tributed to the interpretations and presentation of the findings. M. Gross drafted the manuscript. S. Holte performed all statistical analyses.

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Effects of a Community-Based Intervention on Physical Activity: The Pawtucket Heart Health Program

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ABSTRACT

Objectives. The effect of a community-based physical activity program in Pawtucket, RI, was evaluated relative to one in a comparison community.

Methods. Cross-sectional surveys of 7529 residents of Pawtucket, RI, and 7732 residents of the comparison city were conducted at 2-year intervals during 7 years of intervention.

Results. There were no differences in self-reported knowledge of the benefits of physical activity, attempts to increase exercise, or prevalence of physical inactivity between Pawtucket and the comparison community.

Conclusions. Future community-based physical activity interventions should attempt to involve a wider range of individuals. (*Am J Public Health.* 1999;89:1741–1744)

Over 60% of Americans are physically inactive.[1] The health benefits of physical activity have been recently highlighted in the US surgeon general's report on physical activity and exercise.[2] It is predicted that a reduction of 5% to 25% in the rate of coronary heart disease would result if all sedentary individuals could become physically active.[3–5] These findings suggest that effective community-based interventions to increase physical activity could have significant public health benefits. The Pawtucket Heart Health Program (PHHP) was a federally funded research and demonstration project designed to test whether community-based interventions could reduce cardiovascular disease risk factors.[6] This study reports on the effectiveness of the PHHP's intervention on physical activity and discusses the trends in physical activity in southeastern New England from 1982 through 1993.

Methods

The design and methods of the PHHP have been described in detail elsewhere.[6–8]

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Independent cross-sectional surveys of 7529 residents of Pawtucket, RI (the intervention city), and 7732 residents of a comparison city (all subjects aged 18 to 64 years) were conducted at 2-year intervals. The method of Kish[9] and Deming[10] was used to select one person aged 18 to 64 years from each randomly selected household; the resident was asked to participate in a 35-minute interview performed by trained survey technicians. There were 2442 participants in cross-sectional survey 1 (XS1) (1981–1982), 2799 in XS2 (1983–1984), 2955 in XS3 (1985–1986), 2953 in XS4 (1987–1989), 2037 in XS5 (1990–1991), and 2075 in XS6 (1992–1993). All respondents were asked questions regarding knowledge of physical activity, change in exercise, and levels of physical activity (see Table 1). The physical activity question used in XS1 and XS2 has not been validated. The physical activity question used in XS4 through XS6 has been validated against measures[11] of maximum oxygen consumption with $r = 0.60$ and has a test–retest reliability[12] of $r = 0.70$. The combining of both questions to define physical inactivity has been tested for face validity in a prospective analysis with this combined category to demonstrate an increased risk with sedentary lifestyle of coronary heart disease in women.[13]

TABLE 1—Physical Activity Questions Used in Surveys: The Pawtucket Heart Health Program

1.	Knowledge that physical activity prevented cardiovascular disease was assessed by the interviewer with the probing question "What specific steps can a person take to make a heart attack or stroke less likely?" If exercise or physical activity was mentioned, the response was considered positive.
2.	Attempts to increase physical activity were assessed by the following question: "In the past 12 months, have you tried to increase the amount of exercise you get regularly?" (yes or no)
3.	Level of physical activity was determined at baseline (XS1 and XS2) by the question "How often do you exercise on the average?" (every day, at least once a week, or less than once a week)

For peak intervention periods (XS4 and XS5) and postintervention assessment (XS6) of physical activity, the following "sweat" question was asked: "At least once a week, do you engage in any regular activity such as brisk walking, jogging, bicycling, etc. long enough to work up a sweat?" (yes or no). "If yes, how many days?" Physical inactivity was defined either as exercising less than once a week (baseline) or as zero days of sweat-related physical activity (peak intervention and postintervention).

