
Physical Activity Interventions in Latin America

A Systematic Review

Christine M. Hoehner, PhD, MSPH, Jesus Soares, ScD, Diana Parra Perez, CPT, Isabela C. Ribeiro, PhD, MSc, Corinne E. Joshu, MA, MPH, Michael Pratt, MD, MPH, Branka D. Legetic, MD, PhD, MPH, Deborah Carvalho Malta, MD, PhD, Victor R. Matsudo, MD, PhD, Luiz Roberto Ramos, MD, PhD, Eduardo J. Simões, MD, MSc, MPH, Ross C. Brownson, PhD

Background: Recommendations for physical activity in the *Guide to Community Preventive Services* (the *Community Guide*) have not been systematically examined or applied in developing countries such as those in Latin America. The aim of this systematic review was to assess the current evidence base concerning interventions to increase physical activity in Latin America using a modified *Community Guide* process and to develop evidence-based recommendations for physical activity interventions.

Methods: In 2006, a literature review of both peer-reviewed and non-peer-reviewed literature in Portuguese, Spanish, and English was carried out to identify physical activity interventions conducted in community settings in Latin America. Intervention studies were identified by searching ten databases using 16 search terms related to physical activity, fitness, health promotion, and community interventions. All intervention studies related to physical activity were summarized into tables. Six reviewers independently classified the intervention studies by the categories used in the *Community Guide* and screened the studies for inclusion in a systematic abstraction process to assess the strength of the evidence. Five trained researchers conducted the abstractions.

Results: The literature search identified 903 peer-reviewed articles and 142 Brazilian theses related to physical activity, of which 19 were selected for full abstraction. Only for school-based physical education classes was the strength of the evidence from Latin America sufficient to support a practice recommendation.

Conclusions: This systematic review highlights the need for rigorous evaluation of promising interventions to increase physical activity in Latin America. Implementation and maintenance of school physical education programs and policies should be strongly encouraged to promote the health of Latin American children.

(Am J Prev Med 2008;34(3):224–233) © 2008 American Journal of Preventive Medicine

From the Prevention Research Center, Saint Louis University School of Public Health (Hoehner, Soares, Perez, Joshu, Brownson), St. Louis, Missouri; Physical Activity and Health Branch, Division of Nutrition and Physical Activity (Soares, Ribeiro, Pratt) and Prevention Research Centers Program (Simões), Centers for Disease Control and Prevention, Atlanta, Georgia; World Health Organization/Pan American Health Organization Regional Office (Legetic), Washington DC; Division of Situation Analysis and Prevention of Non-transmissible Diseases, Brazil Ministry of Health (Malta); Centro de Estudos do Laboratório de Aptidão Física de São Caetano de Sul (Matsudo); and Department of Preventive Medicine, Universidade Federal de São Paulo (UNIFESP) (Ramos), São Paulo, Brazil

Address correspondence and reprint requests to: Christine Hoehner, PhD, Saint Louis University School of Public Health, Salus Center, Room 474, 3545 Lafayette Avenue, St. Louis MO 63104. E-mail: hoehnerc@slu.edu.

The full text of this article is available via AJPM Online at www.ajpm-online.net; 1 unit of Category-1 CME credit is also available, with details on the website.

Introduction

The majority of low- and middle-income countries¹ (hereafter “developing countries”) are experiencing a shift from a high prevalence of infectious diseases to a high prevalence of noncommunicable diseases (e.g., cardiovascular disease).² These shifts are due in part to rapid urbanization and globalization processes in which behaviors, lifestyles, and living situations are changing at a significant pace. According to the last World Bank report, 56% of all deaths in developing countries may be attributed to noncommunicable diseases,³ and the WHO estimates that by 2020, 80% of all deaths may be attributed to these diseases.⁴ The growing burden that chronic disease is placing on developing nations is increasing attention to risk factors such as sedentary lifestyles⁵ and encouraging population-based studies of such risk factors in Latin American regions. For example, a population-based survey of adults in North-east and Southeast Brazil,⁶ where approximately 70% of

Brazilians live, reported that the prevalence of physical inactivity (0 days of 30 minutes of leisure-time activity per week) was 87% between 1996 and 1997.

In recent years, increasing attention has been paid to community-based interventions to promote physical activity as a critical piece of an overall strategy to increase health among populations.⁷ For example, in May 2004, in response to the increasing global epidemic of noncommunicable diseases, the WHO released a global strategy on diet and physical activity.⁸ Bauman et al.⁷ developed a six-step framework for internationally disseminating the WHO strategy that would promote its implementation. They concluded that more evaluation as well as the international dissemination of effective evidence-based interventions to promote physical activity is needed.⁷ Likewise, the U.S. Task Force on Community Preventive Services recently published the *Guide to Community Preventive Services* (the *Community Guide*), an evaluation of the effectiveness of public health strategies in 17 areas, including physical activity.⁹ The *Community Guide* constitutes a highly valued and objective evidence-based resource for guiding current and future public health activities.⁹ The physical activity interventions reviewed for the *Community Guide* include informational, social and behavioral, and environmental and policy approaches to increase physical activity levels in the community.^{10,11}

Although many promising interventions to promote physical activity are being carried out in Latin America,¹² the types and effectiveness of most interventions in the region have not been systematically examined. Moreover, the application of the methods and findings of the *Community Guide* to developing countries, such as those in Latin America, is unknown. Namely, several issues are unclear: (1) Do Latin American interventions correspond to categories in the *Community Guide*? (2) What is the body of evidence when Latin American interventions are subjected to rigorous review criteria? and (3) Are the *Community Guide* recommendations generalizable to Latin America?

This paper describes: (1) a systematic review of the Latin American literature on strategies for promoting physical activity in the community and (2) an examination of the *Community Guide*'s applicability. This review includes the first phase of a project entitled Guide for Useful Interventions for Activity (or GUIA, a term that means "guide" in both Portuguese and Spanish) in Brazil and Latin America. The overarching goal of GUIA is to develop evidence-based strategies for promoting physical activity in Brazil and throughout Latin America. Researchers at Saint Louis University School of Public Health led the review, with input provided by a cross-national advisory group composed of members from the CDC, Brazilian Ministry of Health, Universidade Federal de São Paulo, Centro de Estudos do Laboratório de Aptidão Física de São Caetano de Sul (CELAFISCS), and the Pan American Health Organization.

Methods

Overview of the Literature Review

The process of reviewing and critically evaluating the Latin American literature related to physical activity interventions involved a two-phased approach of (1) searching peer-reviewed and non-peer-reviewed literature for studies of these interventions in community settings (e.g., communities, schools, places of worship, work sites) and (2) systematically evaluating the suitability of the design and the quality of execution of intervention studies that met criteria for inclusion. Both phases were carried out in 2006.

Searching the Literature

In the first phase, peer-reviewed literature and Brazilian theses were searched for studies on physical activity interventions. The following databases were systematically searched for entries appearing from 1980 to 2006: Biblioteca Virtual de Saúde (which includes LILACS, MEDLINE, MEDCARIB, OPAS/OMS, PAHO, and WHOLIS); SCIELO; PubMed; CAPES (thesis database); and NUTES (thesis database). Studies of physical activity interventions were identified using 16 search terms in Portuguese, Spanish, and English, including physical activity, physical fitness, cardiorespiratory fitness, aerobic capacity, walking, community intervention, health promotion, sport, motor activity, sedentary lifestyle, inactivity, leisure activity, exercise, exercise program, moderate activity, and vigorous activity. Additional English search terms included Latin America, Brazil, Colombia, Argentina, Chile, Bolivia, Venezuela, Peru, and Mexico. Other articles, government reports, and theses were located by manually searching the reference lists of identified articles. Selected non-peer-reviewed literature was included in the first phase if it could be accessed through online databases (Brazilian theses and Colombian thesis titles) or personal contacts (via the GUIA advisory group). While very few non-peer-reviewed sources have sufficient detail on the design of interventions and their evaluation to meet the *Community Guide*'s criteria for inclusion, it was believed that these supplementary sources might provide a more complete picture of community interventions in Latin America.

