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Perceived neighborhood assets and anthropometric indicators in schoolchildren living in high-risk urban areas

Indicadores antropométricos e ativos do bairro percebidos em escolares de áreas urbanas de alto risco social

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Abstract – This study examined the association between perceived neighborhood assets and anthropometric markers in schoolchildren living in urban areas at high social risk, comparing findings for arm span with those observed for body mass index (BMI). A cross-sectional study was conducted with 164 schoolchildren (82 girls and 82 boys; aged 6-15 years) from Tegucigalpa, Honduras. An adapted neighborhood assets scale was administered, and its internal structure was evaluated through exploratory factor analysis. The association between perceived community capital and arm span was estimated using hierarchical linear regression while adjusting for age and sex. BMI was examined as a comparative weight-related indicator. Factor analysis identified a three-factor structure with high internal consistency (α = 0.837-0.943). Sex comparisons showed no differences in age, BMI, or arm span, although community capital scores were higher among girls (p = 0.035). In the adjusted model, community capital was positively associated with arm span (β = 0.155; p = 0.004), increasing the explained variance by 2.2%. No significant associations were observed between community capital and BMI. These findings suggest that among schoolchildren living in socially adverse urban contexts, perceived community capital may be associated with a structural marker of physical growth but not with a weight-related indicator. Longitudinal studies are required to clarify the temporal nature and direction of these associations.

Key words: Anthropometry; Child; Growth; Social capital; Urban population.

Resumo – *Este estudo examinou a associação entre ativos do bairro percebidos e marcadores antropométricos em escolares residentes em áreas urbanas de alto risco social, comparando os resultados para a envergadura com aqueles observados para o Índice de Massa Corporal (IMC). Foi realizado um estudo transversal com 164 escolares (82 meninas e 82 meninos; 6-15 anos) de Tegucigalpa, Honduras. Aplicou-se uma escala adaptada de ativos do bairro e sua estrutura interna foi avaliada por meio de análise fatorial exploratória. A associação entre capital comunitário percebido e envergadura foi estimada por regressão linear hierárquica, ajustada por idade e sexo, enquanto o IMC foi analisado como indicador antropométrico de comparação. A análise fatorial identificou uma estrutura trifatorial com elevada consistência interna (α = 0,837-0,943). Não foram observadas diferenças entre sexos para idade, IMC ou envergadura; contudo, o capital comunitário apresentou valores maiores entre as meninas (p = 0,035). No modelo ajustado, o capital comunitário associou-se positivamente à envergadura (β = 0,155; p = 0,004), com incremento de 2,2% na variância explicada. Não foram observadas associações significativas entre capital comunitário e IMC. Estes resultados sugerem que, entre escolares residentes em contextos urbanos socialmente adversos, o capital comunitário percebido pode associar-se a um marcador estrutural de crescimento físico, mas não a um indicador ponderal. Estudos longitudinais são necessários para esclarecer a temporalidade e a natureza dessas associações.*

Palavras-chave: *Antropometria; Criança; Crescimento; Capital social; População urbana.*

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INTRODUCTION

Health surveillance in children and adolescents living in socially adverse urban contexts requires indicators capable of describing relevant dimensions of physical development beyond conventional weight-based parameters. In epidemiological practice, body mass index (BMI) is widely used because of its simplicity and comparability; however, its weight-based nature may not accurately reflect variations in structural dimensions of growth that do not necessarily translate into changes in adiposity. In this context, it is pertinent to consider complementary anthropometric metrics that capture structural aspects of physical growth, particularly those closely related to height and used as alternative indicators in epidemiological research.

Among the available structural markers, arm span has been used as a variable associated with height and as a valid alternative measure in different clinical and epidemiological contexts. Previous studies have documented its close relationship with growth parameters and its usefulness as a stable anthropometric index, particularly in research related to respiratory function and somatic assessment[1-3]. This evidence supports its consideration as a relevant structural indicator in population-based studies.

At the same time, the literature on adolescent development has highlighted the role of community environments as contexts with potential influence on trajectories of well-being and adjustment. The neighborhood assets approach proposes that perceived community resources, such as community social capital, opportunities for youth participation, or identity attachment, may constitute relevant factors in positive development. Health and physical development do not depend exclusively on individual or biological factors but are strongly shaped by the social determinants that configure people's living environments, including neighborhood characteristics and community social capital[4].

