

The Ciclovía-Recreativa: A Mass-Recreational Program With Public Health Potential

Olga Sarmiento, Andrea Torres, Enrique Jacoby, Michael Pratt, Thomas L. Schmid, and Gonzalo Stierling

Background: The Ciclovía-Recreativa is a free, community-based program in which streets are closed temporarily to motorized transport, allowing access to walkers, runners, rollerbladers, and cyclists only. We assessed existing information about the Ciclovía as a public health strategy and proposed next steps for research and public health practice. **Methods:** We conducted a systematic search of peer-reviewed and other literature, which was complemented by expert interviews and consultation. **Results:** We reviewed 38 Ciclovías from 11 countries. Most programs (84.2%) take place in urban settings. The programs range from 18–64 events per year (54 ± 24.6 ; 52 [mean \pm standard deviation; median]) with events lasting from 2–12 hours (6 ± 2.4 ; 6). The length of the streets ranges from 1–121 km (14.6 ± 22.1 ; 7), and the estimated number of participants per event ranges from 60–1,000,000 persons ($61,203 \pm 186,668$; 3810). Seventy-one percent of the programs include physical activity classes and in 89% of the Ciclovías, the streets are connected with parks. **Conclusions:** Ciclovías have potential for positive public health outcomes, but evidence on their effectiveness is limited. The different stages of new and established programs offer a unique opportunity for transnational studies aimed at assessing their public health impact.

Keywords: epidemiology, evidence-based research, environment

Increasing evidence indicates that public places are important venues for a wide variety of urban community interventions that impact public health.¹⁻³ A community program like the Ciclovía-Recreativa⁴ may have multiple effects on public health at individual, environmental, and policy levels.⁵

The Ciclovía-Recreativa,⁴ which we will refer to as Ciclovía, is a program in which streets are closed temporarily to motorized transport, allowing access only to walkers, runners, rollerbladers, and cyclists for recreation and socialization (Figure 1).^{4,5} The term Ciclovía is used in many countries to refer to permanent bicycle paths. However, in this review we use the term specifically to describe a public recreational program. Ciclovías have been established in many cities worldwide, seemingly with most being located in Latin America (Figure 2).

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As a mass recreational program, the Ciclovía is recognized as a promising program to promote physical activity (PA) in the population,⁶ contributing to chronic disease prevention, social capital development, and improvement in the population's quality of life (QOL). The program moves beyond advocating a healthy lifestyle to providing supportive environments and policies to promote PA.⁶ Specifically, it encourages the use of public space for recreation, creates socially cohesive environments, promotes efficient and sustainable modes of transportation like cycling,⁷ and provides community activities such as PA classes.

At the same time, by reducing vehicle miles traveled and promoting nonmotorized modes of transportation, the Ciclovía may help decrease exposure to air and noise pollution⁸ and motor vehicle emissions.⁸ With adequate coverage across the city, such programs could help decrease environmental injustice and its consequences on public health outcomes.⁹

Potential public health benefits of the Ciclovías have been acknowledged in several arenas. The Ciclovías from Quito and Mexico City won the Award to Active Cities Contest in 2005 and 2008, respectively, recognizing them as programs that promote healthier and more active lifestyles.¹⁰ A recent review identified the Ciclovía as a component of “community-wide policies and planning”¹¹ strategies and suggested that it might have promise for promoting PA.⁶



Figure 1 — Street in Bogotá, Colombia, on a workday (a) and on Sunday for the Ciclovía (b).

Despite the numerous potential public health benefits of the Ciclovías, there are currently no published intervention studies or comprehensive reviews assessing these programs. Therefore, we performed a systematic search to 1) summarize existing information about the Ciclovía as a public health and public policy strategy in the Americas and the Caribbean and 2) to define next steps for research, evaluation, and public health practice.

Methods

For this review, the Ciclovía was defined as a mass program occurring with a frequency of at least 2 events per month during the operating season, in which public streets covering a distance of at least 1 km are temporarily closed to motorized vehicles to allow use of the streets for recreational activities.

Literature Search

The systematic review of literature related to Ciclovía in the Americas and the Caribbean included peer-reviewed and other literature identified through literature databases, Internet and newspapers searches, and expert consultation. The first searches took place in April 2008, and follow-up searches were conducted in October 2008.

The following databases were searched for entries up to April 2008: LILACS, MEDLINE, MEDCARIB, PAHO, WHOLIS, and SCIELO. Search terms in English and Spanish included “Ciclovía” and combinations of “bicycling” or “cycling” and “bike path” or “bike lane,” as well as “mass/mega events” and “walking,” “biking,” or “cycling.”

The process also included Internet searches, which increased the probability of identifying grey literature (documents by governmental agencies, academic institutions, and other groups that are not distributed or indexed by commercial publishers), networks, and experts that could complement information from the databases. A Google search included the terms “Ciclovía” or “bike path” with the names of specific countries or cities in the Americas and the Caribbean. Also, groups related to Ciclovías were identified on the social networking website Facebook.

Next, we sent e-mails to 83 official members of the Physical Activity Network of the Americas (RAFA/PANA) in 18 countries asking for information on each city’s Ciclovía. Subsequently, a survey was administered to participants of the 2008 RAFA meeting in Costa Rica, and interviews were conducted with officials and members of the Ciclovía Unidas de las Americas (CUA),⁴ a network that promotes the creation of Ciclovías, during



Figure 2 — Geographical location of Ciclovía programs.

its 2008 international seminar in Quito, Ecuador. Finally, personal or e-mail consultation took place with researchers and government agencies responsible for sports and recreation in several cities.

The materials identified during the literature search were screened and reviewed independently by 1 investigator and 2 research assistants. All protocols and questionnaires were approved by the Institutional Review Board of the Universidad de los Andes in Bogotá.

Data Extraction and Evaluation

Reports about Ciclovías were accepted for further review only if the program fulfilled the description of a

regular Ciclovía. Therefore, the review excluded yearly or occasional mass events like marathons, car-free days, marches, bike trips, festivals, parades, and critical mass gatherings by activists. It also excluded reports related to permanent bikeways.

