in front of television and electronic games of American teenagers. These

authors advised parents to find a strategy to reduce this time in order raise the level of physical activity of these youth.

In the present study, the highest percentages of students who practise sports as well as weekly utilitarian activities is higher than or equal to 6 and 3 hours respectively have been registered in rural areas. As far as useful practices are concerned, such a result was expected since rural areas are presumed potentially to be favourable to the use of rudimentary means of mobility for the achievement of daily tasks. It is also in rural areas that the participation of young people in cultural activities (traditional dancing), agricultural works (rustic works, climbing trees, drawing water from the well etc.) is a habit when they are not in class.

In this study, only a small percentage of students in the rural and suburban areas do not participate in sports practices due to lack of sports infrastructures. In urban areas like Porto-Novo, few young people practise active sports/ activities probably because of the lack of sports

(a single omni sports stadium for 223500 inhabitants), lack of green spaces and natural sports route, lack of access to few sports grounds and to leisure centres (cinema, video clubs). The probability of developing atherogenous and cardiovascular risk factors by this population may be high due to the individuals' low level of physical activity.

Many studies have established some relationships between levels of physical activity and the of parameters associated with atherogenous risk factors in adult men and women (Ashton, Nanchahal & Wood, 2000) children and teenagers (Durant *et al.*, 1983; Raitakari *et al.*, 1997; Al-Hazza, 2002). Durant *et al* (1983) observed for instance that most active teenagers had the lowest atherogenicity indications (total cholesterol/LDL-cholesterol ratio, LDL-cholesterol/HDL-cholesterol ratio). Adamopoulos *et al* (1993) showed also that the lower the physical activity, (i.e. low level of physical activity), the higher the atherogenous lipid values (VLDL-cholesterol), higher diastolic blood pressure, body mass index, urea and uric

acid in men and women populations living at Athena.

The results of this study allow us to presume some repercussion for physical activities on the atherogenous risk factors of students living in urban areas. It is possible therefore that young people attending schools in urban areas would be more exposed to dyslipidemies and hypertension risk, due to low level of physical activity. A high level of physical activity probably leads to positive values in these health factors. Future studies on this subject are advised to be structured to determine the relationship between physical activity practices, physical fitness and atherogenous or hypertensive risks in the three areas of study. It is advised that such studies focus on two approaches:

- (i) A qualitative approach on advanced inquiry and interview on the socio-economic status of individuals in the three areas and,
- (ii) A quantitative approach that evaluates more objectively the weekly energy expenditure resulting from the different physical activities of the youth.

## CONCLUSION

This study aimed at comparing the physical practices (activities) of Beninese students living in rural, suburban and urban areas. The results show significant differences between students' physical activities in the three areas according to the present mode of moving, utilitarian and sports practices. The students in the rural areas engage in more physical activities, than the suburban and urban students. It is assumed the individuals living in the rural areas will have less of health problems related to atherogenous and cardiovascular risks due to their higher level of physical activities compared with students living in the suburban and particularly the urban areas. This is yet to be further objectively and quantitatively assessed. The fundamental question to ask is whether conscious choices justify the present physical activities of students in rural area or whether physical practices result from constraints, like socio-economic. In Benin Republic, certain socio-economic factors force individuals to adapt and this adaptation has helped to shape the living habits of individuals irrespective of the areas they live in.