To assess the state of the evidence concerning physical activity interventions, the peer-reviewed articles meeting the search criteria were categorized into 11 broad study topics (Table 1), and the relative frequency of articles within each study topic was computed.

Screening and Categorizing Studies

All intervention studies from the peer-reviewed and non-peer-reviewed literature were synthesized by trained researchers into one-page summary tables in English (available from first author), containing citation, language, study design, country, population, setting, intervention characteristics, outcome measurement, results, and conclusions. Using the synthesis tables, six reviewers independently categorized the intervention studies by the 14 *Community Guide* categories for physical activity interventions (Appendix A, online at www.ajpm-online.net) and screened the studies for inclusion in a full abstraction process to assess the strength of the evidence. Three reviewers were assigned to each intervention study, and decisions about categorization and selection of studies were

Table 1. Distribution by topic of the peer-reviewed articles that met search criteria

Topic	Focus	n (%)			
		Total (N=903)	Portuguese (n=414)	Spanish (n=333)	English (n=156)
Physical activity interventions	Increasing physical activity or aerobic capacity	45 (5.0)	18 (4.3)	7 (2.1)	20 (12.8)
Therapeutic interventions	Evaluating interventions in which exercise or physical activity is being used to treat a specific condition or for rehabilitation purposes (e.g., diabetes, cardiac disease, obesity).	98 (10.9)	38 (9.2)	55 (16.5)	5 (3.2)
Training studies	Effects of specific exercise regimens on health parameters (e.g., blood pressure, cholesterol, aerobic capacity, body weight); studies are conducted primarily in a laboratory or research setting.	71 (7.9)	22 (5.3)	38 (11.4)	11 (7.1)
Descriptive studies	Reports of the prevalence of physical activity behaviors or sedentary behavior without associating physical activity with other health outcomes or treating physical activity as a dependent variable.	120 (13.3)	44 (10.6)	51 (15.3)	25 (16.0)
Correlates of physical activity	Physical activity, inactivity, or aerobic capacity is treated as the dependent variable, typically in a cross-sectional study.	56 (6.2)	21 (5.1)	27 (8.1)	8 (5.1)
Etiologic studies	Physical activity is treated as the independent variable; outcomes may include heart disease, cancer, or mortality	86 (9.5)	46 (11.1)	17 (5.1)	23 (14.7)
Measurement of physical activity	Measurement properties of various methods of determining or measuring physical activity (e.g., self-report questions, accelerometers, pedometers) for population-based studies	31 (3.4)	7 (1.7)	22 (6.6)	2 (1.3)
Exercise physiology/biomechanics	Laboratory-based studies that examine physiologic effects of exercise or strength-training protocols; predictors of exercise-related health outcomes; and measurement of aerobic/anaerobic capacity.	215 (23.8)	90 (21.7)	79 (23.7)	46 (29.5)
Other physical activity-related (e.g., review, commentary)	Studies that do not fit other categories	181 (20.0)	128 (30.9)	37 (11.1)	16 (10.3)
Non-Latin American		39 ^a	0 ^a	8 ^a	31 ^a
Unrelated to physical activity		2568 ^a	421 ^a	1105 ^a	1042 ^a

^aExcluded from total and denominator.

based on the opinions of a majority of the reviewers or group consensus (if there was disagreement among all three reviewers). Interventions were assigned to only one category. Intervention studies that met all of the following criteria were selected for abstraction: (1) assessed an intervention with a significant focus on physical activity (e.g., not a general health promotion intervention); (2) were original investigations of interventions selected for evaluation rather than, for example, guidelines or reviews; (3) evaluated physical activity behavior or aerobic capacity (maximal oxygen uptake [VO₂] or estimate of VO₂) as outcomes; (4) compared outcomes among groups of persons exposed to the intervention with outcomes among groups of persons not exposed or less exposed to the intervention; (5) were conducted in a community setting (e.g., not an exercise laboratory or hospital clinic) and, therefore, were not interventions that used physical activity as a therapeutic intervention or for rehabilitation or that addressed a population group because the members shared a clinical condition (e.g., heart disease, hypertension, or obesity); (6) did not solely involve one-to-

one advice or counseling in a healthcare setting; and (7) were published in a format in which details about the intervention and its execution were available.

Abstracting Studies to Evaluate the Evidence

The abstraction phase of the GUIA project followed the abstraction procedure in the *Community Guide*¹³ with some modifications to streamline the review of articles. Five trained abstractors, three of whom could read Portuguese or Spanish, participated in the abstractions of articles, reports, and theses from the search of Latin American scientific literature. Two trained researchers independently abstracted each study and came to consensus on the suitability of the design and quality of intervention execution—the two measures by which the studies were evaluated. Design suitability was coded as greatest, moderate, and least and was determined based on the criteria described by Briss et al.,¹⁴ which are presented in [Appendix B](#), online at www.ajpm-online.net. Based on the number of limitations, quality of execution was categorized as

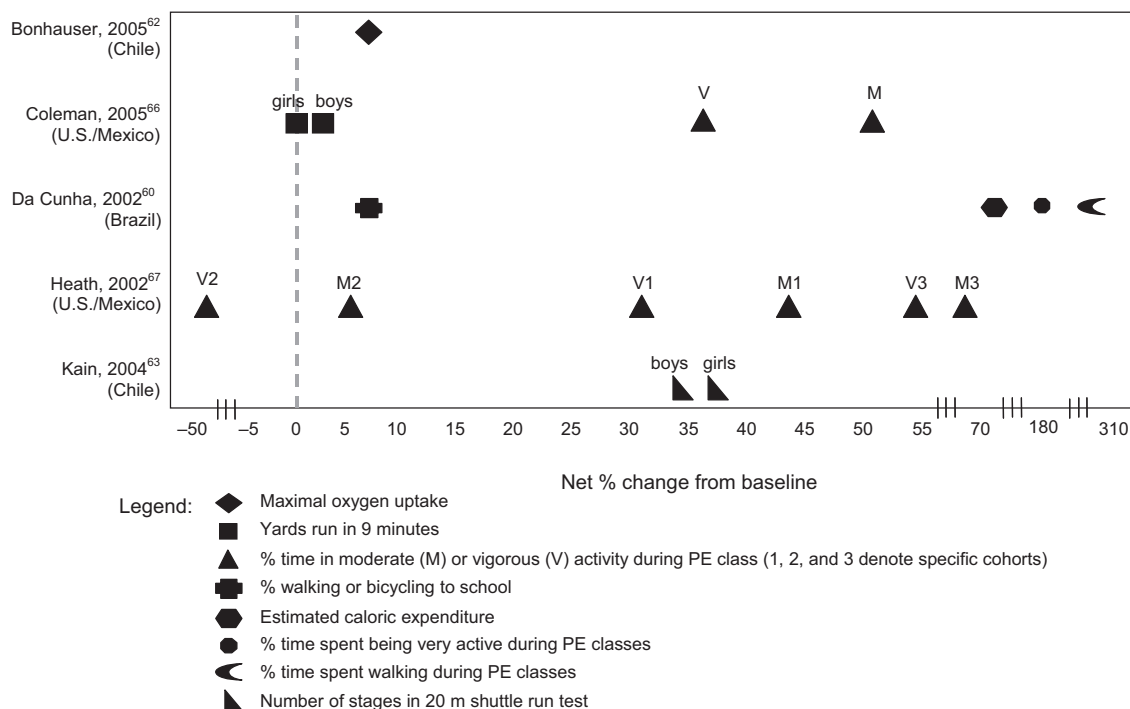


Figure 1. Net percentage change in physical activity from baseline for the intervention studies on school-based physical education.

Net percentage change was calculated as follows:¹³

Studies with pre- and post-intervention measurements for intervention (I) and comparison (C) groups

$$\frac{I_{\text{post}} - I_{\text{pre}}}{I_{\text{pre}}} - \frac{C_{\text{post}} - C_{\text{pre}}}{C_{\text{pre}}} \times 100\%$$

Studies without a comparison group

$$\frac{I_{\text{post}} - I_{\text{pre}}}{I_{\text{pre}}} \times 100\%$$

Studies with a comparison group but no pre-intervention measurements

$$\frac{I_{\text{post}} - C_{\text{post}}}{C_{\text{post}}} \times 100\%$$

good (0–1 limitations), fair (2–4), or limited (≥ 5).¹⁴ Limitations were counted in the following nine broad categories, as described elsewhere¹³: (1) description of the study population and intervention, (2) sampling, (3) measurement of exposure, (4) measurement of outcome and independent variables, (5) confounding bias, (6) data analysis, (7) participation, (8) comparability and bias, and (9) other biases.

