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Physical activity and body composition in a Quilombola community in the Tocantins state (Brazil)
Actividad física y composición corporal en una comunidad quilombola del estado de Tocantins (Brasil)

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Abstract. The Quilombola population has precarious living conditions and a risk of obesity. In addition, this population has been little studied in the health area, resulting in a gap in scientific evidence and a lack of policies to promote, protect, and restore health in Tocantins state. Objective: This study aimed to describe the Physical Activity Level (PAL) and body composition of a Quilombola community in the Tocantins state, Brazil. Methods: A cross-sectional study. We study 73 individuals between 10 and 81 years old. The instruments used were: Questionnaire on PAL and sedentary behavior and the International Physical Activity Questionnaire. Body composition was assessed by bioimpedance. The statistics analysis was performed using Stata software version 11.0. Results: Sedentary individuals were not found. Among children under 13 years old, 47.8% had a low PAL. The body composition, children and adolescents obtained better results 65.3% and 31.6% respectively. Conclusion: The children's body fat indexes are within the recommendations (but the PAL is not). PAL of adolescents, adults, and the elderly is not sufficient to cause physiological adaptations in changing body fat levels. Although the Quilombola community maintains some cultural habits, complications of modern life regarding health are concerning, as they seem to be reaching these communities, leading to a lifestyle change, as observed in large cities.
Keywords: Exercise; Body Composition; Vulnerable; Public Health.

Resumen. La población Quilombola tiene condiciones de vida precarias y riesgo de obesidad. Además, esta población ha sido poco estudiada en el área de la salud, resultando en un vacío de evidencia científica y falta de políticas de promoción, protección y restauración de la salud en el estado de Tocantins. Objetivo: Este estudio tuvo como objetivo describir el Nivel de Actividad Física (PAL) y la composición corporal de una comunidad Quilombola en el estado de Tocantins, Brasil. Métodos: Estudio transversal. Estudiamos 73 individuos entre 10 y 81 años. Los instrumentos utilizados fueron: Cuestionario sobre PAL y comportamiento sedentario y el Cuestionario Internacional de Actividad Física. La composición corporal se evaluó mediante bioimpedancia. El análisis estadístico se realizó utilizando el software Stata versión 11.0. Resultados: No se encontraron individuos sedentarios. Entre los niños menores de 13 años, el 47,8% tenía un PAL bajo. La composición corporal, niños y adolescentes obtuvieron mejores resultados 65,3% y 31,6% respectivamente. Conclusión: Los índices de grasa corporal de los niños están dentro de las recomendaciones (pero el PAL no lo está). La PAL de adolescentes, adultos y ancianos no es suficiente para provocar adaptaciones fisiológicas en los niveles cambiantes de grasa corporal. Aunque la comunidad Quilombola mantiene algunos hábitos culturales, las complicaciones de la vida moderna en materia de salud son preocupantes, ya que parecen estar llegando a estas comunidades, lo que lleva a un cambio de estilo de vida, como se observa en las grandes ciudades.
Palabras clave: Ejercicio; Composición corporal; Vulnerable; Salud pública.

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Introduction

According to the World Health Organization (WHO), chronic noncommunicable diseases (such as cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases) are the leading global cause of death and are responsible for just over 70% of deaths worldwide. In Brazil, 74% of deaths are attributed to chronic noncommunicable diseases with a 17% probability of premature deaths. According to the WHO, numerous risk factors can be changed by noncommunicable diseases, e.g., alcohol, unbalanced diet, obesity, tobacco, physical inactivity, and/or insufficient physical activity (GBD, 2021).

Mortality from non-communicable diseases in Brazil is on the rise, in 2019, 72% of deaths in the country were recorded. The main causes of death from NCDs in Brazil are cardiovascular diseases, which represent about 31% of deaths, followed by cancer (26%), respiratory diseases (7%), and diabetes (5%) (Bray et al., 2021; Malta et al., 2021; Poon et al., 2019; Roth et al., 2020). Metabolic changes present in chronic noncommunicable diseases have important components such as malnutrition due to excess, physical inactivity, and obesity, increasing the likelihood of developing cardiometabolic diseases. In addition, physical inactivity and a sedentary lifestyle are risk factors for the development of noncommunicable diseases and increased mortality (Mora et al., 2021; Win-Tin et al., 2022).

There is special interest in understanding how metabolic changes occur in populations and communities in rural areas, as behavioral risk factors may be influenced by the lifestyle practiced in these places or be affected (indirectly) by the urbanization of large cities (Maciel et al., 2022; Rodrigues et al., 2021).