The evaluation of each program’s characteristics was built upon a conceptual framework (Figure 3) derived from a model for developing and implementing environmental and policy interventions for PA²; the framework for PA policy research¹¹; and the model of linkages between the built environment, physical activity, and public health.¹² This framework shows that the development and continuity of Ciclovías are determined by 1) sectors at different levels that influence policy actions

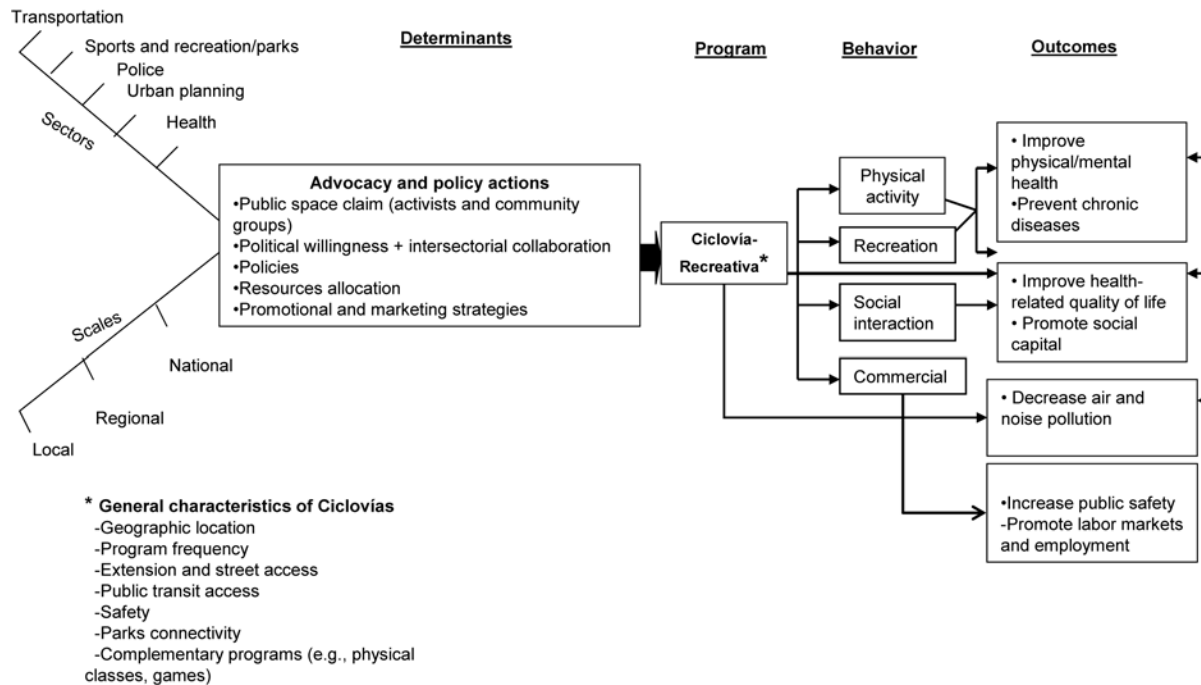


Figure 3 — Conceptual framework to evaluate the Ciclovía program's development, continuity, and effectiveness in improving public health.

(eg, governmental or nongovernmental agencies, transportation departments, sports and recreation departments, and other funding agencies), 2) advocacy actions (eg, marketing strategies and community activists and movements), and 3) general characteristics related to design and scheduling such as street length, park connectivity, complementary programs, and program frequency. In turn, Ciclovías could have an effect on PA behaviors, recreation, health-related QOL, economic activity, and the social and physical environment.

Results

Literature Search

Thirty-eight programs met our definition of a regular Ciclovía and were included for further review (Table 1, Figure 2). A total of 1092 citations were reviewed from databases. From those, only 2 included original research on Ciclovía programs and underwent further review.^{13,14} Based on the consultation with experts and programs directors, a book chapter,¹⁵ 5 reports,^{5,16-19} and an abstract,²⁰ and an in-press article on a cross-sectional study²¹ of the built environment and PA patterns in Bogotá were also reviewed.

Of the web pages evaluated, we included in our review only those from mayors' offices, sports and recreation departments, health departments, nongovernmental organizations, and newspapers, along with official Ciclovía program websites. Within the websites for the

programs in Zapopan and San Francisco, we found 1 marketing study (Zapopan)²² and 1 transportation study (San Francisco),²³ both of which were included. Thirty-eight Facebook groups related to Ciclovías were found, and 8 groups provided additional information. The information on park connectivity and access to public transportation was complemented with Google maps.

The following programs were excluded (Figure 2): pilot Ciclovía programs in Baltimore,²⁴ Chicago,²⁵ New York,²⁶ and Portland²⁷ held during the second half of 2008; and programs in Cleveland,²⁸ Halifax,²⁹ Florianópolis,³⁰ Zarzal,³¹ Guayaquil, and Cuenca that have taken place only a few times or are currently inactive. Also excluded were programs in Popayan, Ciudad de Juarez, and the town of Betulia, which are currently inactive primarily because of lack of government support. The Ciclovías in the municipality of Ciudad Bolívar and San Vicente, as well as the programs in San Jose de Costa Rica, Leon, Callao and San Miguel, and Curitiba³² occur irregularly or only once a month. A rural program in el Peñol was excluded because it uses a street less than 1 km long.

General Characteristics of the Ciclovías

The first 3 Ciclovías began in the 1960s,³³⁻³⁵ and 10 more were developed in the subsequent 3 decades.³⁶⁻⁴³ These were followed by a significant increase of 25 new programs in the 21st century (Figure 4).⁴⁴⁻⁶⁰ Currently, Ciclovías operate in a geographically diverse group of cities in the Americas (Figure 2). Most (86.8%) take place

