Evaluation of a statewide program to reduce chronic disease: The Healthy Hawaii Initiative, 2000–2004

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Abstract

Physical inactivity and poor nutrition are major contributors to premature morbidity and mortality in the United States. Multilevel interventions using a social ecological approach may be necessary to change population behaviors contributing to the rise of obesity. The Healthy Hawaii Initiative is a statewide program funded by tobacco settlement funds designed to reduce these risk factors. Started in 2000, this program implements interventions in school and communities and through public and professional education to improve physical activity and nutrition. Evaluation of these programs includes long-term objectives focusing on health outcomes, intermediate objectives focusing on health behaviors and short-term objectives focusing on stage of change, attitude, subjective norms, self-efficacy and perceived environment. Results show positive trends in adults for increased fruits and vegetable consumption and a reduction in no leisure time physical activity. Improvements in health behavior among youth have not yet been demonstrated. Some changes in short-term objectives have occurred especially for fruit and vegetable consumption. In conclusion, the Healthy Hawaii Initiative appears to be having some impact in short-term indicators and some effects of fruit and vegetable consumption. More years of data collection are necessary before true trends can be detected to assess the overall impact of this initiative.

Keywords: Evaluation; Chronic disease; Physical activity; Nutrition

1. Introduction

Poor nutrition and physical inactivity are the second leading causes of preventable morbidity and mortality, and are among the top priorities of Healthy People 2010 (United States Department of Health and Human Services [USDHHS], 2000). Over the past 15 years, the prevalence of overweight and obesity has increased rapidly across the US (Mokdad et al., 2003). To have a public health impact, interventions must not only be effective in changing individual behavior, but have significant reach into the population (Dzewaltowski, Estabrooks, & Glasgow, 2004). While effective interventions exist for increasing population physical activity and nutrition, much work remains to be done in translating these research programs into practice (Dunn & Blair, 2002). Multilevel community interventions following the social ecological approach appear promising for effective population rates of physical activity.

1.1. Social ecological approaches

Social ecological models of health behavior incorporate multiple levels of influence from individual to broader social and environmental factors that may facilitate or inhibit individual behavior (Sallis & Owen, 2002). Synergy exists between individuals and environments such that the components are interdependent and exert influence beyond individual characteristics (Kelly, 1990). The interdependence of levels provides health professionals with multiple points of intervention including policies, environment, institutions and individual level approaches (Richard, Potvin, Kishchuk, Prlic, & Green, 1996; Stokols, 1996).
1.2. Program rationale

In 1999, 25.5% of the adult population in Hawaii had no leisure time physical activity and only 18.7% of the population got the recommended 20 min a day of vigorous physical activity at least 3 days a week. Less than 20% of the population consumed five or more servings of fruits and vegetables a day. The obesity rate was 15.7% rising steadily from 13.0% in 1994 (Hawaii Department of Health, 2005). These statistics along with rising health care costs provided a pressing rationale for the creation of a population-based intervention for physical activity and nutrition.

1.3. The healthy Hawaii initiative

The tobacco settlement provided a unique opportunity for the state of Hawaii to address this problem. In 1999, the state legislature passed legislation mandating that the Hawaii Department of Health (HDOH) allocate 25% of the State’s tobacco settlement money for disease prevention programs targeting tobacco, physical activity and nutrition. The state used these funds to create the Healthy Hawaii Initiative (HHI). The direct costs of the program and personnel changes from year to year depends on tobacco settlement payments and has ranged from $5–12 million per year.

At the beginning of the initiative, the HDOH realized the need to have a strong evaluation of all components of the HHI and decided to partner with the University of Hawaii’s Department of Public Health Sciences to create the Healthy Hawaii Initiative Evaluation Team (HHIET). The HHIET is comprised of university-based faculty and research staff which are tasked with evaluating the effectiveness of the HHI.

