

The traditional Hawaiian diet: a review of the literature

Abstract: The prevalence of obesity is increasing among all Americans, including Native Hawaiians. Because obesity is a risk factor for major chronic diseases and shortens lifespan, it is important to develop and test interventions to prevent and reduce it. Traditional Hawaiian Diet (THD) programs, conducted over the last two decades, were examined in the context of national information on weight loss and obesity prevention programs. This review reveals that THD programs appeal to Native Hawaiians, especially the education about the health and cultural values of native foods and the support of peers. The majority of participants realize short-term weight loss and improvements in health, but few individuals sustain a significant weight loss. Most participants have difficulty adhering to the THD, citing barriers to accessing fresh, affordable produce and the lack of support systems and environments that embrace healthy eating. Any THD program offered in the future should address these barriers and engage participants for at least a year. This review includes a logic model that can be used to help program providers improve THD programs and increase the rigor of evaluation efforts. Additionally, public health professionals and Native Hawaiians should advocate for environmental changes that will support healthy lifestyles, for example: increase access by Native Hawaiians to the land and ocean; provide land for home, neighborhood and community gardening; support local farmers; remove junk-food vending machines from public buildings (including schools); improve school lunches; and mandate daily, enjoyable physical education classes in schools and after-school programs. **Key Words:** Cognitive therapy, culture, health policy, obesity, Native Hawaiian, Pacific Islander Americans, values

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Introduction

Obesity, implicated as a significant risk factor in many chronic diseases, is occurring in epidemic proportions in most economically developed nations¹. The prevalence of obesity continues to rise in the United States (US), and is markedly high in many US minority groups, including Native Hawaiians and other Pacific Islanders².

Although there may be a genetic basis for obesity, obesity is ultimately caused by consuming more calories than are expended³. Changing dietary behaviors to reduce obesity is a fundamental aim of most weight-loss programs, including Traditional Hawaiian Diet (THD) programs developed and tested in Hawai'i. THD programs provide a structured environment within which groups of Native Hawaiians come together to eat low-fat meals for 21 days, learn about the health and cultural values of native foods, learn to prepare low-fat meals from native and introduced foods, support each other in weight control, and exercise together. Examples of THD programs include *Ka Ho'okē 'Ai* (the Molokai

Diet Study), the Wai'anae Diet Program (WDP), the 'Ai Pono (Balanced Eating) Program, and the *Uli'eo Koa* (Warrior Preparedness) Program⁴.

The purpose of this report is to present a review of the literature and data relevant to the THD. Questions guiding this review included: 1) What do we know about obesity and its management? 2) What are the successful components of THD programs? 3) What are the short- and long-term impacts of THD programs? 4) What more is needed to help reduce obesity and improve health among Native Hawaiians?

Method

Relevant literature was obtained through various online databases accessible through the National Institutes of Health, the University of Hawai'i (UH), the Hawai'i Medical Library, and the Native Hawaiian Center of Excellence (NHCOE), a program within the UH medical school's Department of Native Hawaiian Health. Search words employed singularly or in combination included: diet, native diet, obesity, exercise, diabetes, cultural diet, traditional diet, Hawaiian, Hawai'i, and Native Hawaiian. The NHCOE abstract database was by far the most useful yielding 89 publications on the search term "diet." Many of the reports on the THD are unpublished, but were made available from the personal collection of the Dr. Claire Hughes, Dr. N. Emmett Aluli, Dr. Terry Shintani, and Herbert Hoe.

Findings on obesity and weight-loss programs

The 'problem' and prevalence of obesity

Obesity is implicated as a significant risk factor in many chronic diseases, including diabetes, hypertension, heart

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disease, stroke, obstructive sleep apnea, osteoarthritis, breast cancer, uterine cancer, prostate cancer, and colorectal cancer⁵. It is associated with depression, low self-esteem, and eating disorders and is a strong risk factor for premature death, accounting for more than 400,000 deaths annually in the U.S. In fact, if trends continue, obesity will soon overtake smoking as the primary preventable cause of death⁶. Today 64% of US adults are overweight and 30% are obese⁷.

