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Associations between community programmes and policies and children's physical activity: the Healthy Communities Study

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Summary

Background: Community initiatives to promote physical activity in children are common, but evidence supporting their effectiveness is limited.

Objectives: The objective of this study is to examine the relationships between community programmes and policies and children's physical activity in a large and diverse sample of US communities.

Methods: Programmes and policies to promote children's physical activity were assessed in 130 communities by key informant interviews, and physical activity behaviours were measured by self-report and parental report in samples of children in each community (total n = 5138). Associations between composite indices of community programmes and policies and indicators of total and moderate-to-vigorous physical activity were examined without and with adjustment for demographic factors.

Results: An index reflecting the 6-year history of the number of behaviour change strategies used in community programmes and policies was positively associated with children's moderate-to-vigorous physical activity. This association was attenuated with adjustment for demographic factors. Effect modification analyses found that the association was positive among non-Hispanic children but was negative for Hispanic children.

Conclusions: Community initiatives to promote physical activity in children were positively associated with children's physical activity in non-Hispanic children. Such initiatives were negatively associated with physical activity in Hispanic children, suggesting that future research should consider unique cultural factors when designing community initiatives to promote activity in this population sub-group.

What is already known about this subject?

- Most children and youth in the USA do not meet current physical activity guidelines.
- Children's physical activity levels vary across gender and race/ethnicity groups, and they also vary across school and community groups.
- Previous community interventions to increase children's physical activity have yielded modest and inconsistent outcomes.

What this study adds?

- An index that is reflective of community programmes and policies aimed at increasing physical activity was found to be positively related to children's physical activity but only in non-Hispanic children.
- This study shows that community initiatives to promote children's physical activity operate inconsistently across ethnicity groups.
- Research is needed to identify community programmes and policies that positively influence physical activity in Hispanic children.

Keywords: Children, community, obesity prevention programmes, physical activity.

Abbreviations: CPP, community programmes and policies; HCS, Healthy Communities Study; KI, key informants; MVPA, moderate-to-vigorous physical activity

Introduction

Physical activity provides multiple health benefits to children and youth (1), and low physical activity is an important precursor to excessive weight gain and development of overweight in youth (2). Accordingly, prominent national organizations, including the Institute of Medicine, have recommended that public health efforts to reduce childhood obesity emphasize promotion of physical activity (3). In response to these recommendations, numerous communities across the USA have implemented programmes and policies to increase children's physical activity levels. However, such efforts have been informed by a limited base of scientific evidence. The Guide to Community Preventive Services has recommended built environment strategies and community-wide campaigns as effective approaches to promoting physical activity (4,5). However, recent reviews have indicated that the available evidence is not sufficiently robust to conclude that community interventions consistently increase physical activity (6,7). The Institute of Medicine has cited this deficiency as a critical gap that should be addressed to make progress in reducing childhood obesity (8).

Physical activity levels in children vary across gender and race/ethnicity groups (9), and levels also vary across school and community groups (10,11). Few previous studies have examined whether community programmes and policies (CPPs) are equally effective across different population sub-groups or in different types of communities. Most previous studies that examined the moderating influence of demographic factors focused on individual characteristics (12,13). A few studies have focused on community-level moderators, but they examined adults (14–16). We know of no previous studies of children's physical activity that have considered the moderating influence of socio-demographic factors at both the individual and community levels in a large and diverse sample of communities.

The Healthy Communities Study (HCS) was a large observational investigation of CPPs aimed at reducing childhood obesity. In each community, the HCS collected information on programmes and policies to increase children's physical activity and assessed physical activity behaviour in samples of children (17). Socio-demographic factors were measured at both the community and family/child levels. The primary purpose of this specific investigation was to use the extensive resources of the HCS to examine the relationship between composite indicators of CPPs to promote physical activity in children and measures of children's physical activity. A secondary purpose was to examine the moderating effects of community socio-demographic characteristics on the association between CPPs and children's physical activity levels.

Methods

Study design

Data were drawn from the HCS, an observational study of 130 communities which included both cross-sectional and retrospective longitudinal components. A complex sampling process was used in selecting communities for inclusion in the study, and it has been described elsewhere (18). Briefly, communities were selected based on known efforts to implement programmes and policies targeting childhood obesity ('certainty' communities, $N = 28$) and from a probability sample based on race and ethnicity, income and regional distributions (national probability sample, $N = 102$). Children were recruited from two elementary and two middle schools that fed students to a defined high school in each study community (19). Up to 81 children per community were recruited and enrolled in data collection (20). Children who were institutionalized, non-ambulatory or had lived at their current address for less than 1 year were not eligible to participate. Data collection occurred from November 2013 through July 2015. Data were collected year round and simultaneously in several communities at a time throughout the data collection period. The study was approved by the Battelle Memorial Institute IRB, and all parents and children over the age of 8 provided written consent or assent, respectively.