## REFERENCES

- Adamopoulos, P.N., Macrilakis, K., Papamichael, C., Malakos, I., Panayidis, N. & Mouloupoulos, S.D (1993). Physical activity and relationship with coronary heart disease risk factors. *Acta Cardiologica*, 48, 523-534.
- Ainsworth, B.E., Haskell, W.L., Leon, A.S., Jacobs, D.R., Montoye, H.J., Sallis, J.F. & Paffenbarger, R.S. (1993). Compendium of physical activities : classification of energy costs of human physical activities. *Medicine and Science in Sports and Exercise*, 25, 71-80.
- Al-Hazza, HM. (2002). Physical activity, fitness and fatness among Saudi children and adolescents: implications for cardiovascular health. *Saudi Medical Journal*, 23, 144-150.
- Allison, K.R., Dwyer, J.J., Goldenberg, E., Fein, A., Yoshida, K.K. & Boutilier, M. (2005). Male adolescent' reasons for participating in physical activity, barriers to participation, and suggestions for increasing participation. *Adolescence*, 40, 155-170.
- Andersen, L.B., Schnohr, P., Schroll, M. & Hein, H.O. (1992). Mortality associated with physical activity during leisure time, at work, in sports, and cycling to work. *Ugeskr Laeger*, 164, 1501-1506.
- Andersen, Lb, Schnohr, P, Schroll, M, & Hein, H.O. (2000). All-cause mortality associated with physical activity during leisure time, work, sports, and cycling to work. *Archive International of Medicine*, 160, 1621-1628.
- Ashton, W.D., Nanchahal, K., Wood, D.A. (2000). Leisure-time physical activity and coronary risk factors in women. *Journal of Cardiovascular Risk*, 7, 259-266.
- Bigard, A.X., Duforez, F., Portero, P. & Guezennec, C.Y. (1992). Détermination de l'activité physique par questionnaire autoadministrable: validation du questionnaire de Baecke. *Science et Sports*, 7, 215-221.
- Boisvert, P., Washburn, R.A, Montoye, H.J. & Léger, L. Mesure et évaluation de l'activité physique par questionnaire. Questionnaire utilisés dans la littérature anglo-saxonne. *Science et Sports*, 3, 245-262.

- Boreham, C.A, Twisk, J., Savage, M.J., Cran, G.W, & Strain, J.J. (1997). Physical activity, sports participation, and risk factors in adolescents. *Medicine and Science in Sports and Exercise*, 29, 788-793.
- Dufour, D.L., Reina, J.C. & Spurr, G.B. (2003). Physical activity of poor urban women in Cali, Colombia: A comparison of working and not working women. *American Journal of Human Biology*, 15, 490-497.
- Durant, R.H., Linder, C.W., Harkess, J.W. & Gray, R.G. (1983). The relationship between physical activity and serum lipids and lipoproteins in black children and adolescents. *Journal of Adolescent Health Care*, 4, 55-60.
- Feinstein, R., Francis, K & Lorish, C. (1991). Physical activity and fitness. *Acta Medica*, 61, 102- 104.
- Jago, R., Anderson, C.B., Baranowski, T. & Watson, K. (2005). Adolescent patterns of physical activity differences by gender, day, and time of day. *American Journal of Preventive Medicine*, 28, 447-452.
- Loucaides, C.A., Chedzoy, S.M. & Bennett, N. (2004). Differences in physical activity levels between urban and rural school children in Cyprus. *Health Education Research*, 19, 138-47.
- Mayer, E.J., Alderman, B.W., Regensteiner, J.G., Marshall, J.A., Haskell, W.L., Baxter, J. & Hamman, R.F. (1991). Physical-activity-assessment measures compared in a biethnic rural population: the San Luis Valley Diabetes Study. *American Journal Clinical Nutrition*, 53, 812-820.
- Mo, F., Turner, M., Krewski, D. & Mo, F.D. (2005). Physical inactivity and socioeconomic status in Canadian adolescents. *International Journal of Adolescence Medicine and Health*, 17, 49-56.
- Piéron, M. (2001). Activité physique et santé chez les jeunes. *Revue Médecine Liège*, 56 (4), 204-211.
- Raitakari, O.T., Taimela, S, Porkka, K.V., Telama, R, Valimaki, I., Akerblom, H.K. & Viikari, J.S. (1997). Associations between physical activity and risk factors for coronary heart disease: the cardiovascular risk in young Finns study. *Medicine and Science in Sports and Exercise*, 29, 1055-1061.
- Sjolie, A.N. & Thuen, F. (2002). School journeys and leisure activities in rural and urban adolescents in Norway. *Health Promotion International*, 17, 21-30.
- Sobowgni, E.N., Mbanya, J.C., Unwin, N.C., Aspray, T.J. & Alberti, K.G.M.M. (2001). Development and validation of a questionnaire for the assessment of physical activity in epidemiological studies in Sub-Saharan Africa. *International Journal of Epidemiology*, 30, 1361-1368.
- Umezaki, M., Yamauchi, T. & Ohtsuka, R. (2002). Time allocation to subsistence activities among the Huli in rural and urban Papua New Guinea. *Journal of Biosociology of Science*, 34, 133-137.
- Washburn, R.A., Cook, T.C. & Laporte, R.E. (1989). The objective assessment of physical activity in an occupationally active group. *Journal of Sports Medicine and Physical Fitness*, 29, 279-284.