

- Heart Survey. *Am J Epidemiol.* 1985;121:570-579.
25. Dannenberg AL, Keller JB, Wilson PWF, Castelli WP. Leisure-time physical activity in the Framingham Offspring Study: description, seasonal variation, and risk factor correlates. *Am J Epidemiol.* 1989;129:76-87.
 26. Jones BR, Barrett-Connor E, Criqui MH, Holdbrook MJ. A community study of calorie and nutrient intake in drinkers and nondrinkers of alcohol. *Am J Clin Nutr.* 1982;35:135-139.
 27. Larkin FA, Basiotis PP, Riddick HA, Sykes KE, Pao EM. Dietary patterns of women smokers and non-smokers. *J Am Diet Assoc.* 1990;90:230-237.
 28. Bild DE, Jacobs DR, Sidney S, Haskell WL, Aderssen N, Oberman A. Physical activity in young black and white women: the CARDIA study. *Ann Epidemiol.* 1993;3:636-644.
 29. Kokkinos PF, Holland JC, Newman R, Fiest-Fite B, Signorino CE. Physical activity, smoking, alcohol consumption, body mass index, and plasma lipid profiles of military reserve officers. *Mil Med.* 1989;154:600-603.
 30. Barret DH, Anda RF, Croft JB, Serdula MK, Lane MJ. The association between alcohol use, cardiovascular risk factors and health behaviors: South Carolina Cardiovascular Disease Prevention Project. *J Stud Alcohol.* In press.
 31. Bouchard C, Depres JP, Tremblay A. Exercise and obesity. *Obes Res.* 1993;1:133-147.
 32. Willett WC, Sampson L, Stampfer MJ, et al. Reproducibility and validity of a semi-quantitative food frequency questionnaire. *Am J Epidemiol.* 1985;122:51-65.
 33. Block G, Thompson FE, Hartman AM, Larkin FA, Guire KE. Comparison of two dietary questionnaires validated against multiple dietary records collected during a 1-year period. *J Am Diet Assoc.* 1992;92:686-693.
 34. Rimm EB, Giovannucci EL, Stampfer MJ, Colditz GA, Litin LB, Willett WC. Reproducibility and validity of an expanded self-administered semiquantitative food frequency questionnaire among male health professionals. *Am J Epidemiol.* 1992;135:1114-1126.
 35. Samet JM, Humble CG, Skipper BE. Alternatives in the collection and analysis of food frequency interview data. *Am J Epidemiol.* 1984;120:572-581.
 36. Cummings SR, Block G, McHenry K, Baron RB. Evaluation of two food frequency methods of measuring dietary calcium intake. *Am J Epidemiol.* 1987;126:796-802.
 37. Willett W. *Nutritional Epidemiology.* New York, NY: Oxford University Press; 1990.
 38. Kalk WJ, Kruger M, Slabbert A, Osler C, Raal FJ. Fat, protein, and carbohydrate content of diets of white insulin-dependent diabetic adolescents and young adults. *South Afr Med J.* 1992;81:399-402.
 39. Brand RJ, Paffenbarger RS Jr, Sholtz RI, Kampert JB. Work activity and fatal heart attack studied by multiple logistic risk analysis. *Am J Epidemiol.* 1979;110:52-62.
 40. Hulshof KFAM, Wedel M, Lowik MRH, et al. Clustering of dietary variables and other lifestyle factors (Dutch Nutritional Surveillance System). *J Epidemiol Community Health.* 1992;46:417-424.
 41. Zimmerman RS, Connor C. Health promotion in context: the effects of significant others on health behavior change. *Health Educ Q.* 1989;16:57-75.
 42. Blair SN, Goodyear NN, Wynne KL, Saunders RP. Comparisons of dietary and smoking habit changes in physical fitness improvers and nonimprovers. *Prev Med.* 1984;13:411-420.
 43. Mechanic D, Cleary PD. Factors associated with the maintenance of positive health behavior. *Prev Med.* 1980;9:805-814.

ABSTRACT

Changes associated with two serial, nationwide, mass-media-based campaigns to promote physical activity conducted by the National Heart Foundation of Australia in 1990 and 1991 were examined. Surveys conducted before and after each campaign found statistically significant differences in message awareness (46% vs 71% in 1990; 63% vs 74% in 1991). In 1990, there were significant increases in walking, particularly among older people, and in intentions to exercise. No such changes were apparent in 1991. In the case of these two campaigns, conducted 1 year apart, the second may have been redundant. (*Am J Public Health.* 1995;85:244-248)

Serial Mass-Media Campaigns to Promote Physical Activity: Reinforcing or Redundant?