Increasing numbers of children are overweight as well. For example, in 1999 13% of US children aged 6 to 11 years and 14% of US adolescents aged 12 to 19 years were overweight. This prevalence has nearly tripled for adolescents in the past 2 decades⁸. Overweight adolescents are more likely to develop hypertension and type-2 diabetes than children with healthy weights. They also have a 70% chance of becoming overweight or obese adults. This increases to 80% if one or more parent is overweight or obese. Social discrimination is a frequent consequence of being overweight, as perceived by the children themselves, and is associated with poor self-esteem and depression. Childhood obesity generally is caused by lack of physical activity and unhealthy eating patterns. "Television, computers, and video games contribute to children's inactive lifestyles"⁸.

Prevalence of overweight and obesity in Native Hawaiian adults and children

Native Hawaiians have higher rates of overweight and obesity than other ethnic groups in Hawai'i. In addition, the percentages of Native Hawaiians who are overweight and obese have increased over the years. Data from the 2002 Behavioral Risk Factor Surveillance System (BRFSS), a statewide random-sample telephone survey, suggest that 75.6% (N=755) of Native Hawaiians were either overweight (38.1%) or obese (37.5%). In comparison, 68.6% (N=274)

were overweight or obese in 1996, representing a 10% increase (Table 1)⁹.

High rates of overweight and obesity also have been found in community samples of Native Hawaiian adults. In a 1985 study of 257 rural-dwelling Native Hawaiian adults, 62.8% of women and 65.5% of men were overweight or obese¹⁰. In another rural sample of 567 Native Hawaiians, 82% of Native Hawaiians were overweight compared to 53% of a national sample, and 49% of Native Hawaiians were obese compared to 21% of a national sample¹¹. In a longitudinal study of 1,437 grade-school children, 24% of the 6-to-11-year-old boys and girls studied were overweight, compared to only 11% of the children in the national sample. For adolescents age 12 to 17, the overweight rate was 24%, compared with 11% for similarly aged adolescents in the NHANES sample¹². Another study compared Native Hawaiian children in schools that required frequent exercise and those that did not. The results showed that 26% of children who had few or no physical education classes were overweight, compared to 19% of children that had frequent physical education classes. In comparison, about 14% of similarly aged children on the continental US were overweight¹³.

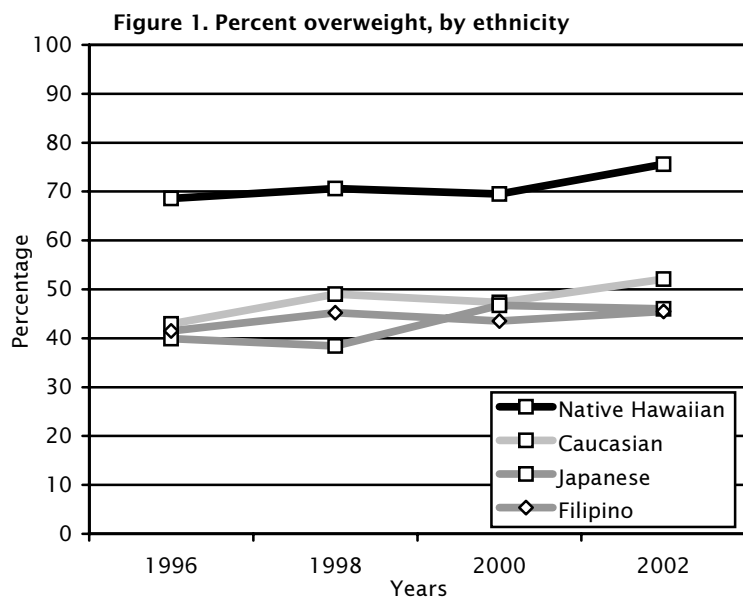
How is obesity measured?

The standard measure of overweight and obesity is Body Mass Index (BMI), which is a ratio of height and weight and reflects one's level of body fat. Health care providers use BMI as a marker of overall health, and researchers use BMI as a measure of body size. To calculate a BMI:

- visit <http://www.cdc.gov/nccdphp/dnpa/bmi/calc-bmi.htm>; or
- use the following formula: $BMI = [weight\ in\ pounds \div height\ in\ inches \div height\ in\ inches] \times 703$ ¹⁴.