The overall goal of the HHI is to increase years of healthy life for all people of Hawaii and reduce existing health disparities among ethnic groups in Hawaii. This goal is addressed by creating sustainable changes that promote healthy lifestyles in particular through tobacco, nutrition, and physical activity and reduce health disparities throughout the state. Interventions are targeted at the individual, social, and environmental level and use a variety of channels including public education, education of health professionals, school-based programs and community initiatives (Hawaii Department of Health, 2000). During the development of the HHI, tobacco has been funded differently from the other risk behaviors due to the existence of a coordinated, ongoing tobacco prevention and control program within the HDOH. Due to these differences, this article will only focus on the evaluation of physical activity and nutrition components.

1.4. HHI interventions

Between 2000 and 2004, HHI interventions were divided into four main delivery channels: (1) community-based interventions, (2) school-based interventions, (3) public education and (4) professional education. These channels focused on a variety of different strategies to effect behavior change.

1.4.1. Community-based interventions

The long-term objective of the community programs is to develop sustainable changes in programs, policies, and environments that support healthy lifestyles and reduce the prevalence of chronic diseases. Through the community-based initiatives, the HHI assisted communities in building and maintaining their own infrastructure for promoting, educating, and supporting environmental and system changes that foster increased physical activity, better nutrition, and decreased tobacco use as strategies to reduce the prevalence of chronic disease. The community initiatives followed two tracks, small community-based planning grants and larger targeted interventions.

Planning grants: In 2002–2003, 26 communities were funded to create and implement action plans that focused on improving nutrition, increasing physical activity, and reducing and preventing tobacco use. Communities implemented a variety of programs including: planning and renovating walking paths; changing health screenings from blood pressure only to blood pressure, cholesterol and glucose screening; making physical activity venues (e.g., pools, on site classes) accessible to older adults; creating a gardening website and a mobile gardening library; establishing a demonstration garden with walking paths; increasing healthy choices in restaurants; and helping implement smoke-free workplace policies.

Targeted interventions: In addition to the planning grants, five community agencies received funding targeted towards addressing systems, environmental or policy changes. Example projects within this area address traffic calming; joint land use agreements between the Department of Parks and Recreation and the Department of Education; safe routes to school; and development of a physical activity curriculum to augment physical education and adopting Native Hawaiian food literacy curriculum in Hawaiian language charter schools. Process evaluation results have been published elsewhere (Nigg et al., 2005).

1.4.2. School-based interventions

The school-based interventions have two focuses, the Coordinated School Health Program and Teaching to Health Education and Physical Education Standards. Coordinated School Health Program (CSHP): From 2000 to 2002, school complexes were awarded grants to create systems, environmental and policy changes for tobacco use, nutrition, and physical activity using the eight component model devised by the Centers for Disease Control and Prevention (CDC) for CSHPs (McKenzie & Richmond, 1998). In 2003, a more focused program involving schools on the islands of Maui and Kauai was implemented. This program included training of school...
personnel through annual leadership institutes and hands-on technical assistance.

Teaching to Health Standards and Physical Education Standards: The target of this arm is to improve the teaching of health and physical activity using the state’s content standards for health and physical education. School faculty and staff may attend conferences and workshops, visit district resource centers that house standards-based materials and curriculum, and receive technical assistance from district health and physical education resource teachers. An in-depth description of these programs has been published elsewhere (Pateman, Irvin, Shoji, & Serna, 2004).

1.4.3. Public education campaign

The public education campaign entitled Start Living Healthy was launched in 2002 with television and radio advertisements, advertisements in movie theaters, press releases, a website, and special events. The basic message of the campaign was that small, achievable changes in eating better and getting active can add up to enormous health benefits directly to communities statewide. In this first phase, television and radio advertisements were developed to encourage people to start thinking about changing their behavior. Phase 2 was launched during the summer of 2004 and encouraged high-fat milk drinkers to switch to low-fat milk. Evaluation results of the campaign estimated that 65,000 people switched to low-fat milk during the campaign (Maddock et al., 2005).