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Introduction

Habitual physical activity has cardiovascular and other health benefits,^{1,2} but up to one third of the adult populations of industrialized countries engage in virtually no leisure-time physical activity.^{3,4} Few populationwide attempts at exercise promotion have been systematically evaluated: studies have usually focused on volunteer populations or have targeted groups in specific settings.⁵ The evaluations of such campaigns have shown increases in awareness of the benefits of physical activity, but limited data are available on behavioral change.⁶⁻⁸ An earlier Australian study found increases in the prevalence of reported walking for exercise after a mass-media campaign in 1990; changes were most marked in older people and occurred across all socioeconomic groups.⁹

We examined the possible cumulative effect of serial campaigns to promote physical activity by using comparable data from the evaluations of two national campaigns conducted in 1990 and 1991. The campaign goals examined were (1) to increase recall of the campaign message; (2) to increase the proportion of the

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population involved in moderate-intensity physical activity, particularly walking; and (3) to influence intentions to be more active.

Method

The Campaigns

The National Heart Foundation of Australia has conducted annual national cardiovascular disease awareness campaigns over the past two decades, using the mass media supported by local community activities. In 1990 and 1991, the National Heart Foundation conducted serial campaigns to promote physical activity during May of each year. The campaign slogan for 1990 was "Exercise: make it part of your day."¹⁰ For 1991, the slogan was "Exercise: take another step." Both campaigns were based on social-learning and social-marketing models,¹¹ emphasized walking as the main activity, and aimed to influence early stages of behavioral change.¹² The 1991 campaign built on the 1990 message, modeling maintenance of the moderate-intensity physical activities that were promoted by the previous campaign.

The campaigns were promoted through paid national television advertisements, public service announcements on the radio, distribution of a professional paper, posters, leaflets and stickers, T-shirts, sweat shirts, publicity tours by two heart-health experts, magazine articles, and the scripting of one episode of each of two nationally broadcast television drama series. The two campaigns were similar with respect to paid television coverage: 2050 TARPs and 2263 TARPs in the 1990 and 1991 campaigns, respectively. (A TARP (target audience rating point) is the percentage of the target audience watching a particular television program during which an advertisement is shown; for example, if 10% of all people 18 years and over watch the evening news program on one channel, an advertisement shown during that program would have a TARP of 10; the TARPs for each advertising spot are summed, providing an estimate of total exposure, but not total audience.) Campaign budgets were similar for each year.

State-level activities were organized by each National Heart Foundation divisional office, and each campaign launch involved media personalities, activity days, and competitions. There was widespread unpaid coverage in the electronic and print media, including interviews, news coverage, editorials, and feature articles.

TABLE 1—Characteristics of Respondents in the Precampaign and Postcampaign Samples for the 1990 and 1991 Heart Week Campaign Surveys

	No. (%) of Respondents			
	1990		1991	
	Precampaign	Postcampaign	Precampaign	Postcampaign
Age group, y				
14–19	201 (8.3)	246 (9.9)	234 (9.1)	215 (8.5)
20–29	486 (20.0)	439 (17.7)	470 (18.2)	478 (19.0)
30–39	605 (24.9)	570 (23.0)	616 (23.8)	590 (23.4)
40–49	378 (15.6)	440 (17.8)	428 (16.6)	417 (16.6)
50–59	279 (11.5)	286 (11.6)	320 (12.4)	311 (12.4)
60+	477 (19.6)	493 (19.9)	516 (20.0)	506 (20.1)
Total	2426 (100)	2474 (100.0)	2584 (100.0)	2517 (100.0)
Sex				
Male	1182 (48.7)	1195 (48.3)	1220 (47.2)	1205 (47.9)
Female	1244 (51.3)	1279 (51.7)	1364 (52.8)	1312 (52.1)
Education level, y				
< 10	745 (30.7)	822 (33.2)	807 (31.2)	778 (30.9)
10–12	1086 (44.8)	1052 (42.5)	1135 (43.9)	1108 (44.0)
> 12	595 (24.5)	600 (24.3)	642 (24.8)	631 (25.1)