Per established US standards, a BMI between 18.5 and 24.9 is "good." Someone with a BMI of 25.0 to 29.9 is called "overweight," someone with a BMI of 30 to 40 is considered "obese," and someone with a BMI greater than 40 is considered "extremely obese" or "morbidly obese."

Generally, the higher the BMI, the greater the risk for developing health problems and shortening one's life, although there is also some risk in having a BMI that is too low (less than 19)¹⁵. However, using BMI as the sole criterion on which to judge weight has some limitations because adult formulas do not consider age, gender, body shape, and other health factors¹⁶. It is also important to remember that most US norms have been based on research with Caucasians; and some researchers suggest that normal BMI ranges could vary among ethnic groups. Additionally, it is important to acknowledge that many people, including Native Hawaiians, find the term "obese"



to be objectionable, and health professionals should know that using terms like “obese” and “morbidly obese” may alienate individuals and communities that they are trying to help.

For children, overweight and obesity are determined using a BMI-for-age value that is at or above the 95th percentile according to US growth charts published in 2000 (<http://www.cdc.gov/growthcharts/>). Because overweight children have a high chance of growing up to be overweight adults, many health professionals feel that attention should be focused on helping children achieve and maintain healthy weights¹⁷.

What causes obesity?

Although there may be a genetic basis for obesity, ultimately obesity is caused by eating more than is needed³. People of any ethnicity that regularly consume more calories than they expend will gain weight. This is especially true as we age and become less active.

Approaches to weight control

There are three general approaches to weight control—cognitive interventions (also called behavioral interventions), environmental interventions, and medical interventions. Cognitive approaches include diet, exercise and counseling programs. The primary goal of these programs is to teach individuals to make healthy food choices and to increase their activity levels so that they can maintain these habits throughout life. The THD falls in the category of cognitive/behavioral intervention because it focuses on diet, exercise, and lifestyle habits; and it requires participants to learn new things, think about their eating habits, engage in exercise, and adopt healthy lifestyle habits. Examples of other cognitive programs include Weight Watchers, Jenny Craig, and Curves for Women.

Although these programs can be successful in teaching people how to improve their lifestyle, many individuals go back to their old eating and exercise patterns and regain weight when they stop attending the program¹⁸. The research on the potentially detrimental effects of repeated weight loss and gain (sometimes called weight cycling or the “yo-yo” effect) is in its infancy. However, a 1997 review article suggested that weight cycling may be associated with decreased perceptions of health and well-being and reductions in eating self-efficacy¹⁹.

Efforts to increase the success of cognitive programs are focusing on interventions that will help maintain healthy lifestyle habits. Following a review of 92 studies examining the impact of cognitive interventions on dietary outcomes, the Agency for Healthcare Research and Quality (AHRQ) identified several dietary intervention components that appear to be promising in modifying dietary change. These

factors include social support, goal setting, small groups, food-related activities (such as cooking or taste testing), and the incorporation of family components²⁰.

Cognitive approaches are important in preventing excessive weight gain in children, especially children with a family history of obesity²¹. Many of the successful weight-control interventions have targeted children. For example, Epstein and colleagues tested an intervention aimed at overweight children and their parents and found that, even after 10 years, 20% of the children had maintained a decrease of at least 20% of overweight compared with only 1% of the parents²². This does not imply, however, that interventions should only focus on children. Consistent with the AHRQ findings above, Golan and Crow found after seven years that children whose parents were targeted as the exclusive agents of change were better able to maintain their weight loss than the children whose parents were not involved²³.

Environmental approaches to weight control attempt to modify existing programs and policies, for example, enhancing the food label to display calorie count more prominently, improving food choices in vending machines, mandating schools to require daily physical education classes for students, getting fast-food restaurants to stop offering “super-size” options, and subsidizing the growing and distribution of local produce. Because the increasing prevalence of obesity is related to increasing availability of food and decreasing demand and opportunity for physical activity in our environment, it makes sense to consider environmental solutions to the problem of obesity²⁴.