Table 1 Characteristics of the Ciclovia Programs of the Americas

General characteristics															
Country	City	Name	Year ^a	Participants/ event	Schedule ^d	Events per year	Length/ km	Design			Policy and advocacy				
								Parks connectivity	Public transport access	Complementary programs & activities	Temp businesses	Safety & first aid services	Sponsorship & staff	Promotion- marketing strategies	Source of the information
Brazil	Belo Horizonte	Domingo na Orla	2008	NA ^b	Su 8:00-14:00	52	1.5	YES	YES	Theater plays, concerts, health evaluation/pro-motion points	NO	YES	Mayor's office	NA	Website from Prefeitura
	Brasilia	Eixão do Lazer	1991	4,292	Su + H 8:00-18:00	69	17	YES	YES	Theater plays, concerts, children activities	YES	YES	Federal district government, Secretary of Transportation, police department, private sector	Advertising materials	Website & newspaper
	Rio de Janeiro	Ruas da Saúde	1998	Ne ^c	Su + H 7:00-19:00	59	>50	YES-beach	YES	Soccer	YES	NO	City Hall, Department of Transportation & Engineering, municipal guards	NO	Website, YouTube, newspaper & director of the NGO Transporte Ativo
	Salvador	Rua de Lazer, Farol da Barra	2005	2,500-4,000	Su 9:00-14:00	52	5	YES-beach	YES	Walking trips, book reading spaces, dancing, aerobics, semi-contact sports	YES	YES	Public sector: SMEL-Municipal de Espotes, Lazer e Entretenimento; Private sector; budget \$45,000	Flyers	Website, newspaper & director of the program Ruas de Lazer
	São Paulo	Ruas de Lazer	1966	40,000 Minhocao	Su + H 8:00-17:00	69	3.4 Minhocao	YES	YES	Soccer, volleyball, board games	YES	NA	Public sector: SEME (The City Institution of Sports and Recreation)	NA	Website & YouTube
	Sorocaba	Pedala Sorocaba	2008	1,000-5,000	Su 7:00-13:00	52	8	YES	YES	Painting classes for children, aerobics, stretching, biking classes, a mobile health unit	YES	YES	Public sector; budget \$300,000 per year	Webpage	Website & director of the program

(continued)

Table 1 (continued)

Country	City	Name	Year ^a	General characteristics			Design				Policy and advocacy				
				Participants/ event	Schedule ^d	Events per year	Length/ km	Parks connectivity	Public transport access	Complementary programs & activities	Temp businesses	Safety & first aid services	Sponsorship & staff	Promotion- marketing strategies	Source of the information
Canada	Ottawa	AlcateI Sunday Bike-days	1976	80,000/ season in 1996	Su (May- Sep) 9:00-13:00 & Gatineau parkways 6:00-12:00	21	52	YES	YES	Skating classes, safety features check, helmet tips	NA	YES	Public & private sectors & 300 volunteers	Advertise- ment in local newspapers, magazines sponsored by the Capi- tal area radio & Webpage	Website & director of the program
Chile	Santiago de Chile	CicloRec- reoVía La Reina	2006	3,000	Su 9:00-13:00	52	7	YES	YES	Aerobic sessions	YES	YES	Private & public sectors & 10 employees & volunteers, children; budget \$135,000 per year	TV shows, newspaper & Webpage	Website & director of the program
Colombia	Abriaquí municipality ^e	Avenida de la Juventud	2002	60	1 day per week 18:00-20:00	52	1	YES	YES	Physical activ- ity classes, bike repair services	YES	YES	Public sector & 2 staff	Flyers	Director of the program
	Carolina del Príncipe municipality ^g	Carolina Saludable	2001	120	Every 15 days 8:00-18:00	26	1	YES	YES	Aerobics, skat- ing classes, soccer, vol- leyball, chess, and traditional games	YES	YES	Public sector & 8 staff	Radio stations, newspapers & promotion during mass at church	Director of the program
	El Retiro municipality ^e	Encuentro en Familia	2008	NA	F+ Su F 19:00- 21:00 & Su 8:00-11:00	104	3	YES	YES	Aerobics, walks, spinning	YES	YES	Public sector & 20 staff	Local channel, radio station & posters	Director of the program
	Guarne municipality ^e	Ciclopas- eos noctur- nos	2008	120	Every 15 days 2 hr	26	7	NA	YES	Aerobics, stretching	YES	NA	Public sector & 7 staff	Radio stations, mainly in schools	Director of the program

(continued)

Table 1 (continued)

Country	City	Name	Year ^a	General characteristics			Design				Policy and advocacy				
				Participants/ event	Schedule ^d	Events per year	Length/ km	Parks connectivity	Public transport access	Complementary programs & activities	Temp businesses	Safety & first aid services	Sponsorship & staff	Promotion- marketing strategies	Source of the information
Colombia (continued)	San Pedro municipality ^e	Ciclovas recreativas	2007	120-150	Every week 18:00-20:00	52	5	NA	YES	Aerobics, dancing classes	NO	NA	Municipal administration	Radio stations, TV channels, & newspapers	Director of the program
	Armenia	Ciclovia de la Avenida Centenario	2001	1,300-1,900	Su 8:00-12:00	52	3.8	YES	YES	Aerobics, spinning, recreational activities	NA	YES	Public & private sectors	Part of the program "Armenia se mueve con actividad física"; flyers, radio & newspaper	Website & director of the program
	Bogotá	Ciclovia RecreoVía	1974	700,000- 1,300,000 in 2008; 1,400,273 per month in 2005	Su + H 7:00-14:00	72	121	YES	YES	RecreoVía program, extreme sports stations, veterinarian points, health evaluation/promotion points (RAFI), bike riding classes	YES	YES	Mainly the District Institute of Sports and Recreation (IDRD); also private sector, & NGO; 2,026 staff budget \$1.7million per year	"Bogotá no tiene mar pero tiene cicloVía," "CicloVía, sectional studies Rueda la vida" Web- page, radio newspaper, Program Muevete Bogotá	Director of the program & cross-sectional studies conducted in 2003 and 2005
	Cali	Ciclovidas comunitarias	1982	350,000	Su 8:30-13:00	52	37	YES	YES	Aerobics, health promotion campaigns	YES	YES	The Secretary of Recreation, Secretary of Public Health, Secretary of transportation & police department	"play in Cali"	Director of the program & newsletters
	Cúcuta	Ciclovia o ciclopaseos	1999	400	Su 8:00-13:00	52	5	YES	NA	Aerobics, traditional games, soccer, biking trips	NA	YES	Municipality Institute of Sports and Recreation & 10 staff	Publicity & radio station	Website & staff from the program

(continued)

Table 1 (continued)