Physical exercise is an instrument for recovery, maintenance, and health promotion in different populations, including the vulnerable, such as Afro-descendants and Quilombola (Lima et al., 2022; Quaresma et al., 2022). In Brazil, there is a higher prevalence of overweight among Afro-Brazilians, especially at low socioeco-

nomic levels, as is the case of the remaining Quilombola population, where is difficult for health promotion because of the cultural barriers and other issues such as the unknown PAL and the body composition indexes measured by methods as electrical bioimpedance or waist circumference (WC) (Rodrigues et al., 2022).

The remaining Quilombola are ethnic and racial groups characterized by the historical trajectory resulting from black descent (Goulart & Tavares, 2021). Quilombola communities are made up of Afro-descendants enslaved between the 16th century and 1888, when slavery was abolished in Brazil (Nascimento et al., 2022). They have a strong connection with the land from which they live, and live in precarious conditions, such as poor sanitation, poor garbage collection, and poor sewage treatment, besides high illiteracy rates and difficulty in accessing basic health care (Loh et al., 2020; Silva, 2007).

Communities of remnants of Quilombos are places inhabited by individuals descended from slaves, and former slaves, the population has links with their ancestors and historical process, and they are distinguished by ethnic identity – a particular form of social organization, and predominant rural area (Goulart & Tavares, 2021; Quaresma et al., 2019). They are traditional communities meaning due to their historical and cultural character, socially vulnerable, and they occupy a territorial area that structures their lifestyle (relationships with the land) (Goulart & Tavares, 2021).

Health risk factors, such as obesity and high blood pressure, have been investigated in Quilombola communities and their associations with diets and socioeconomic status (Ferreira et al., 2013). Furthermore, evidence suggests that vulnerable economic groups have lower PAL, especially leisure activities, which can be explained by a lack of resources, favorable environments, and lack of knowledge (Faisal-Cury & Rodrigues, 2022; Góis et al., 2019; L. A. de Melo & Lima, 2020; Monteiro-Bezerra et al., 2018). As such, research and encouraging physical activity is a good strategy to fight obesity in low-income countries (Reichert et al., 2015).

Quilombola population has precarious living conditions and is poorly studied in the health area (Quaresma et al., 2019, 2022), furthermore, overweight in this population is reported (Maciel et al., 2022). Thus, this study aimed to describe the PAL and body composition of a Quilombola community in the Tocantins state, Brazil.

Methods

Study design and ethical aspects

A cross-sectional study reported in accordance with the guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology (Von-Elm et al., 2014). The study was approved by the Committee of Ethics in Research with Human Subjects (report code 3358190). Access to the community residents was obtained by means of contact with a Quilombola leader. The collections were performed by previously trained staff, through face-to-face interviews, and after obtaining free and informed consent in accordance with relevant country guidelines.

Study settings and localization

The study was conducted on participants from Quilombola community, Tocantins state, Brazil. Quilombola community has a territorial extension in three municipalities: Santa Tereza, Novo Accord and Lagoa do Tocantins, and is located 73.8 kilometers from the capital Palmas, Tocantins state, Brazil. The municipality of Santa Tereza is responsible for public policies in the community. According to data from the Brazilian Institute of Geography and Statistics (IBGE, 2010), this city has an area of 539.908 km2, 2,523 inhabitants with a population density of 4.67 inhabitants/km2 and a mean Human Development Index of 0.668 (Bezerra et al., 2022; Darze et al., 2016; Oliveira et al., 2022).

The community was recognized and certified by the Palmares Cultural Foundation in December 2005. In its territory, there is a health center, an elementary school, a Catholic church, a community association, and a cultural center (Teixeira & E Souza, 2016). Figure 1 shows a map of Brazil, highlighting the Tocantins state and, beside it, an image of the Tocantins state, highlighting the location of the community.

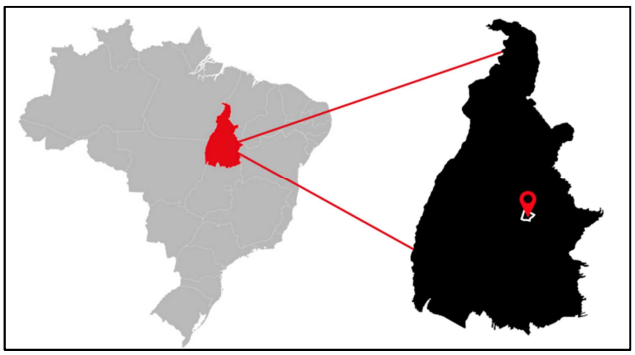

Figure 1. Brazil's map with emphasis on the Santa Tereza of the Tocantins, Tocantins state, Brazil.