Intervention

For 7 years of active intervention, from fall 1983 through spring 1991, the PHHP facilitated extensive behavior change programming in cholesterol control, blood pressure control, smoking cessation, weight control, dietary change, and physical activity through partnerships with 500 local organizations, including 23 public and private schools, 29 churches, approximately 40 worksites, most civic and social organizations, and city government.[14–17] PHHP physical activity programming consisted of 3 distinct programs: Exercity, Get Fit!, and Imagine.ACTION; additional physical activity messages were woven into all self-help materials, screening advice, and school curricula.[18]

Exercity, which started out as a small Pawtucket Department of Recreation program, was augmented extensively by PHHP staff during the intervention, with the training of additional exercise instructors, use of community resources such as church space, and the development of new programs such as a walking club, park fitness trails, and lighted walking tracks. As a result, Exercity significantly expanded its hours of operation and the number of exercise programs offered. Get Fit! was a 6-week exercise campaign developed and implemented by the PHHP. Conducted at several worksites in 1988 and 1989,[19] Get Fit! encouraged participants to do aerobic exercise for 100 minutes per week. The majority of Get Fit! participants were already exercisers before the campaign, so Imagine.ACTION was developed to target sedentary individuals.[20] This 6-week physical activity campaign was based on the Transtheoretical Model for behavior change[21] and was conducted in 1990 only.

Analyses

We evaluated 3 outcomes of interest: (1) knowledge of the fact that physical activity prevents cardiovascular disease, (2) attempts to increase exercise in the past 12 months, and (3) physical inactivity. For each, we constructed a mixed-effects analysis of variance (ANOVA) model weighted by the eligible number of adults in the household; it included terms for time and binary covariates for city, age, sex, education, and place of birth.[6] Age was dichotomized at 35 years (an approximate median) and education at 12 years to be consistent with previous analyses of other cardiovascular disease risk factors analyzed during the PHHP intervention.[6] Interaction terms were included to evaluate not only city differences but also secular trends.

Results

During the 7 years of physical activity interventions, 4498 individuals participated in PHHP-sponsored exercise programs, resulting in a total of 10051 *exercise contacts* (total number of people × number of programs they participated in). Women (87%) were much more likely to participate in the exercise interventions than men (13%). Most of the exercise participants were young, with 62% younger than 35 years.

Cross-sectional survey response rates (XS1–XS6) averaged 70%, 67.5%, 68%, 67.5%, 64.5%, and 69%, respectively, and did not differ by city. Table 2 reports the percentage of respondents that (1) knew that physical activity prevents cardiovascular disease, (2) attempted to increase exercise in the past 12 months, and (3) reported zero days of physical activity. With regard to knowledge that physical activity prevented cardiovascular disease, the young were more knowledgeable than the middle-aged ($P = .001$); there were sex differences ($P = .001$), age-by-sex-by-city differences ($P = .001$), and sex-by-city secular trends ($P = .006$), but no overall city differences ($P = .881$) or overall time-related trends ($P = .638$) were found. Regarding attempts to increase exercise over the preceding 6 months, there were differences by age ($P = .0001$) and sex ($P = .0001$), an overall secular trend toward more attempts to increase exercise ($P = .047$), and sex-by-time interactions ($P = .032$), but no overall city differences ($P = .186$) were noted. When it came to physical inactivity, the middle-aged were more sedentary than young adults ($P = .001$), women were more sedentary than men ($P = .001$), and a significant age-by-sex-by-city interaction was noted ($P = .0006$), but no overall city effect ($P = .146$) was found. With regard to secular trends in physical inactivity, there was an overall decrease in physical inactivity ($P = .001$) that differed by age ($P = .0001$) and by sex ($P = .0001$), with young men showing the greatest change in sedentary lifestyle ($P = .0001$) over the decade.

Discussion

The PHHP did not demonstrate a consistent, measurable decrease in the prevalence of physical inactivity in the intervention

TABLE 2—Percentage of Residents Who Knew That Physical Activity Prevents Cardiovascular Disease (CVD), Attempted to Increase Physical Activity, and Were Sedentary During Baseline, Peak Intervention, and Postintervention, by City, Age, and Sex: The Pawtucket Heart Health Program