Country	City	Name	General characteristics				Design					Policy and advocacy			Source of the information
			Year ^a	Participants/ event	Schedule ^a	Events per year	Length/ km	Parks connectivity	Public transport access	Complementary programs & activities	Temp businesses	Safety & first aid services	Sponsorship & staff	Promotion- marketing strategies	
Colombia (continued)	Ibagué	Ciclovia de Ibagué	2002	10,000- 12,000	Su + H 8:00-13:00	69	6.6	NO	YES	Special events, aerobics, self defense classes, recreational activities	YES	YES	Mayor's office	Newsletter & Webpage	Website & director of the program
	Medellin	Ciclovia recreativa	1984	58,895	Su + H + Tu Su + H 7:00-13:00 & T + Th 20:00-22:00	164	23	YES	YES	Soccer champi- onships, aero- bics, activities for children, mass	YES	YES	Public sector and private industry & 76 staff; budget \$275,000	Ciclovía program belongs to "Healthy Life Styles" program	Website, report & director of the program
	Pasto	Ciclovia Recreoivia	2005	3,000-10,000	Su 8:00-12:00	52	4.5	YES	YES	Chess games, climbing wall, dancing, martial arts, concerts	YES	YES	Public & private sectors	Radio, newspapers & flyers	Former advisor of the Mayor of the city
	Pereira	Ciclovia de la Villa	2008	NA	Su 9:00-13:00	52	4	YES- stadium	YES	Dancing, aerobics, "Rumba- therapy," weight measurement	YES	YES	Municipality Institute of Sports and Recreation & private	Newsletter	Website & staff from the Mayor's office
	Soacha ^e	Ciclovida	2008	100,000	Su + H 7:00-12:00	67	37.5	YES	YES	Aerobics classes	YES	YES	Municipality Institute of Sports and Recreation (IMRDS) & 25 staff	Flyers & newspaper	Newspaper & website
	Tuluá	Ciclo-via	1990	80-100	Su 8:00-12:00	72	1.5	YES	NA	NA	YES	YES	Public & private sectors	Advertis- ing only for special programs	Website & director of the program (continued)

Table 1 (continued)

General characteristics										Design				Policy and advocacy			
Country	City	Name	Year ^a	Participants/ event	Schedule ^d	Events per year	Length/ km	Parks connectivity	Public transport access	Complementary programs & activities	Temp businesses	Safety & first aid services	Sponsorship & staff	Promotion- marketing strategies	Source of the information		
																Public transport access	Temp businesses
Ecuador	Quito	Ciclopaseo de Quito	2003	40,000	Su every 15 days 9:00-15:00	26	29	YES	YES	Contests, playgrounds, bike riding classes	YES	YES	Public & private sectors & 262 staff	“Ciclopolis, Ciclopaseo de Quito, gente en movimiento,” Biciacción & Webpage	Website & director of the program		
El Salvador	San Salvador	Cicloviarias familiares	1992	960	Su 7:00-12:00	52	8.5	NO	YES	Cultural, pets, festival activities	YES	YES	Mayor’s office and IMDER (Institute of Sports and Recreation)	Magazines, newspapers, TV, radio & Webpage	Website & staff from the program		
Guatemala	Ciudad de Guatemala	Pasos y Pedales	2005	Hundreds of families	Su + H 10:00-14:00	52	6.5	YES	NA	Dancing, aerobics, Tai-Chi, Tae-Bo classes, extreme sports, reading spaces	NA	YES	Mayor’s office & 250 staff	Webpage	Website		
Mexico	Chihuahua	Recreovia	2007	15,000-30,000	Su 8:00-12:30	52	20	YES	YES	Aerobics	NO	NA	Private & public sectors	“El domingo la Calle es tuya,” “Disfruta la ciudad con tu familia,” “Un Domingo con sentido familiar” & Webpage	Website		
	Guadalajara	Vía Recre-Activa	2004	120,000	Su 8:00-14:00	52	21.6	YES	YES	Chess tournaments, board games, yoga, photography expositions, dancing, security workshops, magician and clown acts	NO	NA	Private & public sectors & 450 staff; budget \$6,350 per event	Webpage & TV	Website & director of the program		

(continued)

Table 1 (continued)

Country	City	General characteristics					Design				Policy and advocacy				
		Name	Year ^a	Participants/ event	Events per year	Schedule ^d	Public transport access	Parks connectivity	Length/ km	Complementary programs & activities	Temp businesses	Safety & first aid services	Sponsorship & staff	Promotion- marketing strategies	Source of the information
Mexico (continued)	Ciudad de Mexico	Muevete en Bici, Cierre Dominical & El paseo ciclista Reforma-Zócalo	2007	10,000	52	Su 7:00-14:00	YES	YES	Biking classes, skateboard exhibitions	NO	YES	Private & public sectors	TV, newspaper & Webpage	Website & director of the program	
	Merida	Bici-ruta	2003	3,500	52	Su 6 hr	YES	YES	Theater plays, sewing lessons, painting lessons, shows for children	NO	YES	Public sector	Posters, radio, TV commercials & Webpage.	Staff of the program & director of the Zapopan program	
	Tlaquepaque	Vía Recre-Activa	2007	25,000	52	Su 8:00-14:00	YES	YES	Cultural activities	NO	YES	Private & public sectors	Webpage & TV	Website & director of the program	
	Zapopan	Vía Recre-Activa	2007	80,000	52	Su 8:00-14:00	YES	YES	NA	NO	YES	Public sector; budget \$180,000 per year	Radio & Webpage	Cross-sectional study conducted in 2007, Website & director of the program	
Peru	Lima	Muevete San Borja & Ciclodía	2003	250,000	52	Su & Ciclodía every 15 days 6:00-12:30	YES	YES	Bike riding classes	NO	YES	Private & public sectors	Flyers, newspapers, radio & Webpage	Website & director of the program	
United States	Cambridge	Memorial Drive Recreational Sundays	1976	NA	31	Last Su of April-2nd Su of Nov 11:00-19:00	YES	YES	Outdoor and special events	NA	NA	Public sector	NA	Website	

(continued)

Table 1 (continued)