Measures

Face-to-face, home-based interviews with some 2500 people were carried out 2 weeks before and 3 to 4 weeks after each campaign, with random sampling of households until a preset quota of respondents is reached, a technique used for monitoring health behaviors in the Australian population.¹³ Response rates cannot be ascertained precisely; they varied between 45% and 60% of the households selected, depending on the city or region sampled. Self-report measures of physical activity were from National Heart Foundation Risk Factor Prevalence Studies,¹⁴ which have been found to have acceptable levels of reliability and validity.¹⁵

Respondents were first asked whether or not they had participated in vigorous physical activities ("activities that make you sweat or puff and pant"), then about moderate-level physical activities, and finally about walking for exercise in the previous 2 weeks. Two questions could be asked about each of these three types of activity. If the answer was "yes" to the first of each of these questions, the respondent was then asked about the number of times that he or she had engaged in this type of activity over the past 2 weeks. Those who reported no participation in any type of activity were classified as "inactive," and those who reported any participation in any level of activity over the last 2 weeks were classified as "active."

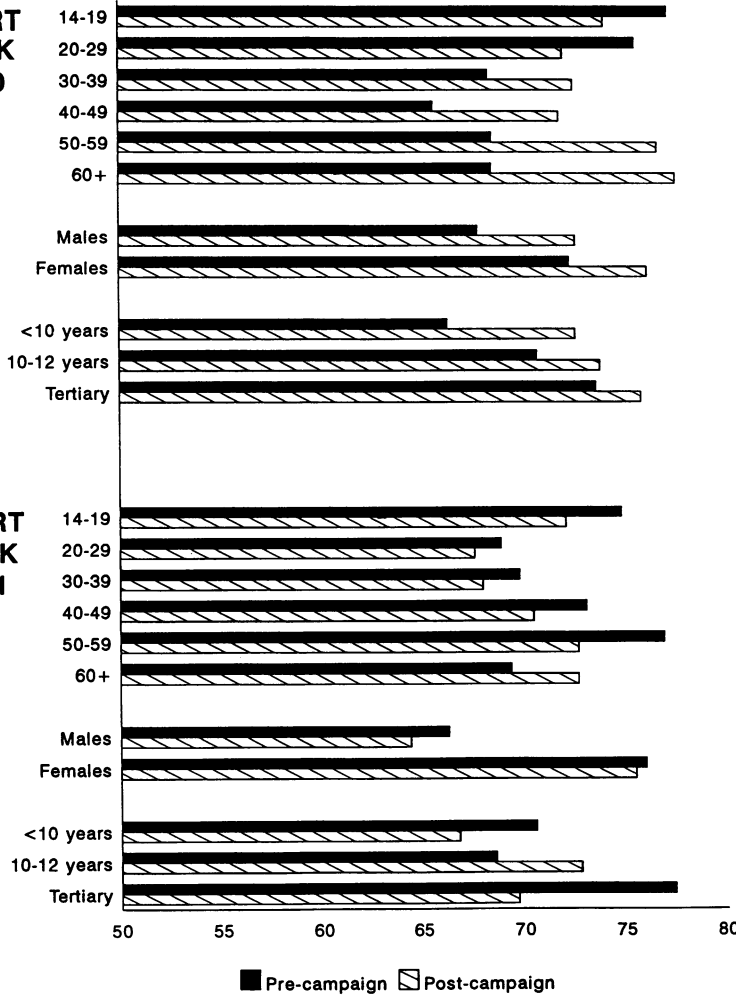
Respondents were asked a yes-or-no question about message recall: "Have you

seen anything in past 4 weeks in the media about exercise?" This question did not refer directly to the campaign message, because it would not have made sense to do so before the campaign had been conducted; it had face validity both before and after the campaign and allowed precampaign and postcampaign data to be compared. Respondents' age, sex, and education level were also recorded. Exercise-related intentions were assessed by asking, "Which statement best describes how much you now exercise and how much you intend to exercise in the future?" The possible responses were "I do not exercise and do not intend to start" (no exercise, no intention to start); "I do not exercise but am thinking of starting" (no exercise, intend to start); "I exercise occasionally and am not thinking of doing more" (exercise occasionally, no intention to do more); "I exercise occasionally but am thinking of doing more" (exercise occasionally, intend to do more); and, "I exercise regularly and intend to continue" (regular exercise).¹⁶

Data Analysis

We compared the proportions of respondents in the precampaign and postcampaign surveys reporting recall of a message about physical activity using the chi-square test, which we also used to determine whether postcampaign message recall varied by age, sex, and education level. We examined precampaign to postcampaign changes in the prevalence

HEART WEEK 1990



Note. Tertiary = > 12 years of education.