Community demographic variables

Community-level characteristics were derived from the American Community Survey using 3-year estimates from 2011 to 2013. Each community was characterized based on weighted census tract minority status (>30% African-American, > 30% Hispanic or Other), income (high or low), urbanicity (urban,

suburban or rural) and region (Northeast, West, Midwest or South). Additional community-level demographic variables were based on census tract data and included percentages of children who were African American, White, Hispanic or other races; percentage of persons living below the poverty line; percentage of high school graduates; percentage unemployed; percentages of housing units that were renter-occupied or vacant; and percentage of population with health insurance (18). These characteristics were selected because previous research has often found them to be related to health behaviours and health outcomes.

Measurement of community programmes and policies

In each community, trained field data collection staff conducted interviews with 10–14 key informants (KI) who represented multiple sectors, including schools, government, non-profit organizations, service agencies and health groups. A data collection staff member completed a structured interview with each KI regarding the implementation of CPPs over the past 10 years. The interviews were conducted either in person or over the telephone. In addition, interviewers reviewed documents provided by the KI and identified additional information through online sources to supplement information provided during the interviews (21).

As part of the interview process, KIs reported on the duration of CPPs (one-time event, occurring more than once or ongoing), the behaviour change strategies used in implementing CPPs (listed subsequently) and the reach of CPPs (high, medium or low based on proportion of children ages 4–15 that may have been exposed). Children in the 4–15-year age range were referenced because these ages are typical for children attending elementary and middle schools. Data collected through the interview and document review process yielded characterizations of CPPs for each year over a 10-year period in each community.

Two CPP indices were created, using only the CPPs for which physical activity was a target, to serve as exposure variables in statistical analyses. A comprehensive CPP intensity score index, CPP-Int, was created from three CPP attributes: behaviour change strategy, duration of the CPP and reach. Each of these attributes was scored as 0.1, 0.55 or 1.0, in order of strength, and the three scores were summed to create a score for each CPP (22). CPP-Int for each community was created by summing the attribute scores for all CPPs observed in the community that promoted physical activity. Prior to including CPP-Int scores in the statistical analyses, the scores were standardized such that each community had a score between 0 and 1.

A second CPP index, CPP-Strat, was created to describe communities on the basis of the range of behaviour change strategies employed in CPPs that were designed to promote physical activity in children. CPPs were scored as employing one of five behaviour change strategies. Table S1 lists the five behaviour change strategies, which vary in level of sophistication from educational strategies to policy and systems changes. For each observed year, each community received a score between 1 and 5 that reflected the number of different behaviour change strategies used in that community.

For both of the CPP indices, scores were calculated for each of the 10 years prior to collection of data in the community, using CPP start and end dates provided by the KIs. The analyses conducted in the present study were based on CPP-Int and CPP-Strat indices for 1 and 6 years preceding data collection.

Home visit procedures

Parents/caregivers and children completed the HCS standard protocol assessment during an in-home visit by a trained field data collector. For the child-report sections of the survey, children ages 9 to 15 were the primary respondents, with parents/guardians asked to assist children ages 9 to 11 as needed. For children ages 4 to 8, parents/guardians responded to the questions. Parents reported the participating child's age, gender, race and ethnicity during the household interview. Child height, weight and waist circumference were measured according to standardized procedures, and body mass index (kg m^{-2}) was calculated for each child participant (23).

Measurement of children's physical activity

Physical activity behaviour was measured using self-report or parental report of participation in selected forms of physical activity that CPPs were hypothesized to influence (17). Children or parents/guardians reported the child's participation in 15 physical activities over the past 7 d (17). Respondents indicated whether or not the child participated in each activity during the past week, the days on which he or she did the activity and the average intensity of the activity (light, moderate, hard or very hard). (The list of activities is included in Table S2.)

Physical activity data were reduced to two metrics reflecting child-level physical activity behaviour. A total

physical activity index was calculated from the number of activities reported multiplied by the frequency of participation in those activities. A moderate-to-vigorous physical activity (MVPA) index was calculated using the subset of 11 activities that are typically performed at moderate to vigorous intensity.