Participants and sampling

We calculated the sample via the G*Power Software, using the Chi-square test ($\chi 2$) with a critical value = 93.95, var1/var0 ratio = 1.5, β = 0.80 and α = 0.05 (Kang, 2021). The sample was estimated at 73 participants. All community residents were invited to participate voluntarily. The sample was composed of 73 people of both sexes and investigated their sociodemographic, socioeconomic, and health indicators, such as body composition and activity physical level. They were classified as follows: children from 10 to 13 years old, adolescents from 13 to 17 years old, adults from 18 to 59 years old, and seniors over 59 years.

Two hundred and ten people (aged 10 and over) were invited to participate voluntarily, corresponding to the total number of residents in the community, between 10

and 13 years old: 30 children; from 13 to 17 years old, 34 teenagers; from 18 to 59 years old, 121 adults and over 60 years old, 25 seniors. 63.3% of children, 82.3% of adolescents, 22.3% of adults, and 16% of elderly people adhered to the research participants. The reasons for non-compliance were: not being in the community on collection days or voluntary choice not to consent to the research. The low number of participant adherence is justified by the availability of the community, since the day and the invitation to participate, and the schedule were determined by the community leaders, with no possibility of rescheduling for another time.

The study included the participation of 73 individuals, mostly female. On sociodemographic identification of adult participants (n = 31), most (64.5%) considered themselves black, 25.8% brown, 6.5% indigenous, and 3.2% white. Most (90.3%) have lived in the community for at least 10 years. More than half of the respondents have worked (51.7%) and are farmers or self-employed (45.1%) or receive government assistance through the exchange (51.6%). All respondents use the community's health center. On socioeconomic identification, 87.1% (n = 27) were classified as D-E class, 3.2% (n = 1) as C2 class, and 9.7% (n = 3) as C1 class. The evaluation of PAL was done in MET thus the pairing of both groups shows (Figure 2) that the median metabolic equivalent (MET) of children and adolescents was 2,424 MET (95% CI: 1812–4892.54) and the median in adults and seniors was 5,940 MET (95% CI: 3236–9054).

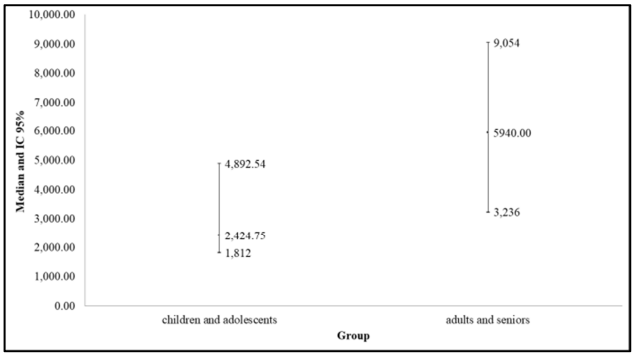

Figure 2. Median and confidence interval of physical activity level.

Variables and measurements

We characterized the participants through the questionnaire validated by the Brazilian Association of Population Studies (ABEP). To assess PAL two instruments were used: we used a validated Questionnaire of PAL Assessment and Behavior Sedentary Behavior on children from 10 to 13 years of age (Militão et al., 2013) and a large version of the International Physical Activity Questionnaire (IPAQ) (Matsudo et al., 2001) on participants between 14 and 81 years of age. Participants' PAL was classified according to the descriptions by Matsudo et al. about IPAQ adapted for the Brazilian population: Sedentary, irregularly active, active, and very active.

To assess body composition, we used electrical bioimpedance tetrapolar (Biodynamics BIA 310), which consists of a method that conducts electricity at a low intensity around the body. (Monteiro & Fernandes Filho, 2002). Waist Circumference (WC) in adults was measured to analyze the risk of metabolic complications. We used an anthropometric tape Sanny, which is a brand, and was taken at the larger circumference of the abdomen between the last rib and the iliac crest, following the recommendation of the Brazilian Association for the Study of Obesity and Metabolic Syndrome (Lam et al., 2015). The classification was of increased risk in measures ≥ 94 cm for men and ≥ 80 cm for women, and substantially increased risk in measurements ≥ 102 cm for men and for women ≥ 88 cm (Bajpai, 2022; Summer et al., 2022).

We measure stature and body mass using a wall stadiometer Seca 206 and a digital scale Health O'Meter and the parameters were used to calculate the body mass index (BMI). BMI was calculated by the body mass and squared stature relation, classified for participants between 10 and 18 years old (calculating percentiles by age) as follows: very underweight, underweight, eutrophic, overweight, obese, and severely obese. The BMI of the participants above 18 years of age was classified in accordance with the proposal of ABESO using the terms underweight, normal weight, overweight, pre-obese, and obese I, II, and III (Damé et al., 2011).