FIGURE 1—Percentages of survey participants in 1990 and 1991 who reported walking for exercise in the previous 2 weeks, by age, sex, and level of education.

TABLE 2—Percentage of Respondents in Each Level of Exercise-Related Intentions in the Precampaign and Postcampaign Heart Week Surveys in 1990 and 1991

Exercise-Related Intention	Respondents, %			
	1990		1991	
	Precampaign (n = 2399)	Postcampaign (n = 2449)	Precampaign (n = 2541)	Postcampaign (n = 2493)
No exercise, no intention to start	13.3	10.6	10.2	11.4
No exercise, intend to start	9.7	9.0	9.2	9.4
Exercise occasionally, no intention to do more	16.2	15.0	14.4	14.9
Exercise occasionally intend to do more	3.6	24.9	26.3	24.8
Regular exercise	37.2	40.5	39.9	39.5

of walking and inactivity using logistic regression models,¹⁷ with adjustment for potential confounders (age, sex, and education level). Both models used active vs inactive as the dependent variable. In both models we fitted survey time (pre-campaign vs postcampaign), and two-way interaction terms between survey time and each of the potential confounders were tested to establish whether there was a differential effect of the campaign across sociodemographic groups. The youngest age group (14- to 19-year-olds), the least-educated group, males, and precampaign respondents served as the referent groups. Analyses were also conducted to determine whether the proportions of respondents in the exercise-intention categories were different in the precampaign and postcampaign surveys. The chi-square test for trend¹⁸ was used to determine whether there was a trend in proportions. The difference between the Pearson chi-square test and the chi-square test for trend was used to determine the linearity of the trend.

Results

Table 1 shows the sociodemographic characteristics (age group, sex, and level of education) of the respondents. Proportions did not differ significantly across the samples, so any differences in outcome variables are unlikely to result from confounding by sociodemographic factors.

Message Recall

In the 1990 surveys, the proportion of respondents who stated that they could recall a message in the past 4 weeks in the media about exercise increased from 46% precampaign to 77% postcampaign ($\chi^2 = 485.5$, $df = 1$, $P < .001$). A significantly greater proportion of women than men (80% vs 73%; $\chi^2 = 19.4$, $df = 1$, $P < .001$) reported campaign message recall in the postcampaign survey. In 1991, precampaign levels of message awareness were much higher than they were in 1990. In 1991, there was a smaller but statistically significant increase in recall, from 62.5% precampaign to 73.5% postcampaign ($\chi^2 = 70.5$, $df = 1$, $P < .001$). A greater proportion of women than men (76% vs 71%; $\chi^2 = 8.2$, $df = 1$, $P < .01$) reported message recall in the postcampaign survey. Recall did not differ by age or education for either campaign.

Reported Levels of Walking and of Inactivity

Precampaign and postcampaign reported prevalences of walking for 1990 and 1991 are shown in Figure 1. Logistic regression models were used to assess the likelihood of walking and of inactivity before and after the campaign, after adjustment for age, sex, and education. After the 1990 campaign, there were significant variations by age in the likelihood of walking. Those respondents aged 40 through 49 years (adjusted odds ratio [OR] = 1.57; 95% confidence interval [CI] = 1.03, 2.39), 50 through 59 years (adjusted OR = 1.79; 95% CI = 1.11, 2.89), and 60 years or older (adjusted OR = 1.92; 95% CI = 1.27, 2.90) were more likely to report walking for exercise or leisure in the postcampaign survey compared with the precampaign survey. The likelihood of walking did not vary by sex or level of education. After the 1991 campaign, the prevalence of walking had not increased significantly, either overall or for any of the sociodemographic subgroups.

Precampaign vs postcampaign differences in the prevalence of physical inactivity were not significant in either year. After the 1990 campaign, the oldest age group appeared to have become active compared with the referent group (adjusted OR = 1.70), but this increase failed to reach statistical significance (95% CI = 0.98, 2.94). Similarly, after the 1991 campaign, none of the precampaign vs postcampaign differences in inactivity was significant overall or within any of the subcategories.

