Cost–Benefit Estimates of an Elderly Exercise Program on Kaua'i

Naomi Sugihara BEd; Marisa Watanabe; Michiyo Tomioka MS; Kathryn L. Braun DrPH; and Lorrin Pang MD, MPH

Abstract

The elderly consume a disproportionate amount of health care resources, and the recent trend in obesity will only escalate costs. EnhanceFitness® (EF) is an exercise program designed to increase the strength, flexibility, and balance of older adults. A comprehensive controlled study in Washington state of an elderly population has shown that participants who attend at least one EF class per week reduce healthcare costs by 20% per year. The present study reports the costs and potential benefits of replicating EF on Kaua'i. For Kaua'i the annual cost of an EF pilot program for 132 clients would be $204,735. Attendance records of the Kaua'i program showed that 96 (73%) of those enrolled attended at least weekly. Based on national reports of healthcare costs for the elderly, averting 20% of the costs for these 96 elderly would save $344,256 per year. The expected investment to return ratio, I–R ratio, for EF on Kaua'i is about 1–1.8. On economic grounds, a case can be made to support and expand these types of programs. In these times of budget cuts, cost-benefit analysis provides a common economic "language" to prioritize among different programs.

Introduction

The alarming rise in obesity rates is one of the latest symptoms associated with bad habits of our modern lifestyle. Health officials are responding with a call for lifestyle changes, including a return to more exercise and more sensible diets. When exercise programs are adhered to they significantly improve the health of everyone, including the elderly. The benefits of exercise include improvements in function[1-3] (balance, strength, endurance, and flexibility) and can help to prevent/improve chronic conditions such as cancer, diabetes, heart disease, high blood pressure, strokes, falls, depression, and other conditions.[1-5] Guidelines are for 2 hours and 30 minutes of moderate-aerobic activity, 75 minutes of vigorous-intensity aerobic physical activity, or an equivalent combination of both per week.[6] Episodes should be performed for at least 10 minutes and preferably spread throughout the week. These guidelines are for adults, including older adults.

When exercise recommendations are administered as programs, they meet with poor adherence and poor sustainability.[7-11] In fact, in randomized controlled studies good outcomes correlate only modestly with group assignment. There is a much better correlation with whether or not exercise actually occurs (some in the intended exercise group don't comply while some in the non-exercise group exercise on their own).[7-8] Not surprisingly, some find that adherence, rather than intention is the most important factor affecting outcome.[7-10]

Faced with the rising cost of health care and rising obesity rates, many try to improve the effectiveness of exercise programs by calling for better adherence rates.[7,9-11]While this might seem easy, the reality of poor motivation is one of the key factors leading to the current crisis. Faced with this situation one is forced to be more quantitative — to ask how powerful exercise, as an intervention, really is. For those who do adhere, do they benefit enough to justify the cost of the entire program, including the non-adherers as well? Or put another way, despite poor adherence, are the benefits of exercise powerful enough to make programs economically worthwhile even under an intention to treat model? This paper begins to address this issue.

Preventing health problems through exercise has two major economic impacts. First, healthy people continue to work and contribute to economic production. Second, preventing illness averts the cost of treating these conditions. For the elderly, many of whom are retired/semi-retired, it is hard to calculate the first economic effect. This paper only focuses on the second effect, reducing healthcare-costs through exercise. When resources are limited, it is important to prioritize recommendations based on a more quantitative economic analysis. Ideally the authors would like to show that for every dollar invested in a program, x dollars in health care costs will be averted, a cost:benefit analysis.[12] Only then can the authors begin to compare different programs on common economic criteria, weighing this against other factors such as ethical and legal issues.

"Choices for Independence" an initiative of the Federal Administration on Aging (AoA), seeks to empower older adults to stay active and healthy through Older Americans Act services, which includes evidence-based disease prevention programs. As a result of a 3-year grant from the AoA, through the Healthy Aging Partnership Program established by the State Executive Office on Aging (EOA), the County of Kaua'i Agency on Elderly Affairs (AEA) planned and implemented the program EnhanceFitness® (EF), a group exercise program for adults at least 60 years of age. This particular program was selected because a large, controlled study shows that it lowers health costs for those with "good" adherence.[13] This paper describes Kaua'i's EF program, its cost and fidelity to the original program, which are critical to extrapolating results from the original study.[14] A cost-benefit analysis is done. This uses the published report of "efficacy" for those who adhere to the EF program, Kaua'i's records of clients' adherence and the cost of the Kaua'i program. Findings and conclusion of the economic impact are presented followed by a discussion of program sustainability.