1.4.4. Professional education

The Provider Training for Changing Habits (PiTCH) was coordinated by the John A. Burns School of Medicine. The PiTCH program worked with a group of health care providers and other health-related groups to review national guidelines and programs for smoking cessation, nutrition and exercise counseling. Qualitative research was conducted consisting of 14 focus groups of health care providers statewide to determine the most effective and culturally sensitive methods for training providers to change the unhealthy habits of the people of Hawaii in the areas of tobacco, nutrition and exercise. The presentation that was developed is based on best practices and feedback from stakeholders in public health and medicine and was administered to health care providers and staff across the state through large group continuing education events, small group discussion sessions, in-office detailing visits, and other efforts to disseminate the information (Withy, Berry, Lee, & Yamada, 2005).

2. Evaluation design & methods

The evaluation design for the HHI was developed using the Center for Disease Control and Prevention’s (CDC) seven-step model for evaluating community physical activity programs (USDHHS, 2002). These steps are engaging stakeholders, describing the program, focusing the evaluation, gathering credible evidence, justifying conclusions, ensuring use and sharing lessons learned. The evaluation of the HHI follows these steps and the evaluation plan has been published elsewhere (Maddock, Nigg, & Wagner, 2002). The evaluation plan is divided into long-term, intermediate and short-term indicators. Long-term outcomes are expected to occur in 10–20 years, intermediate outcomes are expected to occur in 5–10 years, and short-term outcomes were expected to occur in 2–5 years. The mission and vision of the HHI along with the long term and intermediate objectives are displayed in Table 1.


Long-term outcomes include health conditions significantly related with physical inactivity and poor nutrition: stroke and cardiovascular disease mortality and diabetes prevalence. To track these data, the HDOH created a data warehouse. This warehouse produces age-adjusted reports based on vital statistics and several other state data sources. Currently, age-adjusted data is available from 2000–2002 at www.hawaiioutcomes.org.


Intermediate outcomes include physical activity, fruit and vegetable intake and overweight and obesity. The main data sources for these indicators are the Behavioral Risk Factor Surveillance System (BRFSS) for adults and the Youth Risk Behavior Survey (YRBS) for children attending school. The BRFSS is coordinated by the CDC and conducted by all 50 states plus the District of Columbia and several US affiliated territories. Participants are recruited through a multistage cluster design using random digit dialing procedures and constitute a representative sample of each state’s non-institutionalized civilian residents age 18 and older (Centers for Disease Control and Prevention, 2005; Remington et al., 1988). Since the BRFSS was selected as the main, monitoring system for the HHI, funds were used to increase the sample size from 2100 to 6000 per year and to include the physical activity and nutrition questions on the survey.

The YRBS in 2003 employed census surveying representative samples of students in grades 6–8 and grades 9–12. All middle schools and high schools were included in the 2003 survey. Within the schools, intact classes were randomly selected from a required period at each school to participate in one of three adolescent surveys: YRBS, Youth Tobacco Survey, and Alcohol, Tobacco and Other Drugs Survey. Students were required to have active parental consent to participate in the survey. Of these students, all who were in the selected classes were eligible to participate in the survey. In 1999 and 2001, the YRBS employed a two-stage cluster sample design to produce representative samples of students in grades 6–12. Schools containing any grades from 6–12 were selected with probability proportional to
school enrollment size. The second sampling stage consisted of randomly selecting intact classes from either a required subject (e.g., English or social studies) or a required period (e.g., second period) at each chosen school. All students in selected classes were eligible to participate in the survey (CDC, 2004).

2.3. Short-term outcomes

Short-term outcomes are tracked using a psychosocial surveillance system for chronic disease (Maddock, Marshall, Nigg, & Barnett, 2003). This survey is conducted every year to track changes in attitudes, subjective norms, stage of change, self-efficacy and perceived environmental factors. Participants are recruited through a multistage cluster design using random digit dialing procedures and constitute a representative sample of each state’s non-institutionalized civilian residents age 18 and older. Sample size ranged by time point from 4555 to 4706. Results are available from the spring of 2002 through spring of 2004.