Country	City	Name	Year ^a	General characteristics			Design				Policy and advocacy				
				Participants/ event	Events per year	Length/ km	Parks connectivity	Public transport access	Complementary programs & activities	Temp businesses	Safety & first aid services	Sponsorship & staff	Promotion- marketing strategies	Source of the information	
United States (continued)	El Paso	Ciclovia El Paso/ Scenic Sundays	2007	1,000	32	4.8	YES	YES	YES	Arts and crafts exhibitions, sports	YES	YES	Public & private sectors; Paso del Norte Health Foundations, Cemex, Tenet, Western Refining, Texas Round-Up, the City of El Paso; budget: \$64,778 per event	“Take parks to the streets” flyers, and Web page	Website & staff of the program
	San Francisco	Healthy Saturdays in Golden Gate Park & free car Sundays	1968	1,157	18	1.6	YES	YES	YES	Skate board activities	NA	YES	Public sector & general coordinator, volunteers, security staff	“Healthy Saturdays in Golden Gate Park.” website, flyers, newspaper, & Web page	Website & a transportation study
	Seattle	Group Health Bicycle Saturdays & Sundays	1967	2,000-2,200	32	9.7	YES	YES	YES	Bike riding classes, low-priced helmet sales	NA	YES	Public & private sectors (Seattle Parks, Group Health Cooperative)	Webpage	Website & staff from the program & from the Cascade Bicycle Federation
	Caracas	Ciclo-Chacao Dominical	2004	200-400 per month	52	2	YES	YES	YES	Bike riding/repair classes	NO	YES	Mayor’s office, 15 guardians, 1 coordinator & security personnel	Posters & newspapers	Website & the director of the program

^a Inauguration year. ^b NA, not available information. ^c NE, not estimated. ^d If information about total events was not available we assumed that all holidays and the 52 Sundays were available for the program. Su = Sunday; Sa = Saturday; H = holiday. ^e Rural Ciclovía programs.

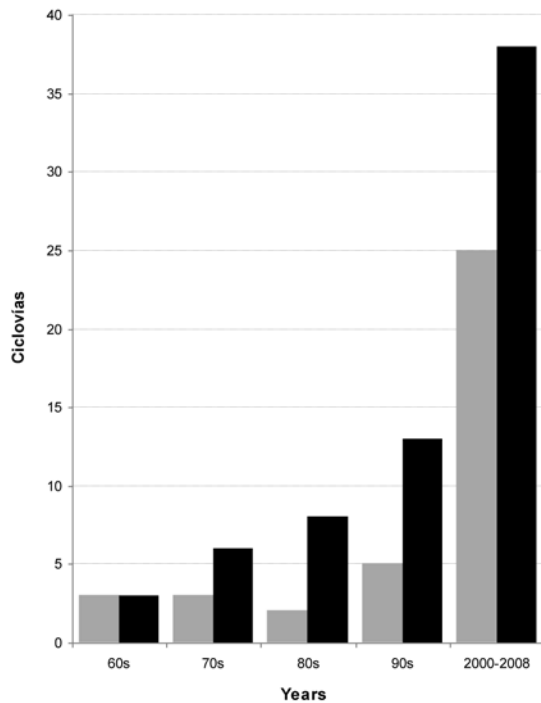


Figure 4 — Frequency (gray bars) and cumulative frequency (black bars) of Ciclovía programs by inauguration year.

in urban settings; 6 rural municipalities have adopted Ciclovía programs.

The frequency of program operation ranges from 18 to 64 events per year (mean 54 ± 24.6 ; median 52) (Figure 5); the duration of operation ranges from 2 to 12 hours (mean 6 ± 2 ; median 6) (Figure 6); and the length of the closed streets varies from 1 km to 121 km (mean 14.6 ± 22.1 ; median 7). For programs that estimate numbers of participants per event, estimates ranged from 60 to 1,000,000 persons (mean $61,203 \pm 186,668$; median 3810). The methodology for estimation of the numbers of participants differs by cities.

A variety of factors, including street quality, traffic control, and concerns about safety can act as barriers to program implementation and continuity. For example, the Zapopan study²² found that 35% of the population reported that lack of traffic control, poor access, street cleanliness, and security were impediments to regular participation. In Bogotá, adult participants reported street quality (12%) and traffic control at intersections (12%) as the main barriers.¹⁶ Likewise, a cross-sectional study conducted in Bogotá showed that individuals living in neighborhoods in which Ciclovía corridors are not available are less likely to participate in the program.²¹

Although perceived lack of access is one of the main reasons for not participating in the Ciclovía, 90% of these programs can be accessed from public transportation. However, in most cities, transportation policies do not allow bicycles on public transit, and bike rentals are unavailable.

Policy and Advocacy Actions of the Ciclovías

Implementing Ciclovía programs requires both public and political support in addition to intersectorial coordination. In fact, all the programs evaluated involve different degrees of concerted actions from both communities and government sectors including transportation, police, sports and recreation, and health. Likewise, all programs involve public-private partnership and, except for Chile's Ciclovía, all are funded primarily by public funds. According to the limited information available regarding direct costs of installation and maintenance of the programs, the cost per year ranges from \$45,000 to \$2,072,896 US dollars. Based on the average number of participants per event, the cost per participant was calculated and ranges from \$0.01 to \$64.80 (mean $\$9.6 \pm \24.3 ; median \$0.35).

Political will strongly influences the sustainability of Ciclovías, as evidenced by the fact that at least 3 programs are currently inactive as a result of lack of political support, and 5 others have been interrupted, threatened with closure, or had their schedules reduced. However, political constraints against Ciclovías are shaped in part by the degree of satisfaction and empowerment within the communities, as illustrated by the case of Chile. In September 2008, the director of the CicloRecreoVía de Chile announced that because of a lack of political support, he was going to reduce the program. The community response indicated that doing so would be a costly political mistake, prompting the mayor to continue supporting the program (Gonzalo Stierling, oral communication, September 2008). In Bogotá an attempt was made, as a part of a larger national transportation reform initiative, to modify the program's schedule. The community expressed their opposition to the proposed changes. In the end, the legislation was not adopted by the Congress.

Advocacy through community mobilization is a thread common to many Ciclovías. Indeed, 5 programs began as activist movements that evolved into partnerships with government. Regardless of public or private genesis, each program has had 1 person or a small group of people as the driving force behind the initiative.

Since their inception, the programs have been adapted to different contexts, given culturally appropriate names, and been marketed using various promotional strategies. Specifically, 84% of the programs have engaged in some type of mass media marketing strategies, and 47% have an official website.