On Kaua'i, although a one-year program had been completed at two sites, outcome data was ready for analysis from only one of these sites at the start of this study. As the program began to expand to four more sites, financial stakeholders asked for an interim estimate of the cost–benefit ratio of this program. The authors agreed to examine Kaua'i's annual cost of running six sites and compare it to estimated averted health costs. Averted health costs depend on a threshold level of program adherence. This is tallied from only one of the first two sites for which there was data at the start of the study, (Koloa). Assuming that this site is representative of the others, one could then estimate averted cost for all the sites, a cost–benefit ratio, and make an argument for or against sustainability/expansion.

Methods

Initial discussions were held with Senior Services in Seattle, Washington to examine the protocols of EF and the requirements to implement the program. Hawai'i's statewide Healthy Aging Partnership Program Steering Committee and the University of Hawai'i (UH)

reviewed the EF protocols and fidelity components. Program planning and coordination included scheduling, participant recruitment, instructor training, and securing sites for implementation. Recruitment presentations were conducted at the first two centers, Koloa and Waimea Senior Centers, located 14 miles apart. Recruitment packets were developed that included registration, health history, and consent forms. The target date to launch the program was July 9, 2007. At each site classes were set to run three times per week and participants were encouraged to come to as many sessions as possible.

To set up six sites, a week-long statewide training was coordinated and held on Kaua'i in June, 2007 by AEA staff and trainers from Senior Services. Eight staff from Kaua'i were trained; 1 Master Trainer, who trains EF instructors and teachs classes, and 7 EF instructors who only teach classes. The authors allocated one EF instructor per site. Assessments were done at baseline and then every four months for all participants. These evaluations measured agility, balance, and upper and lower body strength. Monitoring procedures were established to evaluate each instructor for fidelity to the original EF program. The program was expected to continue as a collaboration among the AEA, County of Kaua'i Department of Parks and Recreation, Kaua'i District Health Office, Lifelong Fitness/Terri Halliday, Kaua'i Economic Opportunity, and the Kaua'i Community College Nursing Department.

This program used computer-scanable client data forms, which were developed by Senior Services of Seattle, Washington and validated by previous EF programs. Data were collected on participant demographic characteristics, attendance rates, performance measures, and program satisfaction. Physical performance was measured through Fitness Checks and includes: (1) Chair stand test for lower-body strength; (2) Arm Curl test for upper-body strength; and (3) Up-and-Go for agility and balance. These sequential assessments were analyzed using paired t-tests.

Regarding fidelity of replicating the EF program, in the beginning of the planning phase County of Kaua'i partners completed a track changes tool, which evaluated each component of the original program.[15] After a review of the operational plan by Seattle staff, Kaua'i began training of local affiliates. Local instructors were continuously monitored with a standardized "fidelity monitoring tool" developed and validated by the Seattle group. One hundred and ten items in nine categories were evaluated after one week, one month, and then every 4th month. These categories were checked using 3 criteria; meets or exceeded requirements, did not meet minimum requirements, and needs improvement. After every evaluation recommendations and corrective actions were made as needed.

Cost–benefit analysis examined the dollar value of resources invested in a program compared to the resulting incremental dollar value of benefits. Since both components were in dollar amounts an investment to return ratio, I–R ratio, was calculated. For Kauai's EF program the cost of resources used to set up and operate the exercise program at six sites was tallied. Regarding benefits, the authors used the results of a published study determining averted health care costs for those who met a minimum criteria of attendance.[13] Next, the attendance records of the clients were examined. The autors used data from the first site to estimate how many clients at six sites could be expected to meet the criteria for "efficacy." While the key factor determining aggregate benefit was the number meeting a minimum attendance criteria, it was useful, but not essential, to describe attendance rates. This introduced questions as to how one defined the denominator, the number enrolled. The denominator was considered to be the number of subjects who ever entered the program. If clients subsequently asked to be dropped for medical reasons or lack of interest they were deleted from the denominator in subsequent tallies. The authors did not set criteria which automatically dropped clients based on the number of absences. Participants could return after long absences, including illness, and were considered "enrolled" throughout this period.