The modified abstraction process for the GUIDA project involved two phases. The purpose of Phase 1 was to assess design suitability as well as the first five of the nine limitations related to quality of execution. If an intervention had the potential to achieve strong or sufficient evidence of effectiveness using the *Community Guide* criteria presented in Appendix C, online at www.ajpm-online.net,¹⁴ Phase 2 was carried out to assess the remaining four limitations of quality of execution. Following abstraction, the eligibility and category assignment of each study, which were initially determined using the synthesis tables, were re-evaluated.

Effect size was calculated as the relative, net percent change from baseline for participants in both the intervention and control groups for all studies that underwent Phase 2 of the abstraction process. The formula for calculating the net effect varied depending on the study design (with or without a control group and/or pre-intervention measurement of out-

come), as defined previously (Figure 1).¹⁰ Net intervention effects were calculated for all reported measurements of aerobic capacity and physical activity behavior, for all time periods relative to baseline, and for all subgroups (e.g., gender, country of study). Sufficient and large effect sizes are based on the quality of the outcomes, magnitude of effect sizes compared with *Community Guide* results, and the population reach of the intervention.

Results from the assessments of design suitability, quality of execution, and effect size were combined to determine whether an intervention had strong, sufficient, or insufficient evidence of effectiveness for recommendation on a broad level (Appendix C, online at www.ajpm-online.net). It should be noted that insufficient evidence of effectiveness does not equate to evidence of ineffectiveness; instead, it indicates an inadequate number of studies or information for basing a recommendation.¹⁵

Results

Searching the Literature

Of the 3510 (835 Portuguese, 1446 Spanish, and 1229 English) peer-reviewed articles that met the search

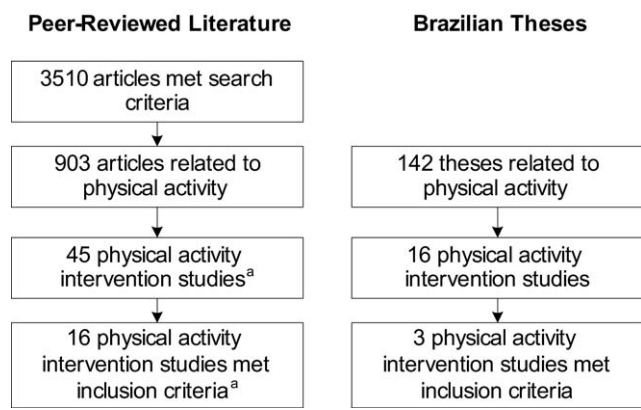


Figure 2. Results from the search of Latin-American peer-reviewed literature and Brazilian theses.

^aIncludes one WHO report.¹⁶

criteria, 903 articles were related to physical activity. Of these, only 5% (4.3% from Portuguese, 2.1% from Spanish, and 12.8% from English searches) addressed physical activity interventions in Latin America, including one WHO report (Table 1; Figure 2). The search of Brazilian theses resulted in 16 potential intervention studies of 142 total physical activity-related theses that met the search criteria (Figure 2). Because there was a low yield of Colombian theses addressing physical activity interventions ($n=11$) and limited information available (only the titles were available electronically), these theses were excluded from the subsequent literature synthesis.

Screening and Categorizing Intervention Studies

Using the summary synthesis tables, the 61 intervention studies from the 44 peer-reviewed articles, one report, and 16 Brazilian theses were each categorized by the 14 *Community Guide* intervention categories (Appendix A, online at www.ajpm-online.net)¹⁰ and listed in Table 2. The studies were also screened a second time using the list of selection criteria defined previously. In one review article,¹⁷ six different intervention studies were described, and the reviewers independently categorized and screened them. On review of the selected studies, it was found that many did not readily fit within the *Community Guide* intervention classifications, and thus three new intervention subcategories were created (Appendix A, online at www.ajpm-online.net). Five studies were classified as “delivery of short physical activity–related messages” under the category of “informational approaches to increasing physical activity.”^{17,20,40} Thirty-three studies were classified as “physical activity classes in community settings” under the category of “behavioral and social approaches to increasing physical activity,”^{17,23–37,41–57} and four studies were classified as “community-wide policies and planning” under the category of “environmental and policy approaches to increasing physical activity.”^{38,39,58,59}

Only 19 of the 61 (31%) intervention studies met all of the criteria for inclusion in the abstraction process. The two criteria most often **not** met were the one requiring the outcomes to be physical activity behavior or aerobic capacity (62% of excluded studies) and the one requiring that the interventions be conducted in community settings and not for rehabilitative or therapeutic purposes (38% of excluded studies). Two thirds of the excluded studies were classified as “physical activity classes in community settings” (Table 3).

Abstracting Studies to Evaluate the Evidence

Of the 19 studies that underwent the full abstraction process, nine were conducted in Brazil^{16,17,40,41,44,53,54,60,61}; three in Chile^{46,62,63}; two in Colombia^{58,64}; and five along the Texas/Mexico border.^{65–69} Fifteen were peer-reviewed articles^{17,40,41,46,53,54,58,62–69}; three were Brazilian theses^{44,60,61}; and one was a WHO report.¹⁶ The results of the abstraction are presented in Table 2. The *Community Guide* results are also presented so that readers can compare the strength of evidence obtained from the Latin American and U.S. scientific literatures. Only those studies under the “physical activity classes in community settings” and “school-based physical education” were eligible for Phase 2 of the abstraction process; the other interventions had too few studies to achieve sufficient evidence of effectiveness.

Physical activity classes in community settings. Of the five studies evaluated that involved classes in community settings, four were conducted in Brazil^{41,44,53,54} and one in Chile.⁴⁶ Three of the Brazilian interventions were conducted in universities—two as work-site interventions among employees^{44,53} and the other as a swimming class for elderly women.⁴¹ The fourth Brazilian intervention was conducted in a church among women aged >50 years.⁵⁴ The Chilean intervention was a small pilot intervention of health education and exercise classes for Seventh-Day Adventist and other women in Villarrica County; the exact setting of the intervention was not described. Three studies had the greatest suitability of study design—two with fair execution^{41,44} and one with limited execution.⁵⁴ The remaining two studies had the least design suitability—one with fair⁴⁶ and one with limited execution.⁵³ Only three studies reported data on outcomes, including endurance capacity as estimated by a step test,⁵⁴ VO_2 max as measured by a 6-minute walking test,⁴¹ and physical activity using an exercise scale from a self-report questionnaire.⁴⁶ Their net effects were 2%, 34%, and 41%, respectively. According to the *Community Guide* rules of evidence (Appendix C, online at www.ajpm-online.net),¹⁴ there is insufficient evidence that “physical activity classes in community settings” are effective in increasing levels of physical activity and improving physical fitness. The evidence was deemed insufficient

Table 2. Recommendations for physical activity interventions, based on the GUIA and *Community Guide*¹⁰ literature reviews