Data analysis

To adjust for missing data, multiple imputation techniques (24) were used for analyses. Analyses were conducted using SAS and R. Results were integrated across 20 imputed datasets. Generalized linear mixed models were used to assess relationships between childhood physical activity outcomes and standardized CPP indices, while adjusting for the anticipated correlation among participants from within the same school/community. The models included fixed effects for gender-specific (quadratic polynomial) age curves and the CPP indices and a random effect for community intercepts.

Prior to analysis, the observed CPP scores were standardized to span a [0–1] range. The regression coefficient for the association between the CPP indices and childhood physical activity is interpreted as the average change in childhood physical activity between a community rated as having maximum intensity of programmes and policies (1) and one rated as having minimal intensity (0), after adjusting for age and gender and accounting for community. A fully adjusted model that included other child/family factors (related to race, ethnicity, family income, parental education, parental employment status and seasonality) and community factors (related to race, income, education, employment and region) was also used to assess the covariate adjusted relationship between childhood physical activity and CPP indices. These child-level, family-level and community-level covariates were identified using a least absolute shrinkage and selection operator methodology (25).

Interaction terms were added to the aforementioned model to assess whether the relationship between CPP and physical activity differed within specific subpopulations defined by either child or family characteristics, such as gender, grade, race, ethnicity or income, or community characteristics, such as region, income or race/ethnic composition. Type-III *F* tests and *t* tests were used to assess the statistical significance of the relationship within each subpopulation. Factors representing the proportion of the population in each community that has a specific attribute were also explored as potential effect modifiers. Linear interaction terms were combined with CPP scores in the minimally and fully adjusted models, allowing assessment of whether the physical activity/CPP relationship differs linearly as a function of these community proportional variables.

Results

Approximately one third of the communities were classified as predominantly Hispanic, and about one fourth were classified as predominantly African-American (Table 1). Over one third of the communities (38%) were categorized as low income, one fifth were rural (23%) and 42% were located in Southern states. Children in the sample were evenly distributed by gender and grade. Approximately 45% of the children were Hispanic, and 20% were African-American. A high percentage of children were from lower-income families (27% with income less than $20 K and 24% with income between $20 and $35 K).

For both 1-year and 6-year CPP-Int and CPP-Strat indices, large ranges were observed for scores across the 130 communities (Table 2). For the 1-year indices, no significant associations were observed with either total physical activity or MVPA. Likewise, the 6-year CPP-Int index was not associated with either of the physical activity variables. However, the 6-year expression of CPP-Strat was significantly associated with MVPA ($P = 0.02$). After adjustment for demographic covariates, this relationship was attenuated and was no longer statistically significant.

Several potential moderators of the relationship between CPP-Strat and MVPA were examined, and the findings are presented in Table 3. Among the child-level characteristics, a significant interaction was found for child ethnicity ($P = 0.03$). Among children who identified as non-Hispanic, a positive association was observed for the relationship between CPP-Strat and MVPA. However, among those identifying as Hispanic, an inverse relationship between those variables was observed. Among the community-level characteristics that were examined as potential effect modifiers, a marginally significant interaction was observed for income at the census tract level ($P = 0.09$). A positive association between CPP-Strat and MVPA was observed for those living in higher income census tracts, whereas the opposite association was observed for those living in lower income tracts. A similar non-significant pattern was observed for family income as reported by the parents. For the two lowest income categories, the associations between CPP-Strat and MVPA were negative, but the associations were positive for the higher income categories.

Table 1 Participant and community demographic characteristics

Child/family participants	*N* (%)
Overall	5138
Gender	
Males	2524 (49.1)
Females	2614 (50.9)
Grade	
K-2	1935 (37.7)
3–5	1637 (31.9)
6–8	1566 (30.5)
Family income	
<$20 k	1261 (24.5)
$20–35 k	1109 (21.6)
$35–50 k	602 (11.7)
$50–75 k	517 (10.1)
$75–100 k	383 (7.5)
>$100 k	840 (16.4)
Do not know/refused/missing	426 (8.3)
Child race	
White	2924 (56.9)
African-American	960 (18.7)
Other	234 (4.5)
More than one race, including AA	148 (2.9)
More than one race, excluding AA	79 (1.5)
Do not know/refused/missing	793 (15.4)
Child ethnicity	
Not Hispanic	2767 (53.9)
Hispanic	2225 (43.3)
Do not know/refused/missing	146 (2.8)
Maximum parent education	
No HS	434 (8.5)
Some HS	713 (13.9)
HS	979 (19.1)
Some college	646 (12.8)
Associates degree	591 (11.5)
Bachelor's degree	756 (14.7)
Masters and above	844 (16.4)
Missing	175 (3.4)
Maximum parent employment	
Full time	3424 (66.6)
Part time	510 (9.9)
Unemployed or on leave	309 (6.0)
Retired or disabled	164 (3.2)
Homemaker/student/other	393 (7.6)
Missing	338 (6.6)