To address a key component of sustaining this program, clients' satisfaction was addressed. Towards this end two client satisfaction surveys were administered, one scannable form developed by Senior Services with 9 questions and one developed by the University of Hawai'i with 11 questions. Surveys were administered at 4 and 12 months from the start of the program. The surveys asked questions about what participants liked most and least about the program, if they would they recommend the program to others, the level of challenge in doing the exercises, satisfaction with instructor support and ability to make the class fun, and the amount of exercise on non-class days.

Results

For one of the first sites opened, Koloa, the data for the 27 participants ever enrolled was: mean age of 80 years; 26 were female; and 18% were Caucasian, 72% were Japanese, and 12% were Filipino. The prevalence of chronic diseases was as follows: arthritis (37%), diabetes (14.8%), and hypertension (48.1%).

Table 1 shows by month Koloa's number enrolled, the number of "successful" clients who attended at least one class per week, and the overall percent attendance using a maximum of three classes per week. As shown in Table 1, attendance suffered starting month 6, near the Christmas and New Years holidays, and continued for the second half of the year. Over the year the monthly average number of clients with "successful" outcomes was 16. The current program was planned to expand to a total of 6 sites for a total enrollment of 132 clients, of which the authors estimated there will be 16 x 6 = 96 successes.

For the Koloa site, comparing baseline to post-program measures of fitness showed the following. The mean number of repetitions of the timed chair stand test increased significantly from 10.9 to 12.7 (P= .02). The time taken for the up-and-go test decreased significantly from 10.7 seconds to 8.8 seconds (P<.001). The number of arm

Table 1

Month	1	2	3	4	5	6	7	8	9	10	11	12	Average
Enrolled	19	20	22	22	23	23	26	26	26	26	26	27	23.8
Success	16	16	16	16	16	10	18	16	17	16	14	18	15.9
Attendance	63%	63%	50%	57%	51%	34%	44%	47%	49%	44%	40%	47%	49%

curl repetitions increased from 9.1 to 10.3, but the increase was not significant (P=0.32). Up-and-Go test resulted in a very significant (P<.001) decrease in time, from 10.7 seconds before to 8.8 after, to perform the standard routine. The satisfaction survey showed that most were greatly satisfied with the class instructor (mean score of 9.8 on a 1-10 scale, 10 indicates greatly satisfied), were likely to continue the exercises they had learned (mean of 9.2), and were very confident they could continue exercising regularly (mean of 8.8). Most of the participants liked the program. They reported that they liked the program because it helped them to exercise regularly, improved their health status, and enabled them to socialize. Evaluation of fidelity after one year showed that 7 (administrative functions, warm up exercises, safety, strength, balance, stretching, cool down period) of the 9 criteria met or exceeded fidelity requirements, while two (aerobics, physical set-up) needed improvement.

Cost–Benefit Analysis

The three basic components needed to determine the cost-benefit of this exercise program were **1)** the averted health costs per client, **2)** the number of clients expected to meet the criteria of a "successful outcome," and **3)** the cost of the program.

1) The averted medical costs of successful exercise participation was based on a literature report of a large, comprehensive, non-randomized, controlled study at the University of Washington.[13] On an annual basis, it was determined that attending classes at least once a week reduced health costs by 20.7%. No reduction was seen in those with less participation. In that study half of the subjects in the study group chosen to exercise were not "successful" in meeting the once a week participation criteria. This raises the possibility that participation itself could have selected for a healthier, subgroup of elderly – with lower baseline medical costs. Further unpublished analysis by the authors (Ackerman, personal communication) showed that this "healthy cohort" effect implies, at most, 12% lower baseline medical costs - an adjustment that needed to be made to general elderly population estimates.