Exercise-Related Intentions

Table 2 shows the proportions of respondents in the five exercise-intention categories before and after the 1990 and the 1991 campaigns. The sample sizes vary slightly between Tables 1 and 2, because between 1% and 2% of the respondents to each survey failed to give a valid response to the exercise-intention item and were excluded from the analysis. For the 1990 campaign, the chi-square test showed a significant association between the stage-of-change category and the precampaign vs postcampaign surveys ($\chi^2 = 13.90$, $df = 4$, $P < .01$). The difference between the proportions of the precampaign and postcampaign respondents in the "no exercise, no intention to start" category was 2.8% (95% CI = 0.9, 4.6). For the 1991 campaign, there was no significant association between stage-of-

change category and the precampaign vs postcampaign surveys ($\chi^2 = 3.28$, $df = 4$, $P = .51$).

For the 1991 data, neither the chi-square test for trend ($\chi^2 = 1.8$, $df = 1$, $P = .18$) nor the test for linearity ($\chi^2 = 1.5$, $df = 3$, $P = .69$) was statistically significant, indicating no change across the intention categories between the precampaign and postcampaign samples.

Discussion

There are no reports of serial, national mass-media campaigns to promote physical activity and few reports of any large-scale physical-activity campaigns with which to compare our findings.⁵ Where these reports do exist, direct comparisons are not possible. The Minnesota Heart Health Program reported increased energy expenditure estimates for their intervention group, but only over 1 year⁷; a Canadian ParticipACTION evaluation showed high campaign awareness, but presented no data on changes in physical activity.⁸ Although community cardiovascular intervention trials in the United States have used face-to-face and print media intervention methods, a small proportion of these physical-activity interventions used a large-scale media campaign.⁵

Reported campaign message awareness increased significantly from before the 1990 campaign (46%) to after that campaign (71%). Message awareness was high before the 1991 campaign (63%) and increased to 74% postcampaign. Although precampaign to postcampaign increases in awareness for both years were statistically significant, the 1991 campaign was associated with a smaller change than the 1990 campaign. The high level of initial awareness in 1991 made it less likely that there would be changes of the magnitude observed in 1990.

Precampaign vs postcampaign differences in reported walking for exercise and in readiness to exercise found in 1990 were not apparent in the 1991 data. In 1990, the proportion of respondents in the "no exercise, no intention to start" category decreased significantly after the campaign; the campaign may have been most effective in reaching those who were the least active and most resistant to change. However, with respect to the message-recall measure in the two campaigns, there appeared to be some maintenance of the 1990 campaign levels before the 1991 campaign, but little further

change beyond those levels. The 1991 campaign message may have reinforced the behavior of those individuals who had adopted physical activity, but failed to motivate change in others. Another possibility is that most of those individuals who were able to adopt physical activity had already done so in response to the 1990 campaign.

There are three other possible explanations. The first—that the method of selecting survey respondents, response biases, or the measurements used explain these findings—is unlikely, because identical methods were used for all samples. The activity questions had previously been used in Australian studies, resulting in similar population-prevalence estimates for inactivity and walking^{4,14}; and face-to-face interviews by trained interviewers were used, so any response bias should have been consistent across all samples. Second, the findings could have resulted from differences in the delivery of the two campaigns. Although it was not possible to quantify accurately the reach of the community activities or that of the unpaid media coverage, levels of paid television coverage were similar, as were levels of community activities, campaign budgets, and postcampaign recall of messages. Third, there were some differences between the two campaigns with respect to content.

Mass media may play four main roles in promoting changes in health behavior¹¹: an educator to introduce new ideas, a supporter to reinforce old messages or maintain change, a promoter to attract attention to existing programs, and a supplement to community-based interventions. Although encouragement of physical activity is by no means a new health message in Australia ("Life, Be in It" campaigns have been conducted for a number of years), the 1990 Heart Week campaign's focus on integrating walking into daily activities had not previously received such explicit attention. Thus, the 1990 campaign might be seen to have used the mass media as an educator. The 1991 campaign intended to build on any gains and to increase the prevalence of walking, particularly among sedentary individuals. However, the 1991 campaign theme, "Exercise: Take Another Step," may have been interpreted as encouragement to maintain already-adopted walking habits and not as encouragement to adopt that behavior. Thus, the 1991 campaign may have played a supporter role, so limited

prevalence changes might have been expected.

The effects of these serial campaigns—maintenance but little further improvement—may be because the impact on behavior of mass-media campaigns is limited,¹⁹ particularly given the relatively small media budgets for campaigns like these and their ambitious behavioral targets compared with those of commercial advertising. A ceiling effect may have occurred with the 1990 campaign. Further improvements might be expected with more-extensive community-based strategies for environmental change, pursued over a longer period of time than the duration of the campaigns we examined. Any campaign is limited by those in the population who are actually able to make changes. Thus, the second of these campaigns, conducted 1 year later, may have been redundant.