Within this perspective, the health assets framework has focused on identifying resources and strengths present in communities that may contribute to well-being and development, particularly in socially vulnerable settings[5]. In the reference study, Oliva and colleagues provided evidence of internal and external validity for the instrument, showing associations between community assets and various indicators of psychosocial adjustment[6]. Likewise, validation in Latin American populations has supported the psychometric robustness of the construct in different sociocultural contexts[7].

However, within the body of studies considered in this field, the relationship between perceived neighborhood assets and structural anthropometric indicators has been scarcely explored. Most research has focused on psychological or behavioral outcomes, whereas the possible correspondence with physical growth metrics remains less documented. This gap becomes particularly relevant in high-risk urban areas, where perceptions of the community environment may reflect dimensions of the social context in which children and adolescents develop, including opportunities for participation, mobility, and social support networks.

From an exploratory perspective, and without assuming causal directionality, examining the association between perceived community assets and different anthropometric indicators may contribute to describing potential correspondences between perceptions of the social environment and dimensions of physical development in children and adolescents living in adverse urban contexts.

In this sense, perceived community social capital can be understood as a psychosocial indicator of the environment that reflects how children and adolescents interpret and experience their community context. Comparing a structural marker (arm span) with a weight-related indicator (BMI) allows the assessment of whether both measures capture in different ways the potential physical expression of perceived community conditions. The aim of this study was to examine the association between perceived neighborhood assets and anthropometric markers in children and adolescents living in high-risk urban areas, and to compare these associations with those observed for body mass index (BMI).

METHODS

Study design and participants

A cross-sectional study was conducted among schoolchildren living in high social-risk urban areas of Tegucigalpa (Honduras). Data collection took place between July and August 2025, within the regular school calendar.

Participants were recruited from the community program "Formación en valores" (Values Education) run by the Fundación Cristo del Picacho, an educational initiative aimed at children attending four schools located in areas considered to be at high social risk in the city. All minors enrolled in the program during the data collection period were invited to participate. Data collection was conducted in two separate sessions: the first session was devoted to the collection of sociodemographic information and administration of the perceived neighborhood assets questionnaire, and the second session was used to obtain anthropometric measurements.

The final sample consisted of 164 participants (82 girls and 82 boys) aged 6 to 15 years. The sample size was determined by the total number of minors enrolled in the community program "Formación en valores" during the data collection period. All children available in the program during July and August 2025 were invited to participate, thus constituting a convenience sample based on the accessible population. No prior sample size calculation was performed because the study was designed to include all available participants with complete data for the variables of interest.

The present study was reported following the recommendations of the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for observational studies. The study was approved by the Research Ethics Committee of the National Autonomous University of Honduras (approval No. PI-05-2025). Written informed consent was obtained from parents or legal guardians, and assent was obtained from the participating children. All data were anonymized prior to analysis, and the principles of confidentiality and voluntary participation were strictly guaranteed throughout the study.

Instruments

Perceived neighborhood assets

Perceived neighborhood assets were assessed using an adapted version of the Neighborhood Assets and Adolescent Adjustment scale developed by Delgado et al.[6]. The original instrument consists of 22 items rated on a Likert scale from 1 to 7.

Because the study population included participants younger than 12 years of age, a linguistic review of the items was conducted to ensure comprehension among younger participants within the age range included in the study. Two items were excluded during this phase, and the wording of one item was adjusted. The adapted version applied in the field consisted of 20 items. Reverse-worded items were recoded to maintain directional consistency. To avoid assuming automatic psychometric equivalence with the original instrument, validated in adolescent populations, an exploratory factor analysis (EFA) was conducted in the study sample. The EFA was performed using the maximum likelihood method with oblimin rotation, given the theoretical expectation of correlation among dimensions. After the exploratory factor analysis, factor loadings (minimum threshold of 0.40) were examined for item retention together with the conceptual coherence of each item. Items that did not meet the minimum loading criteria were removed from the final solution. The internal consistency of the resulting dimensions was estimated using Cronbach's alpha within the study sample. For the main analyses, the mean score of the Community Social Capital dimension was used as the primary predictor variable.

Bias control

To reduce potential sources of information bias, the neighborhood assets questionnaire was administered through individual interviews with each participant, ensuring comprehension of the items among younger children. Interviews were conducted individually to avoid the influence of other participants on responses.

Anthropometric measurements

Anthropometric measurements were obtained by members of the research team following a standardized procedure. Arm span was measured using an anthropometric tape, and body weight was measured using a calibrated scale. These measurements were performed in a session independent from the questionnaire administration to minimize potential interference between the different phases of data collection; Anthropometric variables, Arm span was recorded as a direct anthropometric measure expressed in meters, Body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2). Both variables were treated as continuous variables.