(*continues*)

Community characteristics	*N* (%)
Overall	130
Census tract minority	
African American	34 (26.2)
Hispanic	42 (32.3)
Other	54 (41.5)
Census tract income	
High	80 (61.5)
Low	50 (38.5)
Census tract urbanicity	
Urban	50 (38.5)
Suburban	50 (38.5)
Rural	30 (23.0)
Region	
Northeast	20 (15.4)
Midwest	26 (20.0)
South	55 (42.3)
West	29 (22.3)

AA, African-American; HS, high school.

Discussion

The key finding of the present study was that an index that reflected the diversity of strategies used in promotion of children's physical activity was positively associated with children's participation in MVPA, but only among non-Hispanic children. This finding suggests that community investments in promotion of physical activity may positively influence children's physical activity levels, but that this effect operates inconsistently across ethnicity groups. The index of CPPs that was associated with children's physical activity was based on assessment of the behaviour change strategies that communities applied in initiatives that were aimed at promoting children's physical activity. Each initiative was rated as applying one of five behaviour change strategies, which are listed in Table S1. The strategies ranged in sophistication from basic (providing information) to higher level (modifying policies or systems). Communities with higher scores on this index had implemented initiatives that employed more diverse behaviour change strategies. For example, a community with a maximum score of five would have implemented initiatives that used all five levels of behaviour change strategies. It is important to note that this index, but not the more comprehensive index (CPP-Int), was found to be associated with children's physical activity. This may indicate that the behaviour change strategy index (CPP-Strat) reflects a community's level of sophistication in its approach to promoting children's physical activity and

Table 2 CPP indices for 130 communities and association between CPP-Int, CPP-Strat and children's TPA index and MVPA index

				TPA				MVPA			
				Base model‡		Covariate model§		Base model‡		Covariate model§	
	Score (SE)	Range	Standardized score (SE; range 0–1)	Slope (std. error)	*P* value	Slope (std. error)	*P* value	Slope (std. error)	*P* value	Slope (std. error)	*P* value
1-year indices											
CPP-Int*	23.97 (0.73)	8.42–53.47	0.35 (0.02)	0.84 (1.70)	0.62	0.44 (1.49)	0.77	0.61 (1.39)	0.66	0.06 (1.18)	0.72
CPP-Strat†	4.69 (0.05)	3–5	0.85 (0.02)	1.04 (1.20)	0.39	0.38 (1.07)	0.96	1.38 (0.98)	0.16	0.41 (0.85)	0.63
6-year indices											
CPP-Int*	119.83 (3.74)	41.88–261.97	0.35 (0.02)	0.63 (1.63)	0.70	−0.03 (1.14)	0.99	0.55 (1.34)	0.10	−0.24 (1.14)	0.41
CPP-Strat†	27.27 (0.29)	18–30	0.66 (0.02)	2.18 (1.34)	0.68	0.99 (0.97)	0.83	2.54 (1.09)	0.02	0.99 (0.97)	0.31

*CPP Intensity Score Composite Index.
†CPP Strategy Score Index.
‡Base model: adjusted for age, gender and age polynomial.
§Covariate model: adjusted for base model plus family income, max parent education, max parent employment, child race, child ethnicity, seasonality, region, community census tract income, community census tract percent African American, community census tract percent high school graduate and community census tract percent unemployed.
CPP, community programmes and policies; TPA, total physical activity; MVPA, moderate-to-vigorous physical activity.

that the comprehensive index (CPP-Int) includes elements that tend to attenuate the more salient effects of CPP-Strat.

The HCS employed a study design that was fundamentally cross-sectional but that included collection of retrospective data on CPPs. Accordingly, it was possible to examine community initiatives as quantified over multiple years. It is noteworthy that, in the present study, a significant association between CPPs was found for the 6-year exposure variable but not the 1-year variable. This suggests that community initiatives to promote children's physical activity are more likely to be effective if they are sustained in the long term. This observation is consistent with widely accepted theories of health behaviour such as RE-AIM, which posits that the effectiveness of an intervention is dependent, in part, on the extent to which it is institutionalized and becomes a routine component of organizational practices and policies (26). Further, this finding is consistent with experience and research on health habit formation for a range of health behaviours (27).