	GUIA in Latin America		
	Recommendations (No. of studies included in abstraction)	No. of studies excluded from abstraction	Community Guide recommendations (No. of qualifying ^a studies)
Informational approaches			
Community-wide campaigns	Insufficient evidence (<i>n</i> =1) ¹⁷	1 ^{17,b}	Recommended (strong) (<i>n</i> =10)
“Point-of-decision” prompts	Insufficient evidence (<i>n</i> =1) ⁶⁵	0	Recommended (sufficient) (<i>n</i> =6)
Classroom-based health education focused on information provision	Insufficient evidence (<i>n</i> =3) ^{16,61,68}	1 ¹⁸	Insufficient evidence (<i>n</i> =10)
Mass media campaigns	Insufficient evidence (<i>n</i> =0)	1 ¹⁹	Insufficient evidence (<i>n</i> =3)
Delivery of short physical activity-related messages ^c	Insufficient evidence (<i>n</i> =1) ⁴⁰	4 ^{17,20}	—
Behavioral and social approaches			
Individually adapted health behavior change	Insufficient evidence (<i>n</i> =0)	0	Recommended (strong) (<i>n</i> =18)
Health education with component for turning off TV/video games	Insufficient evidence (<i>n</i> =0)	0	Insufficient evidence (<i>n</i> =3)
College-age physical education/health education	Insufficient evidence (<i>n</i> =0)	0	Insufficient evidence (<i>n</i> =2)
Family-based social support	Insufficient evidence (<i>n</i> =0)	0	Insufficient evidence (<i>n</i> =11)
School-based physical education	Recommended (strong) (<i>n</i> =5) ^{60,62,63,66,67}	1 ²¹	Recommended (strong) (<i>n</i> =14)
Nonfamily social support	Insufficient evidence (<i>n</i> =2) ^{64,69}	1 ²²	Recommended (strong) (<i>n</i> =9)
Physical activity classes in community settings ^c	Insufficient evidence (<i>n</i> =5) ^{41,44,46,53,54}	28 ^{17,23–37,42,43,45,47–52,55–57}	—
Environmental and policy approaches			
Creation of or enhanced access to places for physical activity combined with activities in informational outreach	Insufficient evidence (<i>n</i> =0)	1 ¹⁷	Recommended (strong) (<i>n</i> =10)
Community-scale urban design and land-use policies and practices	Insufficient evidence (<i>n</i> =0)	0	Recommended (sufficient) (<i>n</i> =12)
Street-scale urban design and land use policies and practices	Insufficient evidence (<i>n</i> =0)	0	Recommended (sufficient) (<i>n</i> =6)
Transportation policy and infrastructure changes	Insufficient evidence (<i>n</i> =0)	0	Insufficient evidence (<i>n</i> =1)
Community-wide policies and planning ^c	Insufficient evidence (<i>n</i> =1) ⁵⁸	3 ^{38,39,59}	—
TOTAL	19	42^d	115

^aQualifying studies included all eligible studies, except those with limited quality of execution.^bMultiple intervention studies were described in this review article.¹⁷^cNew intervention category identified by the GUIA literature review.^dOne of the excluded studies was not an intervention and therefore could not be categorized.

Table 3. Reasons for excluding studies from the abstraction phase

Inclusion criteria not met	No. of excluded studies (n=42)	No. of excluded physical activity classes studies (n=28)
Assessed an intervention with a significant focus on physical activity	2	0
Original investigations of interventions selected for evaluation	3	0
Evaluated physical activity or aerobic capacity as outcomes	26	17
Compared exposed vs not/less exposed	8	4
Conducted in a community setting and not for therapeutic or rehabilitative purposes among a clinical population	16	14
Not one-on-one advice or counseling in healthcare setting	2	2
Published in format in which details about the intervention and its execution were available	6	1

due to: (1) too few studies to meet any of the criteria for sufficient evidence for recommendation (two studies had limited quality of execution and, of the remaining three, one was of least design suitability); and (2) only three of the five studies reported the necessary outcome measures to calculate net effect changes.

School-based physical education. Of the five school-based physical education intervention studies reviewed, one was conducted in Brazil (children aged 7–10 years)⁶⁰; two in Chile (primary school children and 9th-grade classes)^{62,63}; and two in elementary schools on the U.S.–Mexico border.^{66,67} All five studies had the greatest suitability of study design. Three applied a group-randomized design^{60,62,66} and two a group non-randomized design.^{63,67} Three studies had good execution^{60,62,66} and two had fair execution.^{63,67}

Reported behavioral outcomes were minutes spent in moderate and vigorous physical activity,⁶⁷ percentage of children meeting physical activity goals,⁶⁶ percentage of children biking or walking to school, estimated energy expenditure based on observed physical activity behavior of children, percentage of children being very active during physical education classes, and percentage of time spent walking during physical education classes.⁶⁰ Three studies also reported aerobic capacity as estimated by VO_2 max,⁶² results from timed runs,⁶⁶ or endurance capacity as estimated by the shuttle run test.⁶³

The net effect sizes ranged from –50% for percentage of female students meeting vigorous activity goals⁶⁷ to 307% for percentage of time spent walking during physical education classes (Figure 1).⁶⁰ The large range in net effect sizes was a function of the degree of change in the pre- and post-intervention outcome measures for both intervention and comparison (if applicable) groups and the magnitude of the pre-intervention measure (see Figure 1 footnote). The level of evidence in support of school-based physical education as an approach to increasing levels of physical activity and improving physical fitness is consistent with the evidence needed for a strong recommendation using the *Community Guide* guidelines (Appendix C, online at www.ajpm-online.net).

Discussion

This systematic literature review represents the first effort to adapt an evidence-based review process for community interventions developed in the U.S. (i.e., the methods of the *Community Guide*) to Latin America. Importantly, it also reveals key priorities for research and policy related to physical activity interventions in Latin America. In a region experiencing escalating rates of obesity and inactivity among urban populations in particular, there is an opportunity to promote effective community interventions to increase physical activity and prevent noncommunicable diseases.

Several important findings emerged from the *GUIA* literature review. Based on rigorous review standards, there is strong evidence in support of school-based physical education as a strategy to increase physical activity in school children and adolescents. This is particularly important for developing countries, given the rising prevalence of inactivity and overweight in this population and their associated long-term health consequences, such as cardiovascular disease, diabetes, and certain types of cancer.⁷⁰ In addition, physical activity in adolescence has been identified as a possible predictor of levels of physical activity in adulthood.^{71,72} Today, in Brazil⁷³ and other Latin American countries,⁷⁴ physical education is mandatory for students in public and private elementary, middle, and high schools. There has been increased academic and political credibility for school physical education in the past decade,⁷⁵ and yet issues related to salary, work environment, physical space, and curriculum structure still persist as barriers, and schools struggle to offer high-quality physical education.⁷⁶ Regardless, physical education seems to be an effective but underused way to promote physical activity.

Another key finding from the literature review was the identification of three new intervention categories that were not part of the *Community Guide*: community-wide policy and planning, the delivery of short physical activity-related messages, and physical activity classes in community settings. Although evidence was insufficient to assess the effectiveness of these interventions, they represent promising interventions for further evaluation.

tion in Latin America. For example, the VIDA CHILE program, organized by over 13 regions and overseen by more than two dozen Chilean organizations, is a national program that uses a variety of strategies to promote physical activity for improved health and quality of life for all Chileans.³⁹ In Bogotá, Colombia, the Ciclovía-Recreo⁵⁸ and Cicloruta programs⁷⁷ are community-wide programs that promote recreational activity and active transportation for the citizens by encouraging the use of the public space (parks, avenues, and bicycle paths). In addition, several Academia das Cidades (city gyms) have been organized and promoted in Recife, Aracaju, and Belo Horizonte, Brazil, as has a comprehensive physical activity promotion program in Curitiba (CuritibaAtiva), also in Brazil.⁷⁸ These locally funded interventions combine many aspects of physical activity classes and community-wide policy and planning to increase physical activity.

The paucity of literature describing evaluations of community-level physical activity interventions in Latin America was another important finding from this systematic review. Only 15 of over 900 (<2%) peer-reviewed articles related to physical activity addressed interventions in Latin American community settings that were evaluated using physical activity outcomes. Clearly, there is a need to publish and disseminate results from evaluated interventions to provide the minimum number of studies necessary for building evidence about their effectiveness. In reality, there is no shortage of interventions being conducted in Latin America. In particular, the widely implemented Agita São Paulo intervention has shown promise as an effective community-wide campaign to increase physical activity in communities.⁷⁹ Although 50 community-level physical activity interventions in Latin America were recently highlighted in the *Best Practices for Physical Activity Promotion Around the World*,¹² only two with published, peer-reviewed evaluations were eligible for this systematic review.^{17,58}

Finally, this review emphasizes the need for improving the methodologic rigor or reporting of evaluations of interventions in Latin America. Nearly two thirds (63%) of the abstracted studies had limitations related to sampling, including failure to describe the eligibility criteria, sampling frame, or recruitment strategies, as well as use of volunteer samples. For these studies, the impact of the intervention was measured among the participants in the program and not the community at large—limiting an understanding of the population-wide impact of the program. Another limitation that appeared in 53% of the studies was a failure to measure the exposure or to cite the measurement properties of the exposure measures. Examples of exposure measurement might be class attendance among study participants, awareness of the intervention message or activities, or other process evaluation measures. The last two commonly cited limitations were related to

confounding bias (failing to show similarities and differences between study groups at baseline or not controlling for differences; 42% of studies) and limited descriptions of the study population and intervention (37% of studies). Enhancements across these methodologic areas will make it possible to determine whether changes in behavior are clearly attributable to the intervention as well as to assess the impact of the intervention on a community level.