Measures on the psychosocial surveillance survey include stage of change, attitude, subjective norms, self-efficacy and perceived environment. The Stage of Change construct of the Transtheoretical Model has gained widespread use over the past two decades and reflects behavior change as a “process-involving progress” through a series of stages (Prochaska, Redding, & Evers, 2002). The model postulates that people move through a series of five stages of change in their attempts to modify their problem behaviors (Prochaska, DiClemente, & Norcross, 1992). The five stages of change are precontemplation (not planning on changing), contemplation (considering change in the next 6 months), preparation (getting ready to change in the next month), action (currently changing), and maintenance (maintaining change for at least 6 months). Subjective norms and attitude are core constructs of the Theory of Reasoned Action (TRA), an expectancy-value model used as a framework for deciphering individual actions by identifying, measuring, and combining beliefs that are relevant to individuals or groups (Ajzen, 1991). It assumes that behaviors are determined by behavioral intention, which is a function of attitudes towards the behavior and subjective norms (the individual’s perception of whether referent others support their engagement in the behaviors). Self-efficacy from Social Cognitive Theory measures the confidence a person feels to perform a behavior. It is a consistent predictor of a variety of health behaviors (Baranowski, Perry, & Parcel, 2002). Perceived environment from social ecological theory measures the individual’s belief about the surrounding environment. It has been shown to be a good predictor of physical activity (Foster, Hillsdon, & Thorogood, 2004).

3. Results

3.1. Long-term outcomes

Through 2002, little progress has been made in any of these indicators. Stroke mortality and diabetes prevalence have increased slightly over the past year. No significant trends currently exist for cardiovascular mortality. Table 2 displays the trend data for the long-term outcomes.

| Vision: | Healthy communities, healthy people, healthy islands |
| Goal: | Ensure that people in Hawaii have healthy beginnings in early childhood, healthy growth and development through childhood, and healthy adult lifestyles based on good nutrition, regular physical activity, and freedom from tobacco use. Increase years of healthy life for all and reduce existing health disparities among ethnic groups in Hawaii. |

Table 1: The healthy Hawaii initiative: goals and objectives

<table>
<thead>
<tr>
<th>Health status objectives (long term)</th>
<th>Health behavior objectives (intermediate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) By 2020, reduce coronary heart disease deaths to no more than 52/100,000 in all populations.</td>
<td>(1) By 2010, decrease the proportion of adults who are overweight or obese to no more than 40%.</td>
</tr>
<tr>
<td>(2) By 2020, reduce stroke deaths to no more than 16/100,000 in all populations.</td>
<td>(2) By 2010, reduce the proportion of children and adolescents who are overweight to no more than 15%.</td>
</tr>
<tr>
<td>(3) By 2020, reduce the prevalence of Type 2 diabetes to no more than 2.5/1,000 in all populations.</td>
<td>(3) By 2010, increase the proportion of persons aged 2 years and older who consume at least five servings of fruits and vegetables to 50%.</td>
</tr>
<tr>
<td>(4) By 2010, increase the proportion of people who engage regularly, preferably daily, in moderate physical activity for at least 30 min each day to 70%.</td>
<td>(5) By 2010, reduce the proportion of adults who engage in no leisure-time physical activity to 20%.</td>
</tr>
<tr>
<td></td>
<td>(6) By 2010, increase the proportion of youth who engage regularly, preferably daily, in moderate physical activity for at least 30 min each day to 50%.</td>
</tr>
</tbody>
</table>
3.2. Intermediate-term outcomes

Results for the behavioral data are mixed. No leisure time physical activity in adults decreased by 7.2% from 25.5% in 1999 to 18.3% in 2003. Over the same time period, the percentage of adults eating five or more servings a day also increased by 5.2% from 22.4% to 27.6%. A slight increase (2.1%) was seen in diabetes prevalence while no changes were seen for adults participating in regular, moderate physical activity. The rate of overweight and obese adults decreased by 0.2%; however in the rest of the US, the median of overweight and obese increased by 3.0%. Results are displayed in Table 2.