A substantial proportion of the population may be precluded from becoming more physically active due to disability or chronic disease, demands of work and family, lack of suitable facilities, or other barriers.⁴ Social-marketing perspectives emphasize the use of media messages attuned to particular subgroups at different stages of readiness, as well as providing opportunities for people to be more active.²⁰ Systematic strategies may need to be developed and maintained over longer periods of time than is possible with episodic campaigns. These strategies should promote services, settings, and a community environment in which being more physically active is an accessible and enjoyable option.²¹ □

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References

1. Bouchard C, Shephard RJ, Stephens T, Sutton JR, McPherson BD, eds. *Exercise, fitness and Health. A Consensus of Current Knowledge*. Champaign, Ill: Human Kinetics Press; 1990.
2. Blair SN, Kohl HW, Gordon NF, Paffenbarger RS. How much physical activity is good for health? *Annu Rev Public Health*. 1992;12:99–126.
3. Stephens T. Secular trends in adult physical activity: exercise boom or bust? *Res Q Exerc Sport*. 1987;58:94–105.
4. Owen N, Bauman A. The descriptive epidemiology of a sedentary lifestyle in adult Australians. *Int J Epidemiol*. 1992;21:305–310.
5. King AC. Community intervention for promotion of physical activity and fitness. *Exerc Sport Sci Rev*. 1991;19:211–259.
6. Blake SM, Jeffery RW, Finnegan JR, et al. Process evaluation of a community-based physical activity campaign: the Minnesota Heart Health Program experience. *Health Educ Res*. 1987;2:115–121.
7. Crow R, Blackburn H, Jacobs D, et al. Population strategies to enhance physical activity: the Minnesota Heart Health Program. *Acta Med Scand Suppl*. 1986;711:93–112.
8. Iverson DC, Fielding JE, Crow RS, Christenson GM. The promotion of physical activity in the United States population: the status of programs in medical, worksite, school and community settings. *Public Health Rep*. 1985;100:212–224.
9. Booth M, Bauman A, Oldenburg B, Owen N, Magnus P. Effects of a national mass-media campaign on physical activity participation. *Health Promotion Int*. 1992;7:241–247.
10. Oldenburg B, Bauman A, Booth M, Owen N. Increasing levels of physical activity in the Australian community. *Health Promotion J Aust*. 1991;1:15–18.
11. Flora JA, Maibach EW, Maccoby N. The role of media across four levels of health promotion intervention. *Annu Rev Pub Health*. 1989;10:181–201.
12. Marcus BH, Owen N. Motivational readiness, self-efficacy and decision-making for exercise. *J Appl Soc Psychol*. 1992;22:3–16.
13. Pierce JP, Macaskill P, Hill D. Long-term effectiveness of mass media led antismoking campaigns in Australia. *Am J Public Health*. 1990;80:565–569.
14. Bauman A, Owen N. Habitual physical activity and cardiovascular risk factors. *Med J Aust*. 1991;154:22–28.
15. Department of the Arts, Sport, the Environment, Tourism and Territories [DASETT]. *Pilot Survey of the Fitness of Australians*. Canberra, Australia: Australian Government Publishing Service; 1992.
16. Booth M, Macaskill P, Owen N, Oldenburg B, Marcus B, Bauman A. The descriptive epidemiology of stages of change in physical activity. *Health Educ Q*. 1993;20:431–440.
17. Dixon WJ. *BMDP Statistical Software*. Los Angeles, Calif: University of California Press; 1983.
18. Armitage P, Berry G. *Statistical Methods in Medical Research*. 2nd ed. Boston, Mass: PWS-Kent; 1987:372–373.
19. Redman S, Spencer EA, Sanson-Fisher RW. The role of mass media in changing health-related behavior: a critical appraisal of two models. *Health Promotion Int*. 1990;5:85–101.
20. Donovan RJ, Owen N. Social marketing and mass interventions. In: Dishman RK, ed. *Exercise Adherence: Its Impact on Public Health*. 2nd ed. Champaign, Ill: Human Kinetics Press; in press.
21. Owen N, Lee C. Development of behaviorally based policy guidelines for the promotion of exercise. *J Public Health Policy*. 1989;10:43–61.