This literature review has several strengths: This was the first study to adapt the *Community Guide* process to a developing region, and it may encourage similar reviews in Latin America and other parts of the world. These systematic reviews are valuable for three reasons: (1) practitioners and policymakers value scientific knowledge as a basis for decision making; (2) the scientific literature on a given topic is often vast, uneven in quality, and inaccessible to busy practitioners; and (3) an experienced and objective panel of experts is seldom locally available to public health officials on a wide range of topics.⁹ The systematic nature and transparency of this well-accepted review process and the breadth of literature that was searched support the robustness of the conclusions from the GUIA literature search. Moreover, the results were reviewed and endorsed by a cross-national advisory team. This suggests that the *Community Guide* process is feasible and valuable for developing countries in Latin America and possibly beyond.

Some limitations of this review should also be noted. The search was limited to intervention studies in which the results were published (e.g., thesis, journal article, report) and could be identified via searchable databases or recommended by the advisory team. Moreover, the reviewed masters and doctoral theses were limited to Brazilian and a sample of Colombian theses that were readily available using databases on the Internet or through professional contacts. Although for the *Community Guide* there was no searching of theses, they may be a valuable source for identifying studies from Latin America, where peer-reviewed publications in the area of physical activity interventions are less common. Another limitation was that the abstraction process was slightly streamlined, and thus not all of the methodologic limitations were documented, specifically for interventions with few candidate studies.

In addition, the variety of outcomes measured limited our ability to calculate a summary net effect for school-based physical education. Also, although it was determined that the process and intervention categories from the *Community Guide* can be applied to Latin America studies, whether the recommendations for physical activity interventions in the U.S. may be generalizable to Latin America was not assessed; this will be addressed in the later phases of the GUIA project. Finally, it is important to emphasize that the reviewed interventions were conducted in a variety of countries,

including the U.S.–Mexico border. As is the case with the *Community Guide*, it is not known whether interventions may be effective in a single subpopulation, city, region, or country within Latin America.

In summary, this systematic review was the first to apply the *Community Guide* process of evaluating community-level strategies to interventions in a developing region. Two findings from this review should be highlighted: (1) the need for rigorous evaluation of promising physical activity interventions in developing countries, as recommended by others,⁸⁰ coupled with the reporting of such evaluations in peer-reviewed articles, and (2) strong evidence of the effectiveness of school-based physical education programs in Latin America. Clearly, the implementation and maintenance of quality school physical education programs and policies should be strongly encouraged to promote the health of Latin America children. It is hoped that the findings from this review will be used to improve evaluation methodology, eventually leading to more evidence-based policies and programs, which will in turn contribute to positive changes in physical activity among Latin American populations.

This study was funded through the Centers for Disease Control and Prevention contract U48/DP000060-01 (Prevention Research Centers Program). The authors are grateful for the valuable input of Pedro Hallal, Julia Nogueira, and Marcia Munk and for the administrative support of Brenda McDaniel, Mary Adams, Katie Duggan, Madalena Soares, and Diva Brunieri.

No financial disclosures were reported by the authors of this paper.

References

- World Bank Institute Development Education Program. Beyond economic growth: an introduction to sustainable development, 2nd Ed. Washington DC: The International Bank for Reconstruction and Development/The World Bank, 2004.
- Filozof C, González C, Sereday M, Mazza C, Braguinsky J. Obesity prevalence and trends in Latin-American countries. *Obes Rev*. 2001;2:99–106.
- Adeyi O, Smith O, Robles S. Public Policy and the Challenge of Chronic Noncommunicable Diseases. Washington DC: World Bank, 2007.
- World Health Organization (WHO). Global strategy on diet, physical activity and health: a framework to monitor and evaluate implementation. Geneva: WHO Press, 2006.
- Lobelo F, Pate R, Parra D, Duperly J, Pratt M. Burden of mortality associated to physical inactivity in Bogotá, Colombia. *Rev Salud Publica (Bogotá)* 2006;8(Suppl 2):28–41.
- Monteiro CA, Conde WL, Matsudo SM, Matsudo VR, Bonsenor IM, Lotufo PA. A descriptive epidemiology of leisure-time physical activity in Brazil, 1996–1997. *Rev Panam Salud Pública* 2003;14:246–54.
- Bauman A, Craig CL. The place of physical activity in the WHO Global Strategy on Diet and Physical Activity. *Int J Behav Nutr Phys Act* 2005;2:10.
- WHO, World Health Assembly 57.17. Global strategy on diet and physical activity. Geneva: WHO, 2004.
- Truman BI, Smith-Akin CK, Hinman AR, et al. Developing the Guide to Community Preventive Services—overview and rationale. The Task Force on Community Preventive Services. *Am J Prev Med* 2000;18(Suppl 1):18–26.
- Kahn EB, Ramsey LT, Brownson RC, et al. The effectiveness of interventions to increase physical activity: a systematic review. *Am J Prev Med* 2002;22(Suppl 4):73–107.
- Heath GW, Brownson RC, Kruger J, et al. The effectiveness of urban design and land use and transport policies and practices to increase physical activity: a systematic review. *J Phys Act Health* 2006;3(Suppl 1):S55–S76.
- Centro de Estudos do Laboratório de Aptidão Física de São Caetano de Sul, Centers for Disease Control and Prevention. Best practices for physical activity promotion around the world. Atlanta GA: CDC, 2006.
- Zaza S, Wright-De Agüero LK, Briss PA, et al. Data collection instrument and procedure for systematic reviews in the Guide to Community Preventive Services. Task Force on Community Preventive Services. *Am J Prev Med* 2000;18(Suppl 1):44–74.
- Briss PA, Zaza S, Pappaioanou M, et al. Developing an evidence-based Guide to Community Preventive Services: methods. The Task Force on Community Preventive Services. *Am J Prev Med* 2000;18(Suppl 1):35–43.
- Anderson LM, Brownson RC, Fullilove MT, et al. Evidence-based public health policy and practice: promises and limits. *Am J Prev Med* 2005;28(Suppl 5):226–30.
- Menezes A, Neutzling M, Malcon M, Hallal P, Marques A, Victora C. Effectiveness of an educational intervention on smoking, diet and physical activity among adolescents. Pelotas, Brazil: WHO, Final report from the Federal University of Pelotas, 2006.
- Matsudo SM, Matsudo VR, Andrade DR, et al. Physical activity promotion: experiences and evaluation of the Agita São Paulo program using the ecological mobile model. *J Phys Act Health* 2004;1:81–97.
- Rebolledo Acevedo A, Atalah Samur E, Araya LH, et al. Evaluation of an intervention model to stimulate healthy life habits in preschool children. *Revista Chilena de Nutrición* 2000;27:368–75.
- Gámez R, Parra D, Pratt M, Schmid TL. Muevete Bogotá: promoting physical activity with a network of partner companies. *Promot Educ* 2006;13:138–43, 64–69.
- Ferreira MM, Matsudo SM, Matsudo VR, Braggion GF. Efeitos de um programa de orientação de atividade física e nutricional sobre a ingestão alimentar e composição corporal de mulheres fisicamente ativas de 50 a 72 anos de idade. *Revista Brasileira de Ciência e Movimento* 2003;11:35–40.
- Jenovesi JF, Bracco MM, Colugnati FAB, Taddei JAAC. Evolution in the physical activity level of schoolchildren observed during 1 year. *Revista Brasileira de Medicina do Esporte* 2004;12:19–24.
- Monteiro RdCA. Efeitos de um programa de intervenção nutricional com e sem exercício físico sobre o perfil antropométrico e os hábitos alimentares de mulheres obesas no climatério. Manaus: Food Sciences, Federal University of Amazonas, 2000.
- Andreotti RA. Efeitos de um programa de Educação Física sobre as atividades da vida diária de idosos. São Paulo: School of Physical Education, University of São Paulo, 1999.
- Bunout D, Barrera G, Avendano M, et al. Results of a community-based weight-bearing resistance training programme for healthy Chilean elderly subjects. *Age Ageing* 2005;34:80–3.
- Bunout D, Barrera G, de la Maza P, et al. The impact of nutritional supplementation and resistance training on the health functioning of free-living Chilean elders: results of 18 months of follow-up. *J Nutr* 2001;131:S2441–6.
- Caromano FA, Caromano FA. Efeitos do treinamento e da manutenção de exercícios de baixa a moderada intensidade em idosos sedentários saudáveis. São Paulo: Institute of Psychology, University of São Paulo, 1998.
- de Mello ED, Luft VC, Meyer F. Atendimento ambulatorial individualizado versus programa de educação em grupo: qual oferece mais mudança de hábitos alimentares e de atividade física em crianças obesas? *J Pediatr (Rio J)* 2004;80:468–74.
- Forjaz CT, Bartholomeu T, Fernandes TEM, Casagrande V, Massucato JG. Assessment of the cardiovascular risk and physical activity of individuals exercising at a public park in the city of São Paulo. *Arq Bras Cardiol* 2002;79:43–50.
- Hernandes ESC, Barros JF. Effects of a program of physical and educational and activities for elderly people under the performance in daily activities tests. *Revista Brasileira de Ciência e Movimento*. 2004;12:43–50.
- Lopes AS. The influence of continuous versus intermittent aerobic physical activity on the body composition and physical fitness of male college students. *Kinesis* 1990;6:75–96.
- Marin RV, Matsudo SM, Matsudo VKR, Andrade E, Braggion G. 1 kg weight load program on physical fitness and functional capacity in active elderly women over 50 years. *Revista Brasileira de Ciência e Movimento* 2003;11:53–8.
- Matsudo Sea. Longitudinal study – 4-year tracking– of physical fitness of physically active women aged 50+. *Revista Brasileira de Medicina do Esporte* 2004;12:47–52.