Statistical analysis

Statistical analyses were conducted using SPSS Statistics version 31. Descriptive analyses and Student's t tests were performed to examine potential sex differences in anthropometric variables and community social capital. To examine the association between neighborhood assets and anthropometric markers, hierarchical linear regression models were estimated. In the first block, age and sex were introduced as covariates. In the second block, the Community Social Capital dimension was added.

The models were evaluated using R^2 and change in R^2 (ΔR^2), standardized coefficients (β), 95% confidence intervals, and collinearity diagnostics using tolerance statistics. Models were estimated using the simultaneous entry method.

Missing values were handled using listwise deletion. In the present study, all 164 participants included in the analyses had complete data for the main variables considered in the statistical models. Model assumptions were assessed by visual inspection of standardized residual plots to verify normality and homoscedasticity. Statistical significance was set at $p < 0.05$.

RESULTS

The sample consisted of 164 participants (82 girls and 82 boys) aged 6 to 15 years. The mean age was 9.35 years (SD = 2.03) for girls and 9.76 years (SD = 1.87) for boys, with no statistically significant differences between sexes *($t = -1.32$; $p = 0.189$)*. Mean arm span was 1.28 m (SD = 0.17) in girls and 1.30 m (SD = 0.15) in boys, with no significant differences *($t = -1.02$; $p = 0.310$)*. The mean body mass index (BMI) was 17.44 kg/m^2 (SD = 3.04) in girls and 17.72 kg/m^2 (SD = 3.34) in boys, with no statistically significant differences *($t = -0.54$; $p = 0.592$)*. In the Community Social Capital dimension, a statistically significant difference by sex was observed, with higher scores among girls *(5.19; SD = 0.97)* compared with boys *(4.86; SD = 1.01)* *($t = 2.13$; $p = 0.035$)*. Complete values are presented in Table 1.

Table 1. Anthropometric characteristics and community social capital by sex.

	Girls (n = 82) Mean (SD)	Boys (n = 82) Mean (SD)	t	p
Age	9.35 (2.03)	9.76 (1.87)	-1.31	0.189
Arm span (m)	1.28 (0.17)	1.30 (0.148)	-1.01	0.310
BMI (kg/m2)	17.44 (3.03)	17.72 (3.34)	-0.53	0.592
Community social capital	5.19 (0.97)	4.86 (1.01)	2.12	0.035

Note. Independent samples Student's t test. Equal variances were assumed in all cases (Levene's test $p > 0.05$).

Exploratory factor analysis showed adequate sampling adequacy *(KMO = 0.839)* and a **significant Bartlett's test of sphericity ($\chi^2(190) = 3206.898$; $p < 0.001$)*, confirming the suitability of the data for factor analysis. From the initial matrix of 20 items, one item was removed due to an insufficient factor loading in the rotated solution, resulting in a final 19-item structure. Specifically, item 10 ("*In my neighborhood or community, when adults make decisions that affect young people or minors, they first listen to our opinions*") was removed because it did not reach the minimum factor loading criterion (0.40) in any of the identified factors. The three-factor solution explained 68.54% of the total variance after extraction using the maximum likelihood method. The first factor (Community Social Capital) explained 45.69% of the variance, the second (Youth Activities) explained 14.08%, and the third (Identity Attachment) explained 8.77%. Cronbach's alpha coefficients indicated high internal consistency for Community Social Capital *($\alpha = 0.943$)*, as well as satisfactory values for Youth Activities *($\alpha = 0.897$)* and Identity Attachment *($\alpha = 0.837$)*. Complete results are presented in Table 2.

Table 2. Factor structure and internal consistency of the neighborhood assets scale (n = 164).

Factor	No. of items	Eigenvalue	% Variance	Cumulative %	α
Community social capital	12	8.68	45.69	45.69	0.943
Youth activities	4	2.68	14.08	59.77	0.897
Identity attachment	3	1.67	8.77	68.54	0.837

Note. The final factor solution includes 19 items, following the removal of one item with insufficient factor loading in the rotated matrix. Exploratory factor analysis (EFA) was performed using the maximum likelihood method with oblimin rotation. KMO = 0.839; Bartlett's test of sphericity $\chi^2(190) = 3206.898$, $p < 0.001$.