Overall, the Ciclovías we evaluated are characterized by low opposition and high support within the community. A study conducted in Zapopan²² to assess the degree of acceptance of the Vía RecreActiva program among residents living within 500 m of the program corridor showed that 70% of the study population accepted the program, and 80% of those were willing to participate in it. A Bogotá study found that 85.7% of adult participants interviewed during the Ciclovía planned on returning the next Sunday.¹⁶

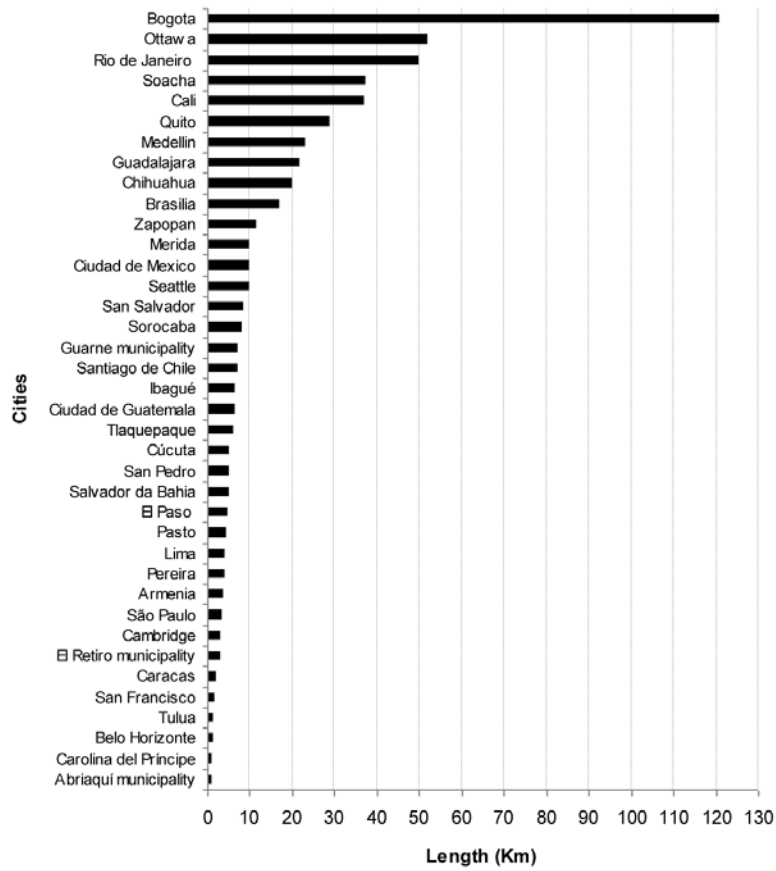


Figure 5 — Kilometers of the Ciclovía programs by cities.

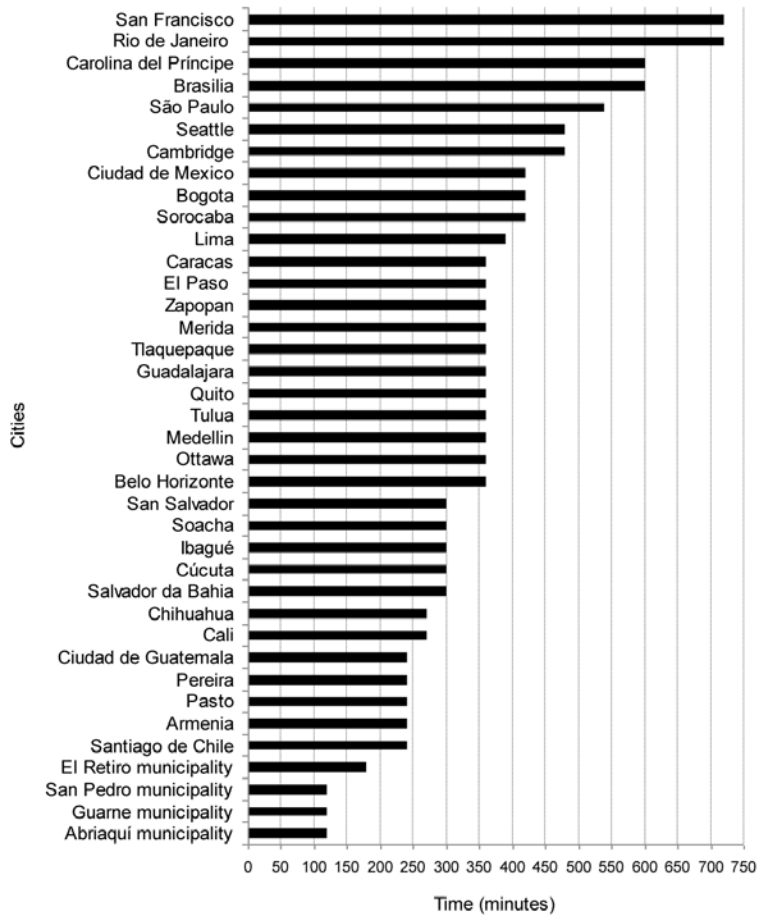


Figure 6 — Duration of the Ciclovía programs per event.

Taken together, the organizational models for these programs, the degree of their acceptance, and their duration (mean 10 y \pm 13.1; median 4.5 y; range 0–42 y) provide partial evidence for their sustainability.

Ciclovía and Public Health Outcomes

Physical Activity. The Ciclovías of the Americas are potential settings for effective promotion of PA among families and individuals of all ages because they are free, conveniently scheduled, and often connected with parks, and they complement existing PA programs.

We calculated the average yearly minutes per week available for PA for program i (θ_i) on the basis of time available for such programs as follows:

$$\theta_i = \frac{\text{minutes for program } i}{\text{day}} \times \frac{\text{daily events}}{\text{year}} \times \frac{\text{year}}{52 \text{ weeks}}$$

For example, let us consider the case of Bogotá that has 420 minutes of the program per day and 72 events per year, then the average yearly minutes per week available for PA for the Ciclovía program is calculated as follows:

$$\theta_{\text{Bogota}} = \frac{420 \times 72}{52} = 582$$

These estimates showed that every year, Ciclovías provide an average of 360 minutes per week (\pm 210; median 300; range 60–1135) for possible participation in PA.