33. Matsudo SM, Matsudo VKR, Barros Neto TL, Araujo TL. Evolution of neuromotor profile and functional capacity of physically active women according to chronological age. *Revista Brasileira de Medicina do Esporte* 2003;9:1–11.
34. McKenzie SB, O'Connell J, Smith LA, Ottinger WE. A primary intervention program (pilot study) for Mexican American children at risk for type 2 diabetes. *Diabetes Educ* 1998;24:180–7.
35. Pereira MHN. Impact of behavioral technique and physical activity program on adult women. *Revista Brasileira de Medicina do Esporte* 2004;12:19–24.
36. Pinto VLM, Meirelles LR, Farinatti PTV. Influence of domestic and community exercise programs on the physical fitness, arterial blood pressure, and biochemical variables in hypertensive patients. *Revista Brasileira de Medicina do Esporte* 2003;9:275–81.
37. Sartorelli DS, Sciarra EC, Franco LJ, Cardoso MA. Beneficial effects of short-term nutritional counselling at the primary health-care level among Brazilian adults. *Public Health Nutr* 2005;8:820–5.
38. Salinas J. Health promotion in Chile: an evaluation of a national plan implementation. *Promot Educ* 2000;7:13–6, 39–40, 45–6.
39. Salinas J, Vio F. Promoting health and physical activity in Chile: a policy priority. *Rev Panam Salud Pública* 2003;14:281–8.
40. Ferreira M, Matsudo S, Matsudo V, Braggion G. Efeitos de um programa de orientação de atividade física e nutricional sobre o nível de atividade física de mulheres fisicamente ativas de 50 a 72 anos de idade. *Revista Brasileira de Medicina do Esporte* 2005;11:172–6.
41. Alves RV, Mota J, Costa MC, Alves JGB. Aptidão física relacionada a saúde de idosos: influência da hidroginástica. *Revista Brasileira de Medicina do Esporte* 2004;10:31–7.
42. Andreotti MC. Fatores que influenciam a adesão de idosos a um programa de educação física supervisionado. São Paulo: University of São Paulo, 2001.
43. Antunes HKM. A influência do exercício físico aeróbico em funções cognitivas e viscosidade do sangue de idosos normais. São Paulo: Federal University of São Paulo, 2003.
44. Barreto AC. Influência da Atividade de Física Sistematizada na promoção de saúde do trabalhador. Um estudo piloto no restaurante universitário da Universidade de Brasília. Brasília, University of Brasília, 2000.
45. Bastone AdC. Impacto da atividade física no desempenho funcional do idoso institucionalizado. São Paulo: University of São Paulo, 2000.
46. Carreño J, Vyhmeister G, Grau L, Ivanovic D. A health promotion programme in Adventist and non-Adventist women based on Pender's model: a pilot study. *Public Health* 2006;120:346–55.
47. Catai AM. Estudo da capacidade aeróbica e da variabilidade da frequência cardíaca em homens jovens e de meia idade submetidos a treinamento físico aeróbico. Campinas: Molecular Biology, State University of Campinas, 1999.
48. Costa ACdB. Adesão de idosos coronariopatas crônicos estáveis a um programa de orientação para a prática domiciliar de atividade física. São Paulo: Public health, University of São Paulo.
49. Farinatti PTV, Oliveira RB, Pinto VL, Monteiro WD, Francischetti E. Home exercise program: short term effects on physical aptitude and blood pressure in hypertensive individuals. *Arq Bras Cardiol* 2005;84:473–9.
50. Gerales AAR. Efeitos do treinamento contra Resistência sobre a força muscular e o desempenho de habilidades funcionais selecionadas em mulheres idosas: Science of Human Motricity, Castelo Branco University, 2000.
51. Lanuez FV. Efeitos de dois programas de exercícios físicos na aptidão motora de idosos sedentários. São Paulo: University of São Paulo, 2004.
52. Martins C. Efeitos da ginástica laboral em servidores da reitoria da UFSC. Florianópolis: Programa de Pós-Graduação em Engenharia de Produção, Federal University of Santa Catarina; 2000.
53. Martins C, Duarte MF. Efeitos da ginástica laboral em servidores da reitoria da UFSC. *Revista Brasileira de Ciência e Movimento* 2000;12:14–8.
54. Pain BM, Matsudo SMM, Andrade EL, Braggion GF, Matsudo VK. Effect of a physical activity program on physical fitness and self-perception of physical fitness of women over 50 years-old. *Revista de Atividade Física e Saude* 2001;6:50–64.
55. Prati SRA. Influência do exercício programado e da ingestão de nutrientes nos níveis de adiposidade de adolescentes obesos. Florianópolis: Physical Education, Federal University of Santa Catarina, 2002.
56. Rabelo RJ. Efeitos de um programa de aprendizagem de natação na realização das atividades da vida diária de mulheres idosas independentes. Brasília: Physical Education, Catholic University of Brasília, 2002.
57. Sabia RV, dos Santos JE, Ribeiro RPP. Efeito da atividade física associada à orientação alimentar em adolescentes. *Revista Brasileira de Medicina do Esporte* 2004;10:349–55.
58. Gómez LF, Mateus JC, Cabrera G. Leisure-time physical activity among women in a neighbourhood in Bogotá, Colombia: prevalence and socio-demographic correlates. *Cad Saúde Pública* 2004;20:1103–9.
59. Coitinho D, Monteiro CA, Popkin BM. What Brazil is doing to promote healthy diets and active lifestyles. *Public Health Nutr* 2002;5:263–7.
60. Da Cunha CT. Impacto de Programa Educativo no Gasto Energético de Escolares nas aulas de Educação Física: Ensaio randomizado controlado. São Paulo: Federal University of São Paul, 2002.
61. Barros MVG. Atividades físicas e padrão de consumo alimentar em estudantes do ensino médio em Santa Catarina: do estudo descritivo à intervenção. Rio Grande do Sul: Escola Superior de Educação Física, Federal University of Rio Grande do Sul, 2004.
62. Bonhauser M, Fernández G, Puschel K, et al. Improving physical fitness and emotional well-being in adolescents of low socioeconomic status in Chile: results of a school-based controlled trial. *Health Promot Int* 2005;20:113–22.
63. Kain J, Uauy R, Albala, Vio F, Cerda R, Leyton B. School-based obesity prevention in Chilean primary school children: methodology and evaluation of a controlled study. *Int J Obes Relat Metab Disord* 2004;28:483–93.
64. Lucumi DI, Sarmiento OL, Forero R, Gómez LF, Espinosa G. Community intervention to promote consumption of fruits and vegetables, smoke-free homes, and physical activity among home caregivers in Bogotá, Colombia. *Prev Chronic Dis* 2006;3:A120.
65. Coleman KJ, González EC. Promoting stair use in a U.S.-Mexico border community. *Am J Public Health* 2001;91:2007–9.
66. Coleman KJ, Tiller CL, Sanchez J, et al. Prevention of the epidemic increase in child risk of overweight in low-income schools: the El Paso coordinated approach to child health. *Arch Pediatr Adolesc Med* 2005;159:217–24.
67. Heath EM, Coleman KJ. Evaluation of the institutionalization of the coordinated approach to child health (CATCH) in a U.S./Mexico border community. *Health Educ Behav* 2002;29:444–60.
68. Holcomb JD, Lira J, Kingery PM, Smith DW, Lane D, Goodway J. Evaluation of Jump Into Action: a program to reduce the risk of non-insulin dependent diabetes mellitus in school children on the Texas-Mexico border. *J Sch Health* 1998;68:282–8.
69. Staten LK, Scheu LL, Bronson D, Peña V, Elenes J. Pasos Adelante: the effectiveness of a community-based chronic disease prevention program. *Prev Chronic Dis* 2005;2:A18.
70. WHO. Obesity: preventing and managing the global epidemic. Geneva: World Health Organization; 2000. WHO Technical Report Series No. 894.
71. Gordon-Larsen P, Nelson MC, Popkin BM. Longitudinal physical activity and sedentary behavior trends: adolescence to adulthood. *Am J Prev Med* 2004;27:277–83.
72. Beunen GP, Lefevre J, Philippaerts RM, et al. Adolescent correlates of adult physical activity: a 26-year follow-up. *Med Sci Sports Exerc* 2004;36:1930–6.
73. Brasil Ministério da Educação e do Desporto. Lei de Diretrizes e Bases da Educação Nacional, Lei nº 9.394. Available at: www.planalto.gov.br/CCIVIL_03/LEIS/L9394.htm.
74. Ministerio de Educación de Colombia. Política de Desarrollo Nacional de la Educación Física, Ley 934. Available at: <http://www.mineducacion.gov.co/1621/article-85833.html>.
75. Melo JP. Perspectivas da Educação Física Escolar: reflexão sobre a Educação Física como componente curricular. *Revista Brasileira de Educ Fis Esp* 2006;20:188–90.
76. Darido SC. Professores de Educação Física: procedimentos, avanços e dificuldades. *Revista Brasileira de Ciências do Esporte* 1997;18:192–206.
77. Gómez LF, Sarmiento OL, Mosquera J, et al. Policy and built environment changes in Bogotá and their importance in health promotion. Indoor and built environment. In press.
78. Rauchbach R, Kruchelski S, Vörös AK, et al. Curitiba gestão nas cidades voltada à promoção da atividade física, esporte, saúde e lazer: avaliação, prescrição e orientação de atividades físicas e recreativas, na promoção de saúde e hábitos saudáveis da população curitibana: Curitiba, Brazil: Livro Digital, 2005.
79. Matsudo V, Matsudo S, Andrade D, et al. Promotion of physical activity in a developing country: the Agita São Paulo experience. *Public Health Nutr* 2002;5:253–61.
80. Schmid TL, Librett J, Neiman A, Pratt M, Salmon A. A framework for evaluating community-based physical activity promotion programmes in Latin America. *Promot Educ* 2006;13:112–8.