This study examined a number of potential effect modifiers, and an important finding was that the association of CPPs with children's physical activity was modified by family race/ethnicity. Specifically, we observed that CPP-Strat was positively associated with children's MVPA in non-Hispanic children but was negatively associated with physical activity among children in Hispanic families. This finding may indicate that current approaches to community health promotion, as reflected by the CPP indices examined in the HCS, have evolved primarily from research and practice in non-Hispanic segments of the population. Accordingly, such approaches may be effective in those groups but may not be applicable in Hispanic groups. While Hispanic sub-groups of the US population may share some cultural characteristics, such as strong emphasis on the family as a source of social support, it is important to note that Hispanic families vary greatly based on national origin, geographic characteristics and factors related to acculturation.

Our finding that CPPs were negatively associated with Hispanic children's physical activity may be explained by multiple factors that could influence the effectiveness of community-based physical activity interventions. Specifically, the built environments in which these interventions took place for Hispanic participants may not have supported the intervention activities. For example, intervention effects may have been diminished in groups that experienced limited access to parks and playgrounds and/or if safety concerns limited physical activity. In addition, studies have

Table 3 Summary of analyses examining demographic effect modifiers of the relationships between 6-year CPP-Strat and moderate-to-vigorous physical activity

	Base model*			Full model†		
Effect modifier	Average CPP slope (SE)	Difference from average (SE)	*P* value	Average CPP slope (SE)	Difference from average (SE)	*P* value
Individual level characteristics						
Grade	2.54 (1.09)			0.96 (0.97)		
K-2		−0.24 (0.41)	0.561		−0.32 (0.41)	0.430
3–5		0.13 (0.30)	0.663		0.14 (0.30)	0.642
6–8		0.16 (0.51)	0.754		0.25 (0.50)	0.613
Race	2.59 (1.11)			0.95 (0.98)		
Black only		−0.32 (1.03)	0.752		−0.05 (1.10)	0.967
Black-multi		−0.30 (2.32)	0.900		0.79 (2.68)	0.767
Not Black-multi		0.55 (3.59)	0.879		1.18 (3.99)	0.768
Other		0.09 (2.27)	0.969		0.15 (2.47)	0.951
White only		0.09 (0.33)	0.794		−0.06 (0.36)	0.869
Ethnicity	2.48 (1.11)			0.89 (0.97)		
Hispanic		−1.24 (0.67)	0.065		−1.42 (0.68)	0.03
Non-Hispanic		1.01 (0.55)	0.065		1.15 (0.53)	0.03
Family income	2.53 (1.10)			1.10 (0.98)		
<20,000		−1.52 (0.88)	0.117		−1.41 (0.86)	0.102
20–35,000		−0.60 (0.88)	0.493		−0.36 (0.93)	0.702
35–50,000		1.53 (1.23)	0.212		1.53 (1.27)	0.230
50–75,000		−0.03 (1.47)	0.983		0.23 (0.68)	0.893
75–100,00		1.09 (1.69)	0.520		0.15 (1.94)	0.937
>100,000		1.16 (1.32)	0.381		1.35 (1.51)	0.370
Sex	2.54 (1.09)			0.96 (0.97)		
Female		−0.17 (0.49)	0.724		−0.18 (0.48)	0.712
Male		0.18 (0.51)	0.724		0.19 (0.50)	0.712
Parent education	2.56 (1.1)			0.99 (0.98)		
No HS		−0.39 (1.65)	0.813		−0.75 (1.64)	0.647
Some HS		−0.75 (1.21)	0.534		−0.81 (1.19)	0.496
HS graduate		−0.40 (0.99)	0.689		−0.60 (0.99)	0.546
Some college		1.76 (1.25)	0.160		1.71 (0.24)	0.168
Associates		−1.42 (1.40)	0.311		−1.06 (1.40)	0.450
Bachelor's		1.03 (1.34)	0.440		1.02 (1.33)	0.443
Master's or higher		−0.004 (1.41)	0.998		0.26 (1.38)	0.854
Parent employment	2.57 (1.1)			1.09 (0.97)		
Full-time		0.30 (0.31)	0.329		0.22 (0.31)	0.475
Part-time		−1.60 (1.40)	0.254		−1.38 (1.39)	0.323
Unemployed or leave		−2.75 (1.77)	0.120		−2.29 (1.75)	0.191
Retired or disabled		−3.15 (2.43)	0.194		−2.66 (2.39)	0.266
Home/student/other		2.76 (1.80)	0.125		2.69 (1.79)	0.132
Community level characteristics						
Region	2.57 (1.1)			0.85 (1.02)		
Midwest		−0.83 (1.80)	0.643		0.34 (1.61)	0.834
Northeast		2.74 (2.77)	0.323		2.28 (2.48)	0.358
South		−1.21 (1.34)	0.367		−1.44 (1.29)	0.266
West		1.02 (1.80)	0.570		0.76 (1.71)	0.658