In addition, the initial model including age and sex explained 59.6% of the variance in arm span (R^2 = 0.596; F(2,150) = 110.781; p < 0.001). Age showed a significant positive association (β = 0.773; p < 0.001), whereas sex did not reach statistical significance. The inclusion of Community Social Capital in the second block significantly increased the explained variance (ΔR^2 = 0.022; $\Delta F(1,149)$ = 8.739; p = 0.004), resulting in a total R^2 of 0.619 (F(3,149) = 80.577; p < 0.001). Community Social Capital was positively associated with arm span (B = 0.025; 95% CI: 0.008-0.041; β = 0.155; p = 0.004), independently of age and sex.

Finally, as shown in Figure 1, the wide dispersion of observations around the regression line reflects the multifactorial nature of physical growth during childhood. Nevertheless, a slight concentration of somewhat higher arm span values can be observed among participants with higher community social capital scores (≈6), a visual pattern consistent with the positive association estimated in the regression model presented in Table 3.

Table 3. Hierarchical linear regression models examining the association between community social capital and arm span (m).

Predictor	Model 1 B (95% CI)	β	p	Model 2 B (95% CI)	β	p
Age	0.064 (0.055, 0.073)	0.773	<0.001	0.062 (0.053, 0.070)	0.748	<0.001
Sex[1]	−0.003 (−0.036, 0.030)	−0.010	0.845	0.007 (−0.026, 0.040)	0.023	0.660
Community social capital	—	—	—	0.025 (0.008, 0.041)	0.155	0.004
R2	0.596			0.619		
ΔR2	—			0.022		
Model F	110.781***			80.577***		

Note. Dependent variable: Arm span (m). CI = 95% confidence interval. Model 1: Age and sex. Model 2: Age, sex, and community social capital. [1] Sex coded as 1 = girl, 2 = boy. *** p < 0.001.

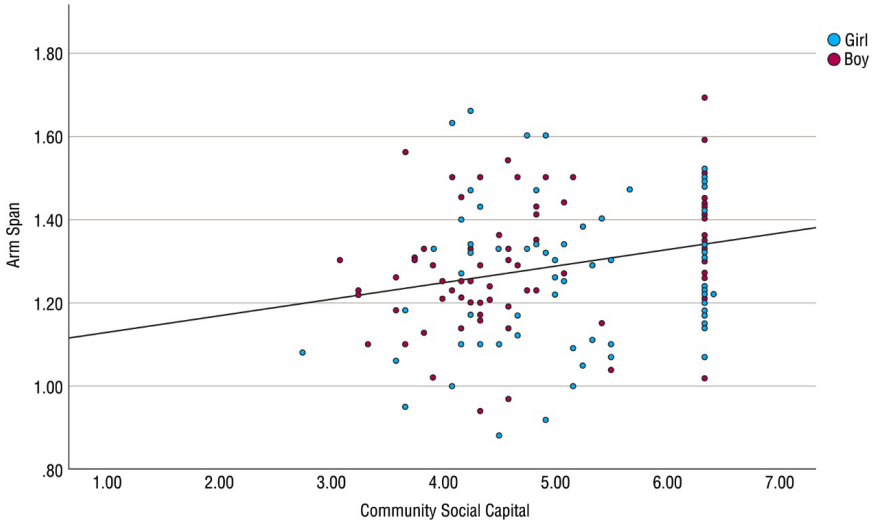

Figure 1. Relationship between perceived community social capital and arm span among schoolchildren in Tegucigalpa by sex.

DISCUSSION

The main finding of this study was the identification of a positive association of modest magnitude between perceived community social capital and arm span among schoolchildren living in urban areas of high social risk, after controlling for age and sex. Although the additional proportion of explained variance was limited,

the identification of small associations may still be informative in population studies exploring relationships between social determinants and dimensions of child physical development. Although modest in magnitude, the observed association remained statistically significant after adjusting for age and sex. While the effect size was modest, the association was statistically significant and consistent with the hypothesis that certain dimensions of the perceived community environment may be related to structural markers of physical growth. In contrast, no associations were observed between community social capital and body mass index, suggesting that different anthropometric indicators may differentially reflect the possible physical expression of social conditions in the surrounding environment.

As expected in a growing child population, age explained a substantial proportion of the variance in arm span, reinforcing the biological coherence of the estimated model. These findings are consistent with a growing body of literature documenting associations between different indicators of social or community capital and child growth. Several studies have shown that community environments characterized by lower social cohesion, weaker support networks, or limited community participation are associated with a higher risk of child growth delay or poorer nutritional indicators. For example, research conducted in Indonesia has identified that lower levels of community social capital are associated with a higher incidence of child stunting, even after controlling for relevant socioeconomic factors [8]. Similarly, studies conducted in Laos have observed that communities with higher levels of social capital show lower levels of child malnutrition[9], while research in Andean contexts has identified associations between community factors and different indicators of child growth and food security[10]. Although most of these studies have focused on indicators such as height-for-age or chronic malnutrition, their findings suggest that the social conditions of the community environment may constitute relevant determinants of child physical development.