Appendix A. Description of the *Community Guide* and New GUIA Intervention Categories

Intervention	Description
Informational	
Community-wide campaigns ¹	<ul style="list-style-type: none"> ● These campaigns involve many community sectors in highly visible, broad-based, multicomponent approaches to increasing physical activity. Most campaigns also address cardiovascular risk factors other than inactivity. ● Campaign messages are directed to large audiences through a variety of channels (e.g., TV, radio, newspapers). ● The campaigns include such components as support and self-help groups; counseling on physical activity; risk factor screening and education at work sites, schools, and community health fairs; community events; and creation of walking trails.
“Point-of-decision” prompts ¹	<ul style="list-style-type: none"> ● Signs are placed next to elevators and escalators to motivate people to use nearby stairs for health benefits or weight loss. ● All interventions are single component, with placement of signs the only activity.
Classroom-based health education focused on information provision ¹	<ul style="list-style-type: none"> ● These programs consist of health education classes in elementary, middle, or high schools whose goal is to help students develop the skills they need to make rational decisions about adopting healthier behaviors. ● Class content is usually multicomponent, with teachers educating students about aspects of physical inactivity, nutrition, smoking, alcohol, and drug misuse. ● Behavioral skills components (e.g., role play, goal setting, contingency planning) can also be part of the classes.
Mass media campaigns ¹	<ul style="list-style-type: none"> ● Spending additional time in physical activity is not usually part of the curriculum. ● These are single-component campaigns that are designed to increase knowledge about physical activity, influence attitudes and beliefs, and change behavior by transmitting messages through newspaper, radio, TV, and billboards, singly or in combination. ● Paid advertisements, donated time and space for promotions, and news or lifestyle features are used. ● These interventions do not include other components such as support groups, risk factor screening and education, or community events.
Delivery of short messages related to physical activity*	<ul style="list-style-type: none"> ● These interventions involve short physical activity-related educational and motivational messages (about 5 minutes) delivered to a specific population on a routine basis. ● Settings for this intervention included work sites, senior centers, and community centers. ● They are distinct from the “mass media campaigns” interventions in that a health educator delivers the short messages verbally to a targeted population in a group setting.
Behavioral and social approaches	
Individually adapted change in health behavior ¹	<ul style="list-style-type: none"> ● These programs are tailored to participants’ specific interests, preferences, and readiness to change, teaching specific behavioral skills that enable participants to make moderate-intensity physical activity part of their daily routines. ● The behavioral skills taught include setting goals for physical activity and monitoring one’s progress toward those goals, building social support for new behavioral patterns, reinforcing new behaviors through self-reward and positive self-talk, structured problem solving to help maintain behavior change, and preventing relapse into sedentary behaviors. ● Participants can engage in activities that are planned (e.g., daily scheduled walk) or unplanned (e.g., taking the stairs when the opportunity arises). ● The interventions are delivered to people either in group settings or by mail, telephone, or directed media. ● Programs typically involve recruiting volunteers who selected physical activity goals and worked in groups to achieve those goals. Group members provide companionship and support for one another.
Social support interventions in community settings ¹	<ul style="list-style-type: none"> ● Study staff also provide encouragement in the form of phone calls to check on participants’ progress and to encourage them to continue, and by leading formal group discussions about negative views of exercise and other barriers to change. ● These interventions build, strengthen, and maintain social networks that support increases in physical activity. ● New social networks can be created or existing networks can be used in social settings outside the family, such as the workplace. The interventions typically involve participants setting up a buddy system and making contracts to guarantee that both buddies will be active, or they form walking groups or other groups to provide companionship and support while being physically active. ● The programs typically involve recruiting volunteers who selected physical activity goals and worked in groups to achieve those goals.