Among high school students, the results were less positive: students who were overweight or at-risk for overweight increased by 2.0% from 1999 to 2003; and students who consumed five or more servings of fruits and vegetables a day decreased by 4.8% to 15.3%. No changes were seen for the percent of students engaging in regular, moderate physical activity. Table 2 displays the high school student results for these variables.
3.3. Short-term outcomes

For fruit and vegetable consumption, the percentage of people in the action and maintenance stages increased from 17.6% in 2002 to 20.5% in 2004. Among the TRA variables, subjective norms increased significantly across the three time points. No changes were seen for attitudes or self-efficacy. Significant changes were also seen for the perception that fruits and vegetables are affordable and the availability of fruits and vegetables in restaurants. No changes were seen in the availability of fruits and vegetables in the community. These results are displayed in Table 3.

For physical activity, the percentage of people in the action and maintenance stages remained stable at 58% from 2002 to 2004. Attitude and subjective norms saw significant decreases in endorsement. However, positive changes were seen in all three perceived environmental variables for physical activity. These results are displayed in Table 3.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Spring 2002</th>
<th>Spring 2003</th>
<th>Spring 2004</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eating 5 servings of fruits and vegetables a day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Theory of reasoned action</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>9.05 (1.91)</td>
<td>7.54 (2.74)</td>
<td>7.46 (2.65)</td>
<td>n.s.</td>
</tr>
<tr>
<td>Subjective norms</td>
<td>5.40 (3.10)</td>
<td>6.52 (3.30)</td>
<td>6.19 (3.15)</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>7.05 (2.66)</td>
<td>7.10 (2.88)</td>
<td>7.12 (2.78)</td>
<td>n.s.</td>
</tr>
<tr>
<td><strong>Perceived environment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits and vegetables are affordable</td>
<td>3.73 (1.40)</td>
<td>3.91 (1.35)</td>
<td>3.84 (1.40)</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>Fruits and vegetables are easy to buy close to where I live</td>
<td>4.58 (0.94)</td>
<td>4.61 (0.91)</td>
<td>4.59 (0.92)</td>
<td>n.s.</td>
</tr>
<tr>
<td>Restaurants in my area offer a wide range of fruits and vegetables</td>
<td>3.83 (1.37)</td>
<td>3.89 (1.41)</td>
<td>3.93 (1.37)</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>Engaging in regular physical activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Theory of reasoned action</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>9.30 (1.56)</td>
<td>7.70 (2.49)</td>
<td>7.49 (2.53)</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>Subjective norms</td>
<td>8.00 (2.29)</td>
<td>7.88 (2.58)</td>
<td>7.68 (2.52)</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>7.51 (2.86)</td>
<td>7.53 (3.00)</td>
<td>7.41 (2.95)</td>
<td>n.s.</td>
</tr>
<tr>
<td><strong>Perceived environment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is safe to go for walks at night in my neighborhood</td>
<td>3.87 (1.42)</td>
<td>3.97 (1.46)</td>
<td>3.96 (1.43)</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>There are a lot of opportunities to be physical activity in my neighborhood</td>
<td>4.33 (1.15)</td>
<td>4.38 (1.15)</td>
<td>4.39 (1.11)</td>
<td>p &lt; .05</td>
</tr>
<tr>
<td>The scenery is enjoyable for walking in my neighborhood</td>
<td>4.27 (1.17)</td>
<td>4.38 (1.18)</td>
<td>4.47 (1.08)</td>
<td>p &lt; .001</td>
</tr>
</tbody>
</table>

*Original anchor for attitudes was harmful/beneficial. Due to the ceiling effect this was changed to unpleasant/pleasant in spring 2003. Significance tests are for the later two waves only.