One way to contextualize this association can be found in the literature on social determinants of child growth. Several studies have suggested that social conditions within the surrounding environment, including community cohesion, perceptions of safety, and the availability of support networks, may indirectly influence child health through multiple contextual mechanisms. These mechanisms may include reduced family stress, increased community supervision of children, more stable access to local resources, and greater participation in structured activities. In urban settings characterized by social inequality or high exposure to violence, these dimensions of the community environment may play a particularly relevant role in shaping child health trajectories[11-13].

An important aspect of these findings is the discrepancy observed between anthropometric indicators: while community social capital was associated with arm span, no associations were found with BMI. This difference is conceptually plausible, as arm span has been described as a marker highly correlated with height and therefore closer to relatively stable processes of linear growth, whereas BMI simultaneously integrates weight and height and may be more sensitive to recent variations in dietary intake, physical activity, and body composition. In this sense, the absence of association with BMI does not necessarily contradict the relationship observed with a structural marker of growth but rather suggests that different indicators capture distinct dimensions of nutritional status and physical development. In adverse urban contexts, where chronic constraints and fluctuating exposures may coexist, this pattern reinforces the value of using complementary measures to characterize child and adolescent physical development[1-3,14].

From a public health perspective, these findings reinforce the importance of considering community environments as part of the ecosystem of factors that may accompany child health and development. These environments and the resources available in the neighborhood constitute relevant social determinants of child health and well-being, in line with the health assets approach, which emphasizes the role of community resources in promoting well-being and development in vulnerable populations[15]. Accumulated evidence on the social determinants of health has highlighted those urban environmental conditions, including community cohesion, perceptions of safety, and the availability of local resources, may shape contexts that are more or less favorable for child well-being[16]. Although the results of the present study do not allow causal relationships to be established, the observed association suggests that perceptions of community social capital may form part of the contextual factors accompanying child growth trajectories in vulnerable urban environments[12,13]. In this sense, promoting safe, cohesive community environments with opportunities for children's participation may represent a complementary dimension within comprehensive strategies aimed at reducing inequalities in child health[11]. Moreover, our results should also be interpreted within the broader framework of the social determinants of health characterizing contexts of urban vulnerability. Recent research has shown that living conditions in socially disadvantaged neighborhoods generate cumulative exposures that affect multiple health outcomes[17].

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design prevents causal relationships from being established between perceptions of the community environment and the observed anthropometric indicators. Second, the measurement of community social capital was based on self-reported perceptions, and direct indicators of family socioeconomic status or nutritional status were not available, meaning that residual confounding cannot be ruled out. In addition, although arm span is closely related to linear growth, its interpretation as a proxy of physical development should be made with caution. Finally, given the contextual nature of the study conducted among schoolchildren from urban areas of high social risk in Tegucigalpa, the transferability of the findings to other urban settings in the Region of the Americas requires confirmation through further research.

CONCLUSIONS

In this sample of schoolchildren living in urban areas of high social risk, perceived community social capital showed a positive association with arm span after controlling for age and sex, an association that was not observed with body mass index. These findings suggest that different anthropometric indicators may differentially reflect the possible physical expression of perceived community conditions.

Given the cross-sectional design, these results should be interpreted with caution; longitudinal studies will help clarify the nature and temporality of these associations. However, from a public health perspective, the findings suggest that perceptions of the community environment may form part of the contextual factors accompanying child growth trajectories in vulnerable urban settings. The integration of community-level indicators into child health surveillance systems may contribute to a broader understanding of inequalities in physical development.

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COMPLIANCE WITH ETHICAL STANDARDS

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Ethical approval

Ethical approval was obtained from the Research Ethics Committee involving Human Beings of the National Autonomous University of Honduras, and the protocol was written in accordance with the standards established by the Declaration of Helsinki (approval No. PI-05-2025).

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conceptualization: NCL; Funding acquisition: NCL; Investigation: NCL, KLML, JCC, EML; Methodology: NCL; Project administration: NCL, KLML; Resources: NCL, KLML; Supervision: NCL; Validation: NCL, KLML, JCC, EML; Visualization: NCL, KLML, JCC, EML; Writing – original draft preparation: NCL, KLML, JCC, EML. All authors read and approved the final version of the manuscript.

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