In addition, 71% of the Ciclovías reported offering complementary programs such as PA classes, and in 89% of the Ciclovías, the streets are connected with parks, or beaches. Hence, such programs could promote visits to parks where additional PA interventions could be offered. For example, in San Francisco, 44% of visitors to Golden Gate Park reported being more likely to visit the park on Sunday when the central JFK Drive is closed to traffic, and 28% of those arriving at the park on Sundays reported their main reason for being there was wanting to exercise or walk.²³ Likewise, 17% of those participating in Zapopan's Ciclovía reported doing so to be physically active, while 54% of those participating in Bogotá's Ciclovía do so to take care of their health or to be fit.^{16,22}

Even though the Ciclovías provide an opportunity for leisure PA, the question remains whether program participants are more likely to meet PA recommendations. In one study among adults residents of Bogotá, 20% of those who reported program participation during the last month reported doing 30 minutes of PA during leisure time per day on at least 5 days.²⁰ Furthermore, an estimated 41% of Ciclovía program participants in Bogotá participated for more than 3 hours with 33% walking or running, 49% cycling, and 38% rollerblading or using other types of

wheels.¹⁶ In contrast, another study showed that women who reported never participating in Bogotá's Ciclovía program during the last 30 days were more likely to be physically inactive.¹³

In well-developed programs such as the Bogotá Ciclovía, the combination of high participation rates, weekly or greater frequency, and average use times of 2 hours or more potentially contributes substantially to meeting overall population requirements for weekly physical activity as defined in the new US PA guidelines for adults (ie, 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic physical activity each week).⁶¹

We estimated the contribution of PA from the Ciclovía in each city towards meeting overall population requirements for physical activity. Based on the program schedule for each city i , the fraction of weekly PA minutes provided by each program under scenario j was estimated as follows:

$$\omega_{ij} = (\text{Ciclovía participants at city } i \times \text{expected minutes of PA per day under scenario } j) / (\text{population of city } i \times 150 \text{ minutes of PA per person})$$

where the scenarios assume 60, 120, and 140 minutes of PA per day for $j = 60$, $j = 120$, and $j = 140$, respectively. The 140 expected minutes were estimated from a survey conducted in Bogotá,¹⁶ but to be conservative, the calculation also included lower estimates (eg, 60 and 120 minutes).

For example let us consider the case of Bogotá ($i =$ Bogotá) under the scenario were participants reported 140 minutes of moderate PA per day, that is $j = 140$. Taking into account that for Bogotá the population is 6,840,116 and the number of Ciclovía participants is 1,000,000 per day, then the fraction of weekly PA minutes provided by the Ciclovía program in Bogotá is calculated as follows:

$$W_{\text{Bogota},120} = \frac{1,000,000 \times 140}{6,840,116 \times 150} = 0.1364 = 13.64\%$$

The estimates indicated that the percentage of weekly PA minutes provided by the programs under the 3 scenarios varies by city (scenario 140 min [mean 2.5%; median 0.36%; range 0%–23.4%] vs. scenario 120 min [mean 2.2%; median 0.3%; range 0%–20.1%] vs. scenario 60 min [mean 6.9%; median 0.2%; range 0%–10.0%]; Figure 7). For cities like Bogotá, Cali, and Soacha, the Ciclovía provides more than 5% of the recommended weekly minutes of PA at the population level under the 3 scenarios.

Beyond influencing leisure activities, Ciclovías could also serve as mass marketing campaigns to promote cycling and walking as culturally acceptable behaviors. For example, 13% of the programs offer biking classes, and 2 of these classes include lessons targeted at women,

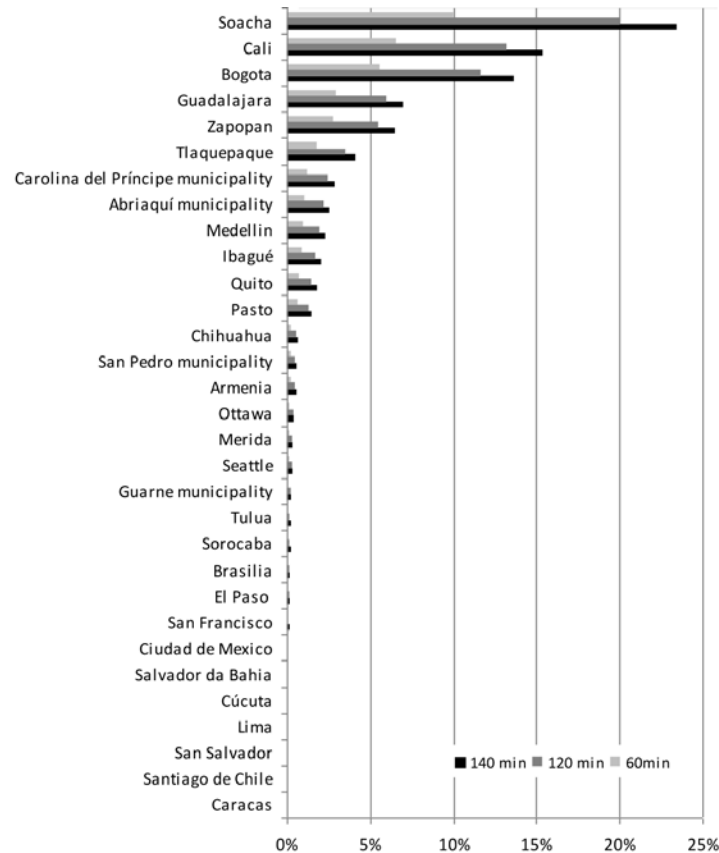


Figure 7 — Percentage of weekly physical activity provided by the Ciclovía programs assuming 60 minutes (light grey bars), 120 minutes (grey bars), and 140 minutes (black bars) of moderate physical activity per participant per event.

a population group less likely to know how to ride a bike in Latin America.¹⁶ In addition, a study conducted in Bogotá reported that adults from low-income communities who reported Ciclovía program participation during the previous week were more likely to report biking for transportation.¹⁴ No association was found between participation and walking for transportation for at least 150 minutes per week.

Quality of Life and Social Capital. Nearly all the Ciclovía programs reported having been implemented with the purpose of improving citizen QOL and promoting social inclusion. Possible pathways for achieving these goals include community mobilization, promotion of recreation and leisure PA,⁶² connectivity with parks and green areas,⁶³ and community empowerment⁶⁴ and volunteering. In fact, 63% of the programs reported including volunteers in their staff, including middle school children, high school students completing their national service, and college students.¹⁷ Ciclovías also provide opportunities for social interaction across all socioeconomic classes.