4. Discussion

Overall, the HHI appears to be on track through the first five years of the initiative, though some of the results are mixed. The percent of people who get no leisure time physical activity has decreased by over 7% in the past 5 years, yet no changes were seen in adequate leisure time physical activity. Obesity rates have remained stable from 2000 to 2003, while the rates increased nationwide by 2.6%. The percent of the population who consumed five servings of fruits and vegetables a day increased by over 5% between 2000 and 2003. In 2003, Hawaii ranked first among the 50 states in percentage of people who were neither overweight nor obese, fifth in fruit and vegetable consumption and 17th in adequate leisure time physical activity (CDC, 2005). Results from the youth data are less positive indicating the need for a stronger focus with youth populations in the future.

The short-term indicators are also mixed. The perceived environmental indicators for both fruit and vegetable consumption and physical activity are moving in the right direction. This is encouraging given the social ecological focus of the initiative. It was hypothesized that these would be the first indicators where change would be seen. For fruit and vegetables consumption, the results are generally positive. Subjective norms, motivation and attitude towards fruits and vegetables are improving. This is consistent with the behavioral change. For physical activity, the results are less positive with attitude and subjective norms moving in the wrong direction. These results indicate that additional emphasis is needed in changing attitudes, subjective norms and self-efficacy for physical activity.

Little movement was seen in long-term disease indicators. This is not surprising given that data is available only...
through 2002. These data are presented in this paper merely for tracking purposes. The HHI would expect to see changes in these indicators starting in 2010.

4.1. Lessons learned

4.1.1. State surveillance systems

State surveillance systems such as the BRFSS and the YRBS provide an excellent way for tracking the long-term progress of a state-level initiative. These systems follow national standards, are implemented on a routine basis using stratified random sampling, allow for comparisons to other states and are already conducted and paid for by the states. While there are many positives to these systems, several limitations are also present. These include: (1). Changes to questions. The core questions for these systems are developed on the national level. During the first 5 years of this project the cutoffs from adult overweight and the definition of regular physical activity changed making comparisons to 1999 impossible; (2). Changes in methodology. Due to contract issues, the 2004 Hawaii BRFSS was conducted only during the last few months of the year, this makes comparisons to other surveys which are collected year round difficult. Also during this program the YRBS changed from spring to fall administration introducing error from maturation effects into the data. The survey methodology also changed from 2001 to 2003 from a two-stage cluster sample design to census survey. Response rates lower than 60% in 2001 and 2003 led to unweighted data for both of these years. While these data sources remain important, the use of additional data sources under the control of the evaluator is also essential.

4.2. Limitations

Several limitations exist in this evaluation. The most important are the use of surveillance data to assess outcomes and the lack of a comparison group. Surveillance data is attractive in many ways for evaluation including comparison to other states and national coordination. However, there are important threats to internal validity. It is impossible to ascertain the effects of the initiative independent of other social forces and events which may be affecting population behaviors. During the first 5 years of the initiative, there was growing awareness of the problem of obesity throughout the United States. Several other local and national programs were occurring simultaneously with this initiative which may have influenced the results. While the other states are used as comparison groups, there is no true control for the state of Hawaii. With a large multi-ethnic population, 2500 miles from the West Coast of the United States there is no other population in the world which is equivalent in terms of shared history and demographics. This makes attribution of effects difficult. Finally, one of the limitations of the social ecological approach is attribution for policy change. Since elected officials pass laws due to a myriad of issues, it is impossible to attribute passage of a law to any advocacy group or initiative. These are all significant and important limitations in attributing the changes in behavior to the HHI which hopefully can be better addressed during the next 5 years of the program.

4.3. Conclusions

The HHI appears to have some initial success in influencing fruit and vegetable consumption and physical activity. The largest successes are seen around fruit and vegetable consumption and weight. Results for physical activity show that more work is needed in the future. Results with youth also indicate the need to increase efforts with this population. To achieve changes in the long term results, the HHI will need to focus on youth and other hard to reach populations as well as focusing on influencing people to get regular physical activity.

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