(*continues*)

Table 3 (Continued)

	Base model*			Full model†		
Effect modifier	Average CPP slope (SE)	Difference from average (SE)	*P* value	Average CPP slope (SE)	Difference from average (SE)	*P* value
Census tract minority	2.54 (1.14)			1.10 (1.01)		
African American		−2.14 (1.80)	0.233		−1.12 (1.56)	0.473
Hispanic		1.83 (1.36)	0.178		1.35 (1.20)	0.264
Other		−0.73 (1.46)	0.617		−0.77 (1.27)	0.545
Census tract income	2.59 (1.09)			0.93 (0.96)		
High		0.90 (0.77)	0.243		1.10 (0.65)	0.092
Low		−1.70 (1.45)	0.243		−2.06 (1.22)	0.092
Census tract urbanicity	2.32 (1.12)			0.73 (0.99)		
Rural		−1.83 (2.36)	0.438		−2.55 (2.01)	0.203
Suburban		0.03 (1.33)	0.984		0.49 (1.12)	0.663
Urban		1.07 (1.39)	0.442		1.02 (1.18)	0.391
Community demographics						
% Hispanic	2.13 (1.76)	1.26 (4.34)	0.226	1.13 (1.52)	−0.74 (3.71)	0.842
% African American	2.14 (1.46)	−1.60 (3.999)	0.141	1.15 (1.36)	−0.75 (3.61)	0.836
% Poverty	2.01 (2.50)	1.71 (9.87)	0.422	1.51 (2.15)	−2.74 (8.59)	0.749
% HS graduate	5.03 (10.61)	−3.07 (13.11)	0.636	−6.92 (8.85)	9.74 (10.90)	0.371

*Base model: adjusted for age, gender and age polynomial.
†Full model: adjusted for base model plus family income, max parent education, max parent employment, child race, child ethnicity, seasonality, region, community census tract income, community census tract percent African American, community census tract percent high school graduate and community census tract percent unemployed.
CPP, community programmes and policies; HS, high school.

shown that parents of Hispanic children may not promote physical activity to the same degree as parents of non-Hispanic children (28). Intervention strategies that have been shown to be successful in Hispanic communities include culturally tailored programming and programming that utilizes Promotoras or community health workers (29,30). It is not clear whether the interventions that were available to Hispanic participants in their communities were culturally tailored. Finally, it is also possible that these families did not have the means to facilitate physical activity by providing transportation to events and/or to pay for the programming (31). Future research is needed that would examine these and other barriers (32).

Important strengths of the present study include the substantial size and diversity of the communities included in the sample and the extensive nature of the information available on CPPs aimed at increasing children's physical activity. Further, it is a strength that CPPs were characterized for a period of 6 years prior to collection of outcome data. Significant limitations include the cross-sectional study design, which precludes establishing causal relationships between exposure and outcome variables. Also, it is a limitation that the indices used to assess children's physical activity levels were based on self-reported participation in specific, common forms of physical activity, and the retrospective reporting of CPPs by key informants was subject to recall limitations. Further, it is a limitation that the two ethnicity groups considered in this study, Hispanic and non-Hispanic, were both racially and culturally diverse.

In summary, associations between indices that reflect community-level programmes and policies to promote children's physical activity and children's activity levels were studied in diverse samples of US communities and children. The study found that an index based on the behaviour change strategies used in community initiatives over a 6-year period was positively associated with non-Hispanic children's physical activity levels. The analogous association was negative in Hispanic children. Additional research is needed to better understand CPPs that are intended to promote physical activity in Hispanic children.

Conflicts of interest statement

No conflict of interest was declared.

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Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Table S1. Examples of Behavioural Intervention Strategies

Table S2. Physical Activity behaviours contributing to total physical activity (TPA) and moderate-to-vigorous physical activity (MVPA)