Appendix A. *(continued)*

Intervention	Description
Health education with component for turning off TV/video games ¹	<ul style="list-style-type: none">● Study staff also provide encouragement in the form of phone calls to check on participants' progress and to encourage them to continue, and by leading formal group discussion about negative views of exercise and other barriers to change.● These health education classes, based in elementary school classrooms, encourage students to spend less time watching TV and playing video games.● Students are taught techniques or strategies to help achieve these goals, such as limiting access to TV and video games.● All classes include a "TV turnoff challenge" encouraging students not to watch TV for a specified number of days.● Classes do not specifically encourage physical activity as an alternative to watching TV and playing video games.● Parental involvement is prominent, and all households are given monitors for automatically monitoring TV use.
College-age physical education (PE)/health education ¹	<ul style="list-style-type: none">● This intervention uses didactic and behavioral education to increase and retain physical activity levels among college students and to help students develop lifelong exercise habits.● The PE classes may or may not be offered by PE or wellness departments at colleges and universities but must include supervised activity in the class.● Classes include both lectures and laboratory-type activities.● Students engage in supervised physical activity, develop goals and activity plans, and write term papers based on their experience.● Social support is also built into these programs.
Family-based social support ¹	<ul style="list-style-type: none">● These interventions help families of those trying to increase physical activity (parents, siblings, or partners) to encourage this effort by modeling healthy behavior and by being supportive of exercise.● Intervention components – which may include goal setting, problem solving, contracts to exercise among family members, and other techniques for promoting physical activity – are often delivered in conjunction with other school-based activities, such as PE or health education.● Family involvement may be promoted through take-home packets, reward systems, and family record keeping.
School-based physical education ¹	<ul style="list-style-type: none">● Some programs, such as CATCH, also include family-oriented special events.● These programs modify school-based PE classes by increasing the amount of time students spend in PE class, the amount of time they are active during PE classes, or the amount of moderate or vigorous physical activity in which they engage during PE classes.● Most increase the amount of physical activity during already scheduled PE classes by changing the activities taught or modifying the rules of the game so that students are more active.● Health education is often part of the program as well.
Physical activity classes in community settings*	<ul style="list-style-type: none">● These interventions are regular, structured exercise group classes that involve some educational component.● They may be implemented in work sites and community centers.● They are different from "classroom-based health education" interventions because they are not restricted to elementary, middle, or high school students. In addition, participation in physical activity is part of the intervention.● They are different from the "individually adapted health behavior change" interventions because they lack an individualized goal-setting or tailoring component.● They are distinct from the "social support interventions in community settings" because their primary purpose is not to build, strengthen, and maintain social networks through activities such as buddy systems or walking groups.
Environmental and policy approaches	
Creation of or enhanced access to places for physical activity combined with informational outreach activities ¹	<ul style="list-style-type: none">● These multicomponent interventions involve the efforts of businesses, coalitions, agencies, and communities to create or provide access to places where people can be physically active.● Creating walking trails or providing access to fitness equipment in nearby fitness or community centers can increase the opportunities for people to be more active.● In addition to promoting access, many include training people to use weights and aerobic fitness equipment; teaching about healthy behaviors; creating health and fitness programs and support or buddy systems; and providing seminars, counseling, risk screening, health forums and workshops, and referrals to physicians or additional services.

Appendix A. (continued)

Intervention	Description
Community-scale urban design and land use policies and practices to promote physical activity ²	<ul style="list-style-type: none"> • These interventions commonly strive to create more livable communities. • The interventions use policy instruments such as zoning regulations and building codes, and environmental changes brought about by governmental policies or builders' practices. The latter include policies encouraging transit-oriented development and policies addressing street layouts, the density of development, and the locating of more stores, jobs, and schools within walking distance of where people live. • The review was restricted to those studies reporting physical activity outcomes, mostly walking or biking for transportation, but also total physical activity and outdoor active play.
Street-scale urban design and land use policies and practices to increase physical activity ²	<ul style="list-style-type: none"> • These interventions use policy instruments and practices to support physical activity in small geographic areas, generally limited to a few blocks. These policies and practices include features such as improved street lighting or infrastructure projects that increase the ease and safety of crossing streets, ensure the continuity of sidewalks, introduce or enhance traffic calming such as center islands or raised crosswalks, or enhance the aesthetics of the street area, such as landscaping. • The review was restricted to those studies reporting physical activity (walking, bicycling, and outdoor play) outcomes. • These interventions involve the efforts of urban planners, architects, engineers, developers, and public health professionals who were instrumental in creating or providing more safe, secure, and enjoyable streets and sidewalks for walking and biking.
Transportation and travel policies and practices ²	<ul style="list-style-type: none"> • Interventions to promote physical activity, including interventions that strive to improve access to walkways for pedestrians increase access to light rail and other forms of mass transit, increase the safety of pedestrians and cyclists, reduce the use of cars, and improve air quality. • The review was restricted to studies reporting physical activity (walking or bicycling) outcomes. • The interventions use policy and environmental changes such as creating and/or enhancing bike lanes, requiring sidewalks, subsidizing transit passes, providing incentives for car/van pooling, increasing the cost of parking, and adding bicycle racks on buses.
Community-wide policies and planning*	<ul style="list-style-type: none"> • These interventions involve community-wide efforts to promote physical activity (all forms) through policy agendas, guidelines, incentives, policies that reduce environmental or institutional barriers to physical activity, and media campaigns. • They are comparable to the informational community-wide campaigns, in that they involve many community sectors in broad-based, multicomponent approaches to increase physical activity. The primary distinction, however, is that these interventions involve more than providing information to motivate people to change their behavior and to maintain that change over time; they require community-level policy changes. • Although these interventions may include aspects of the other environmental and policy interventions to increase physical activity, they are distinct in that they seek to increase all forms of physical activity and often consist of a combination of these strategies delivered to a broad population.

*Newly created intervention category following the GUIA literature review

Appendix B. Suitability of study design for assessing effectiveness in the *Community Guide*, adapted from Briss et al.³

Suitability	Examples	Attributes
Greatest	Randomized group or individual trial; prospective cohort study; time series study with comparison group	Concurrent comparison groups and prospective measurement of exposure and outcome
Moderate	Case-control study; time series study without comparison group	All retrospective designs or multiple pre- or post-measurements but no concurrent comparison group
Least	Cross-sectional study, case series, ecological study	Before-after studies with no comparison group or exposure and outcome measured in a single group at the same time

Appendix C. Assessing the strength of a body of evidence on effectiveness of population-based interventions in the *Community Guide*, adapted from Briss et al.³

Evidence of effectiveness ^a	Quality execution ^b	Design suitability	Number of studies	Consistent ^c	Effect size ^d
Strong	Good	Greatest	At least 2	Yes	Sufficient
	Good	Greatest or moderate	At least 5	Yes	Sufficient
	Good or fair	Greatest	At least 5	Yes	Sufficient
	Meets criteria for execution, suitability, number, and consistency for sufficient but not strong evidence				Large
Sufficient	Good	Greatest	1	Not applicable	Sufficient
	Good or fair	Greatest or moderate	At least 3	Yes	Sufficient
	Good or fair	Greatest, moderate, or least	At least 5	Yes	Sufficient
Insufficient ^e	A. Insufficient design or execution		B. Too few studies	C. Inconsistent	D. Small

^aThe categories are not mutually exclusive; a body of evidence meeting criteria for more than one of these should be categorized in the highest possible category.

^bStudies with limited execution are not used to assess effectiveness.

^cGenerally consistent in direction and size.

^dSufficient and large effect sizes are based on the quality of the outcomes, magnitude of effect sizes compared with U.S. *Community Guide* results, and population reach of the intervention.

^eThese categories are not mutually exclusive, and one or more of these will occur when a body of evidence fails to meet the criteria for strong or sufficient evidence.

References for Appendixes

1. Kahn EB, Ramsey LT, Brownson RC, et al. The effectiveness of interventions to increase physical activity: a systematic review. *Am J Prev Med* 2002; 22(Suppl 4):73–107.
2. Heath GW, Brownson RC, Kruger J, et al. The effectiveness of urban design and land use and transport policies and practices to increase physical activity: a systematic review. *J Phys Act Health* 2006;3(Suppl 1): S55–S76.
3. Briss PA, Zaza S, Pappaioanou M, et al. Developing an evidence-based Guide to Community Preventive Services: methods. The Task Force on Community Preventive Services. *Am J Prev Med* 2000;18(Suppl 1): 35–43.