The expected health costs for elderly on Kaua'i was calculated from nationwide annual healthcare cost statistics.[16] Data from 2004 showed that the average US elderly healthcare expense for the age category 75-84 years was $16,389. Hawai'i's Medicare costs were only 77% that of the corresponding US Medicare cost. However, in 2004 Hawai'i's annual rate of increase for Medicare was 9.3% versus about 6% for the US Medicare population, for this age group. Therefore, for the Hawai'i population, the 2009 health costs would have been ($16,389 x .77) x 1.093^3 = $16,477. The baseline healthcare cost of those individuals fit enough to meet the program criteria of success, the "healthy cohort" effect explained previously, could have been about 12% lower than average, or $17,323. The annual averted cost for a successful outcome would have been 20.7% of this, or $3,586.

2) The number of expected successful clients was estimated from Table 1. The authors expected 16 of the 22 clients enrolled at each site to meet the criteria of success. For a program covering 6 sites this would total 96 successes. The total averted health costs for six sites would be 96 x $3,586 = $344,256 per year.

3) The total cost of the program to operate six sites, based on operational costs of the first site, was $180,476 in 2004. Adjusting to 2009 with a 2.6% average rate of inflation,[17] the cost would have been $204,735. Recurrent costs were 92% of the budget and the 8%, one time, up front costs, are listed in lines 1 and 3 of Table 2. Although instructor training, line 4, might seem to be a one time cost, a conservative estimate accounts for high turnover of instructors and tallies these expenses as ongoing. An itemized list is presented in Table 2.

The investment to return (averted medical costs) ratio for the entire program was $204,735 to $344,256 = 1 to 1.7. Excluding one time costs, the ratio for operational costs only was $188,356 : $344,256 = 1 to 1.8.

Discussion

A model and cost estimates are presented for an exercise program for elderly in small, local communities. This may be an efficient way to avert health care costs. The investment-to- return ratio is 1:1.8 with returns beginning the first year. One key point of health economics is that savings to society as a whole are considered first, irrespective of who pays and who saves. Are there "true gains" to be made by doing things more efficiently? In contrast, merely transferring funds from one group to another may create a false impression, at least among the receivers of funds, that "progress" is being made. This paper does not focus on who would/should make the investment and who reaps the savings. During the current economic and health crisis one

Table 2. Kaua'i EnhanceFitness® Program Budget — Actual Costs for Six Sites

Licensing	8,000	1 time cost: $3,000/first site; $1,000/ea. additional site
Licensing Renewal	800	renewal for 6 sites: $300/first site, $100/additional
Weights	6,397	1 time cost for 6 sites
Training	4,877	New Instructor & Master Trainer, training by Senior Services (initially, turn over may be yearly)
Fees - Instructors	63,180	$10,530 @ 6 mos. (2 instructors) x 2 x 3
Fees - Master Trainer	10,838	4/07 - 4/08
Salaries - Staff	25,121	Half-time coordinator @$2093.40/mo. – current salary as County personnel
Admin. Supplies	1,304	$651.91 @ 6 mos. x 2
Program Supplies	2,121	$1060.67 @ 6 mos. x 2
In-kind	57,838	AEA staff salaries, fringe, County facility usage for sites 48198.25 @ 10 mos. = 4819.83/mo. x 12 mos.
Total $	180,476	

should realize that most health funds eventually can be traced back to the same source. Thus, the concept of efficiency should become a main strategy rather than each agency merely seeking a larger slice of a pie of finite size. Increasing exercise is a key component of our public health response to the obesity epidemic. Although this recommendation is made almost reflexively, evaluations of exercise programs need to take into account adherence, since this is a key factor correlating to benefits.[7-10] If one replicates evidence based programs and adjusts for local variations in adherence and program costs, one can estimate the economic impact, in terms of cost effectiveness or cost benefit, of such programs.