The fat percentage was classified for participants between 10 and 17 years old according to the Lohman guidance as "very low" up to 6% for boys and 12 % for girls, following respectively, "low" from 6.01 to 10% and from 12.01 to 15%, "good" from 10.01 to 20%, and 15.01 to 25%, "moderately high" from 20.01 to 25% and from 25.01 to 30%, "high" from 25.01 to 31% and 30.01 to 36%, "very high" above 31.01% and higher than 36.01%. In participants ≥ 18 years old we used the Lohman classification: "too low" <5% for men and <8% for women, following respectively, "low" 6-14% and 9-22%, "average" 15% and 23% "above average" 16-24% and 24-31%, and "very high" ≥25% and ≥32% (Lohman et al., 1997).

Statistical analysis

We carried descriptive analysis of the variables that comprise the study group using the statistical software Stata version 11.0. Data were described by the prevalence for qualitative variables and for means and standard deviations or medians and percentiles, according to the data distribution for quantitative variables. The data distribution was assessed by the Shapiro-Wilk test.

Results

Tables 1–4, shows results of nutritional status based on BMI, WC, body composition, and PAL. The analysis showed that adults and elderly people in the community had an adequate PAL, higher than those of children and adolescents; adults and the elderly had higher rates of BMI and WC than children and adolescents. Regarding the

percentage of fat, only children had adequate rates. Although adults and the elderly have better levels of physical activity (Figure 2), this is insufficient to have a BMI and WC within the range normality limits. Children and adolescents practice physical activity during leisure time with higher MET, while adults and the elderly have higher MET rates in work and domestic activities.

Observing the results of BMI and percentage of fat, the data indicate that the percentage of fat in overweight/obese people increases with age. In contrast, the PAL was satisfactory in the majority of the sample, justified by the living conditions of the community, in which the characteristics of the activities of transport, work, and domestic tasks are carried out through physical effort (except on children, since their PAL comes from activities of sport and leisure).

Table 1.
Classification of body mass index and waist circumference (n=73).

Variables	n (%)
BMI children (n=23)	
Underweight	2 (8.7%)
Eutrophic	19 (82.6%)
Overweight	2 (8.7%)
BMI adolescents (n=19)	
Eutrophic	17 (89.5%)
Overweight	2 (10.5%)
BMI adults and elderly (n=31)	
Underweight	5 (16.1%)
Eutrophic	10 (32.6%)
Pre-Obese	7 (22.5%)
Obese I	3 (9.6%)
Obese II	3 (9,6%)
Obese III	3 (9.6%)
WC adults and elderly (n=31)	
Normal	6 (19.4%)
Increased Risk	10 (32.3%)
Substantially increased Risk	15 (48.4%)

Table 2.
Classification of fat percentage (n=73).

Variables	n (%)
Children (n=23) [a]	
Low	6 (26.1%)
Optimal	15 (65.3%)
Moderately high	1 (4.3%)
High	1 (4.3%)
Adolescents (n=19) [a]	
Low	3 (15.8%)
Optimal	6 (31.6%)
Moderately high	8 (42.10%)
High	2 (10.5%)
Adults and Elderly (n=31) [a]	
Average	1 (3.2%)
Above average	13 (42%)
Very high	17 (54.8%)
Fat Weight [b]	12.2 (5.9 – 18.5)

[a] value presented in absolute number (percentage); [b] value presented in the median (interquartile range [p25 – p75]).

Table 3.
Categorization of physical activity level (n=73).

Variables	n (%)
Children (n=23)	
Sedentary	2 (8.7%)
Low Active	9 (39.1%)
Active	7 (30.4%)
Very Active	5 (21.8%)
Adolescents (n=19)	
Low Active	1 (5.2%)
Active	3 (15.8%)
Very Active	15 (79%)
Adult (n=27)	
Active	8 (29.6%)
Very Active	19 (70.4%)
Elderly (n=4)	
Active	1 (15%)
Very Active	3 (75%)

Table 4.
Distribution of metabolic equivalents according to the types of physical activity performed (n=73).

Variables	MET	%
Children (n=23)		
Sports	16,860	32
Leisure	28,062	53
Transportation	4,620	9
Physical Education	3,160.5	6
Adolescents (n=20)		
Work	27,808	17.1
Housework	21,549	13.3
Transportation	50,938	31.4
Leisure	62,116.7	38.2
Adults and Elderly (n=31)		
Work	91,152	39.5
Housework	85,921.5	31.2
Transportation	23,116.5	10
Leisure	30,655	13.3

Discussion

We observed that adults and the elderly had high levels of body fat and high WC which is the risk of metabolic complications and obesity. Currently, obesity has been considered one of the biggest social and health problems worldwide and its prevalence is increasing continuously. Visceral fat, in turn, is considered a pathogenic factor in obesity (Mora et al., 2021).