Physical Activity Category Indicator	Baseline (XS1 and XS2)				Peak Intervention (XS4 and XS5)				PostIntervention (XS6)				*P* for City Differences[a]	*P* for Secular Trend[b]
	Pawtucket	SD	Control	SD	Pawtucket	SD	Control	SD	Pawtucket	SD	Control	SD		
Knowledge that physical activity prevents CVD														
Overall													.881	.638
Men (≤35 y)	52.9	1.9	48.7	1.8	61.9	2.5	57.8	2.4	66.4	3.1	62.2	3.1		
Men (>35 y)	38.1	1.6	33.9	1.5	47.2	2.3	43.1	2.2	52.2	2.6	48.1	2.6		
Women (≤35 y)	50.2	1.6	41.8	1.5	62.3	2.3	53.9	2.2	65.8	2.6	57.4	2.6		
Women (>35 y)	38.4	1.5	36.1	1.4	51.1	2.1	48.8	2.0	60.5	2.4	58.2	2.3		
Attempted to increase physical activity														
Overall													.186	.047
Men (≤35 y)	33.0	1.8	34.3	1.8	37.5	1.8	38.9	1.8	38.9	2.9	40.2	2.8		
Men (>35 y)	22.5	1.3	21.1	1.3	24.7	1.4	23.3	1.3	26.6	1.9	25.2	1.9		
Women (≤35 y)	47.2	1.5	46.6	1.5	46.0	1.6	45.4	1.6	42.9	2.2	42.2	2.2		
Women (>35 y)	29.7	1.3	30.0	1.3	35.0	1.4	35.3	1.4	36.6	1.9	36.9	1.9		
Sedentary														
Overall													.146	.001
Men (≤35 y)	50.2	1.8	48.1	1.8	39.3	1.8	37.3	1.8	29.9	2.9	27.8	2.8		
Men (>35 y)	53.6	1.6	55.0	1.6	58.7	1.6	60.1	1.6	55.5	2.3	56.9	2.3		
Women (≤35 y)	56.2	1.6	56.9	1.5	50.7	2.0	51.4	1.9	48.0	2.4	48.7	2.4		
Women (>35 y)	62.6	1.5	63.2	1.4	60.0	1.9	60.6	1.9	56.5	2.3	57.1	2.3		

[a]Adjusted for age, sex, and time.
[b]Adjusted for age, sex, and city differences.

community compared with the comparison community. These results were similar to those found in the other large US community-based cardiovascular disease prevention programs, the Stanford Five-City Project[22] and the Minnesota Heart Health Program.[23] The Stanford project found an increase in vigorous activity among men in the intervention cities in the cross-sectional surveys and an increase in moderate activity among women in the intervention cities in both cross-sectional surveys and cohort analyses, but it did not find an overall effect on physical activity.[24] The Minnesota program, by asking 1 question to ascertain level of physical activity, found that its intervention accelerated a secular trend toward increasing regular physical activity, but it could not confirm this finding with the Minnesota Leisure Time Physical Activity Questionnaire.[25]

We speculate that the modest penetration of our physical activity intervention may explain our null results. The physical activity interventions in Pawtucket did not reach a large percentage of the population and attracted mostly younger women. There were approximately 42 438 adult men and women aged 18 to 64 in Pawtucket during the intervention period. The physical activity interventions documented contacts with only 4498 individuals in Pawtucket, or 10.6% of the target population. Our results may also be due to a misclassification bias associated with self-reported physical activity. We used 2 different physical activity questions, both of which focused on vigorous activity associated with either sweating or aerobic conditioning. Patients labeled as inactive may have been performing moderate but not vigorous physical activity. Such a misclassification bias would most likely not be different between cities and thus would bias our results toward the null hypothesis.

The PHHP study did, however, show a steep increase in vigorous physical activity among women and young men. This secular trend toward increased activity is greater than that found in the Minnesota Heart Health Program,[25] the National Health Interview Survey,[2(pp186–192)] and the Behavioral Risk Factor Surveillance System,[2(pp186–192)] which evaluated leisure-time activity and not vigorous activity during roughly the same time period.

Future community-based physical activity interventions should attempt to involve a wider range of individuals, including men, older adults, and ethnic minorities. Clinical trials that focus on the optimal selection of the intervention components to increase physical activity need to be conducted in a variety of community and clinical settings, including primary care physicians' offices,[26] schools,[27] and worksites.[28] Such studies, in combination with environmental and policy approaches,[29,30] should lead to decreased morbidity and mortality from cardiovascular disease through enhanced physical activity. □

Contributors

C. B. Eaton planned the analyses, helped analyze the data, and wrote the manuscript. K. L. Lapane planned and performed the analyses and edited the statistical and methods sections of the paper. C. E. Garber participated in the design and implementation of the intervention and helped plan the analyses; she also edited the introduction, results, and discussion sections of the manuscript. K. M. Gans designed and supervised the implementation of the study intervention, helped plan the analyses, and edited the intervention and discussion sections of the manuscript. T. M. Lasater oversaw the participant recruitment and implementation of the study and edited the intervention section of the manuscript. R. A. Carleton oversaw the recruitment of participants, the intervention, and the planning and performance of the analyses. He edited all of the sections of the manuscript.

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