One assumes that evidence-based exercise interventions, when adhered to, will reduce baseline health costs for the elderly by an average of x%. There may be wide variations in baseline costs correlating with one's level of fitness, which in turn might correlate with one's ability to adhere to an exercise program. One weakness of this approach is that those who do manage to adhere are a self-selecting group. Their health care costs may not be similar to that of the general elderly population, for whom national data is tracked. While it is tempting to think that those who adhere have a "healthy worker" effect with lower baseline health costs, it is also possible that they are indeed less healthy with higher baseline costs, and their better adherence reflects their physicians' stronger recommendation to exercise. Therefore it may be better to simply measure health costs pre- and post-intervention, rather than try to predict adjustments to averted costs. In this study, averted costs are not actually measured. A valid measurement calls for a large rigorous study with cost standardization across different insurance programs. Small communities, such as Kaua'i, with an estimated population of 63,000, may not support this type of research. In addition, considering the rapid rise in obesity, there may be no time for such detailed studies prior to making general recommendations for exercise. Communities starting such programs before they know the costs and benefits should at least measure these parameters as they conduct their programs. In addition it is important to gather cost data, despite small numbers, on self-selecting groups.

Low attendance/adherence rates will usually be the weak link of behavior modification programs. This will affect the I:R ratio. Only 67% of study clients met attendance criteria to be considered "successful." While this is somewhat better than the 50% rate seen in the Washington study,[13] other exercise programs fail because of lower participation. To address low attendance, some of the elderly in the present study requested more classes per week, for the sake of convenience. On the other hand, funders argue that having classes three times a week might already be excessive when the criterion for success is a minimum attendance of once a week. At some point, increasing the number of classes leads to diminishing returns. If the total number enrolled had all been successful, attending at least once a week, the I:R ratio would have been 1:2.5. One way to improve attendance without scheduling more classes is to increase enrollment beyond the 22 clients that the center can accommodate, to overbook classes – planning for a 33% absenteeism. When the actual attendance exceeds the ceiling of 22 participants, a non-supervised activity could be offered to those who had already come at least once that week.

Another way to improve adherence might be to interview clients to determine what motivates them to attend. In the current study, since sessions were scheduled away from senior center meal times, socialization, health, and exercise are the main reported reasons for attending. Other programs might consider meals, snacks, and gifts as incentives. Alternatively, it is suggested that asking participants to pay a nominal amount at the beginning of the program would result in more commitment to attend, to get one's "money's worth." These kinds of indirect incentives could backfire and flood the classes with too many clients if over-enrollment is used. One can not over-emphasize the need to study factors which affect adherence,[18,19] bearing in mind that this study only reports adherence during the first year of the program. Participants may need additional motivation as the novelty wears off, especially because health benefits do continue beyond the first year (personal communication, Dr. Ackerman).

There are other adjustments which this analysis overlooks. The average US elderly health care costs were used in this analysis. Presumably this represents urban and rural populations. On the neighbor islands if more complex medical treatment requires interisland travel, then adjustments to averted costs need to account for travel and lodging. Thus, it may be that preventive programs on neighbor islands might be more cost effective than those run in Honolulu. The exercise program operates with trained, but non-medical, staff. As long as medical costs continue to rise faster than general wages of the staff, the I:R ratio will show rising returns. With costs rising so quickly, the study's I:R ratios probably are outdated by the time this article is printed. But even under 2009 values, this analysis shows that there are costs to be averted, savings to be made.

As explained in the introduction, estimation of attendance is based on data from only one of the authors initial sites. Although it might have been better to wait for a year's worth of data from all six sites, stakeholders wanted this interim analysis since funding priorities are important in theses difficult economic times. Health officials and those who fund prevention programs are often forced to act with less than perfect information, especially when so many are calling for more physical activity. One has to balance waiting for rigorous proof of new methods to enhance adherence or taking action now. Furthermore, in today's cost conscious economy, funders are asking for best estimates of cost:benefit, the "bang for buck." This paper is submitted as an example of a methodology to approach both crises of rising obesity rates and rising health care costs. Weighed against alternative approaches one can now begin to argue if such programs should terminate, continue or expand.

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Authors' Affiliations:
- County of Kaua'i Agency on Elderly Affairs, Lihue, HI (N.S.)
- University of Hawai'i at Manoa, Honolulu, HI (M.W., M.T., K.L.B.)
- Maui Department of Health, Wailuku, HI (L.P.)

Correspondence to:
Lorrin Pang MD; Maui Department of Health, Rm 301, 54 High Street, Wailuku, HI 96793;
Ph: (808) 984-8200; Email: Lorrin.Pang@doh.hawaii.gov

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