A study in Bogotá found that adults participating in the Ciclovía program at least 1 day per month were more likely to score higher on health-related QOL measures than

adults who reported no program participation.²⁰ This association remained significant even after adjusting for socio-demographics, lifestyle, and built-environment factors.

Physical Environmental Benefits. The Ciclovía programs could help decrease environmental pollution. For example, one pilot study that measured exposure to particulate matter (PM₁₀) over 2 days along a segment of Bogotá’s Ciclovía¹⁹ showed that PM₁₀ was 13 times higher on a regular week day (65 µg/m³) than on a Sunday (5 µg/m³). This decrease could be the result of the replacement of 4865 vehicles on the regular week day by 3797 people during the Ciclovía, in addition to the effect of a lower volume of vehicular traffic generally on Sundays.

Social Environmental Benefits. The Ciclovía could also affect labor markets and employment, key components of the social environment, by generating jobs. Of the programs evaluated, 55% reported an increase in the number of temporary businesses. One study conducted in Bogotá¹⁷ compared the number of temporary vendors in the Ciclovía with the number of automobile-related businesses along the same corridor and found that the former provide 7.4 times more employment than the latter. Moreover, 96% of the Ciclovía vendors were from

the 3 lowest economic strata of the city, and for one third of them, working at the Ciclovía was their only source of employment. In contrast, although most owners of businesses in the Zapopan Ciclovía corridor support the program, 16.5% reported that the program has a negative impact on their business sales.²²

Implications and Directions for Future Research and Public Health Practice

The findings of this systematic review indicate that Ciclovías in the Americas have the potential for positive public health impact. We found that these programs have grown exponentially in the 21st century. Today, they regularly serve the populations of 38 cities in 11 countries throughout the Americas. Both the individuals who participate in the Ciclovía and the communities affected by the closing of the streets can be considered as primary targets for health promotion measures. Each community has unique circumstances that influence the Ciclovía in terms of design, policies, advocacy, and viability. Common among all Ciclovías, however, is the dependence on intersectorial partnerships for development and sustainability.

Although the Ciclovía programs are promising, evidence of their effectiveness is limited to cross-sectional studies that have provided limited data upon which to build a framework for future research and surveillance. The Ciclovía program deserves a rigorous epidemiologic evaluation to assess its effectiveness regarding public health outcomes, its environmental impact, and its cost-effectiveness. This is of particular importance in rapidly urbanized settings of Latin America where incidence rates of inactivity, obesity, and chronic diseases are on the rise; where travel projections indicate a substantial increase in car and motorcycle traffic; and where parks and safe public space for recreation are limited.⁶⁵

The diversity of Ciclovías by size, geography, and stage of development offers a unique opportunity to design experimental, quasi-experimental, and crossover studies that may provide evidence of the public health effectiveness of this strategy. Future research will benefit from comparisons of Ciclovía programs across nations.

In our systematic search we mainly focus on programs from the Americas and the Caribbean. However, it is important to underscore that there are Ciclovía programs in cities from other regions such as the Silom street program in Bangkok, programs in Switzerland, Paris and Jakarta which should be included in future systematic searches. In addition WHO launched the campaigned “1000 cities—1000 lives” as the theme of the World Health Day 2010, which will focus on urbanization and health.⁶⁷ The campaign is promoting that in April 2010, cities around the world close their streets to traffic and promote physical or mental health activity.

In October 2008, in Bogotá, the CDC/WHO Collaborating Center for Physical Activity and Health convened a Workshop for Building Evaluation Capacity for Urban Health Promotion in Latin America to generate ideas for evaluating the effectiveness of public health interventions.

This multidisciplinary group, which included researchers and stakeholders from the United States, Colombia, and Brazil, discussed future research on the Ciclovía. Highlighted areas included the need for instruments to better measure activities and count program participants, and the need for more rigorous epidemiological studies to assess public health outcomes. In this context, the group underscored the need for objective measures, such as direct observation,⁶⁶ which should be evaluated as potentially useful tools in assessing these programs periodically. Lastly, the workshop also focused on the need for studies that identify policy influences on Ciclovía development and sustainability.

Future research into the impact of Ciclovía will help provide empirical underpinning for policy development and aid in translating these programs into interventions with real public health benefits. These studies will require international networks and multidisciplinary groups with true partnerships between researchers, practitioners, stakeholders, and community leaders.

Acknowledgments

The authors are deeply indebted to the directors, coordinators, and colleagues who work in the Ciclovía programs for providing information on their programs. In alphabetical order they are: Aracelis Acosta, Lucia Alonso, Claudia Arango, Fabio Arevalo, Adam Becker, Lucy Barriga, Germán Bonell, Antonio Bramante, Mónica Davila, Susana Espinel, Claudia Garzón, Lucy Gomez, Adolfo Hernandez, José Lobo, Nilton Lopez, Cesar Maia, Cristian Medrano, Gabriel Michel, Ricardo Montezuma, Rafael Moreira, Guillermo Peñalosa, Diego Puente, Carlos Pardo, Mario Andrés Quintero, Mauricio Ramos, Carlos Rivera, Juan Rondón, Oscar Ruiz, Danni Simons, Andrea Tamayo, Jose Tapias, Ricardo Vega, Lisseth Villalobos, Carlos Julio Villamil, Shamori Whitt, Roberto Zaa, Octavio Zegarra, and Carlos Zota. We also thank Ana Maria Cardona, Olivia Ferreira, Andrea Garces, Laura Hernandez, and Andres Mendez, who helped collecting the data. The authors are grateful for the valuable input of Sonja Kahlmeier, Luis Fernando Gomez, Janeth Mosquera, and James Merrell in earlier versions of the manuscript. The authors recognize the valuable contribution of all the workshop members, including Ross Brownson, Pedro Hallal, Tom Mackenzie, and Rodrigo Sirqueira. The authors are grateful for the map designed by Diana Fernandez. The study was funded by the Centers for Disease Control and Prevention and the Pan American Health Organization Cooperative Agreement Grant No. O/CNT/0800127.001. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the Panamerican Health Organization.

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