A study conducted on Quilombola women in the Alagoas state, Brazil, identified 72.4% of them had body fat above recommended levels (Ferreira et al., 2013). Another study of 739 adults and elderly Quilombola of both sexes evaluated the nutritional status, overweight, and abdominal obesity and found that 42% were between overweight and obesity, and 55.7% with abdominal obesity (Lohman et al., 1997).

Although the adults and elderly in our study showed an adequate level of physical activity, this has not been enough to promote changes in BMI and WC. This means that the physical activities of locomotion and housework that are not part of systematized physical exercises are capable of modulating these components. Low-intensity aerobic physical exercises promote improvements in body composition. They are important to reduce visceral fat besides the extra benefits such as physical conditioning gain (Mora et al., 2021).

Despite the limited studies on PAL in Quilombola communities, it was performed in parallel with other conventional populations and it was observed that children and adolescents had low levels of physical activity. A study that analyzed the PAL of children and adolescents showed that 62.68% of participants were classified as inactive or insufficiently active (Cabrera et al., 2014). In other studies on children and adolescents, there was also the predominance of low PAL (Franceschin & Veiga, 2020).

We found that in adolescents there was a higher prevalence of leisure and transportation, while adults and the elderly had a higher rate of work and household activities. A study of 797 individuals aged 18 to 100 years from a Quilombola community found a higher prevalence of physical activity in fieldwork and household work (Bezerra et al., 2015), findings similar to our study when considering the prevalence of PAL in adults and the elderly. The low PAL in children and adolescents is worrying especially in the long term. School Physical Education has not been enough to keep students with a minimum of physical exercise that can contribute to maintaining health.

Lifestyles that keep students inactive (or insufficiently active) contribute to excessive body mass gain and, consequently, contribute to an increase in risk factors for noncommunicable diseases (Alvarez et al., 2019; Giakoni et al., 2021). Even in traditional communities such as the Quilombola, where the environment is favorable for the practice of physical activity, a sedentary lifestyle seems to be becoming predominant among younger people (Maciel et al., 2022; Quaresma et al., 2019).

Body fat and WC measurements are predictors of health conditions and are strongly associated with the development of chronic noncommunicable diseases (Hallal et al., 2003). In addition to the indicators studied, black ethnicity is more predisposed to the development of chronic noncommunicable diseases, especially arterial hypertension (Melo et al., 2019). Although most children have good levels of physical activity, given the reality of the community, where most adolescents and all adults are active, this scenario is worrisome because the early lifestyle tends to remain in the stages of adults and the elderly (Costa & Assis, 2011).

It is important to stress that physical activity is different from physical exercise since physical activity consists of a programmed physical activity with defined intensity, volume, and time and is usually assisted by a physical education professional in which specific goals are pre-defined and therefore better results are expected to be achieved (Caspersen et al., 1985). There is evidence of the effectiveness of exercise in reducing body fat (Neves et al., 2015).

The same may have happened to children, however, our data may have been underestimated because the use of the instrument is subject to a recall bias. Pinho & Petroski (1997) had already reported that the instruments to assess PAL in children had problems and so far, no technique that is more efficient has been developed. Costa & Assis (2011) also commented on the lack of good accuracy in assessing the children population. Militão et al. (2013) filled a gap in validating an instrument that measured the PAL of children between 10 and 13 years old, which was used in this study.

The results of PAL and body composition suggest that the PAL of adolescents, adults, and the elderly is not sufficient to cause physiological adaptations in changing body fat levels. Although the Quilombola community maintains some cultural habits, complications of modern life regarding health are concerning, as they seem to be reaching these communities, leading to a lifestyle change, as observed in large cities. Despite the strong presence in Brazil of health models focused on curative practices reported by Bezerra & Sorpreso (2016), it is important to consider health promotion as a protective factor, an improvement of life quality, and a reduction of public spending.

Conclusion

The children's body fat indexes are within the recommendations (but the PAL is not). PAL of adolescents, adults, and the elderly is not sufficient to cause physiological adaptations in changing body fat levels. Although the Quilombola community maintains some cultural habits, complications of modern life regarding health are concerning, as they seem to be reaching these communities, leading to a lifestyle change, as observed in large cities.

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†*In memoriam* of Professor Fernando Adami, Ph.D.

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