Environmental approaches can be used alone or in combination with cognitive interventions, as shown in a study called CATCH (Child and Adolescent Trial for Cardiovascular Health). In this study, 96 schools in 4 US states agreed to participate. Intervention schools modified school lunches and physical education programs, and children received nutrition education. Control schools did not make any changes. The investigators found that children in intervention schools reduced their fat intake and increased their activity levels compared to students in control schools, and differences were still significant 3 years after the intervention ended²⁵.

Medical interventions include surgery and drugs. The most common surgical procedures—gastric bypass and laparoscopic gastric banding—require hospitalization, surgery, and anesthesia. Although usually successful, surgical procedures are expensive and carry the risks associated with surgery and anesthesia, and they are usually used as a “last resort²⁶.” The pharmaceutical industry markets a number of drugs to help people lose weight, but most of these drugs are short-acting and the effects of long-term use are unknown²⁷.

Table 1. Comparison of pre-Western Hawaiian, Prudent Adapted, and typical American-Island diets (Kekuni Blaisdell, MD 1985)

	Maka'ainana	Prudent Adapted	American-Island
Calories	100%	100%	100%
Carbohydrate	78%	78%	45%
▪ Starch	kalo, 'uala, uhi, 'ulu, lū'au, ho'i'o, mai'a, limu	taro, rice, potatoes, grains, legumes, vegetables, fruits, seaweed	rice, potatoes, noodles, grains, legumes, fruits, vegetables
▪ Fiber	50 gm	50 gm	10 gm
▪ Sugar	kō, 'uala, 'ōhelo (2%)	sugar cane, 'uala, mango, grape, guava (4%)	sugar, candy, pastry, soft drink, ice cream (15%)
Protein	12%	12%	15%
	i'a, i'a viscera, pūpū, pāpa'i, ula, moa	fish, chicken	beef pork, lamb, fish chicken, legumes, egg
Fat	10%	10%	40%
	i'a, mothers milk moa, niu	fish, chicken, coconut	beef, pork, lamb, sausage, nuts, butter, milk, eggs, cheeses, ice cream, shortening, pastry
Cholesterol	200 mg	200 mg	1,000 mg
Minerals			
▪ Calcium	iwi i'a, pūpū, pāpa'i	skim milk, fish	milk, greens, cereal
▪ Iron	kalo corm, lū'au	kalo, fish, greens	meat, fish, greens
▪ Sodium	pa'akai (1 gm)	salt (2 gm)	salt, processed food (10 gm)
Vitamins			
▪ A	i'a, viscera, pūpū, lā'au	fish oil, carrot, yam	carrot, cabbage, greens
▪ B complex	kalo, 'uala, 'ulu	cereal, legumes	pork, cereal, legumes, egg
▪ C	lā'au, kalo, 'uala, mai'a, 'ōhi'a'ai, 'ōhelo, limu	orange, papaya, tomato, melon, greens	orange, papaya, tomato melon, greens
▪ D	i'a viscera, i'a, mālamalama o ka lā	fish oil, sunlight	fish, egg, liver, butter, sunlight
▪ K	lā'au	greens	greens

Findings: Traditional Hawaiian Diet (THD) programs

THD - Program elements

The idea for the THD came about in the mid-1980s, when a group of Native Hawaiian health professionals realized that obesity is a recent problem for Native Hawaiians and that, traditionally, Native Hawaiians were strong, slender, and fit. What was it about the traditional Native Hawaiian lifestyle that kept them fit?

To answer this question, Native Hawaiian health professionals first estimated the nutritional content of the traditional diet by reviewing the literature for accounts of the environment, available plant and animal species, and eating

habits of the indigenous inhabitants. This research suggested that, traditionally, Native Hawaiians ate most of their food raw or steamed. They consumed a diet that was high in complex carbohydrates, which included large amounts of *poi* (mashed taro), *kalo* (taro), *'uala* (sweet potato), and *'ulu* (breadfruit); moderate amounts of land and ocean vegetables, especially greens such as *'uala* (sweet potato) leaves, *kalo* (taro) leaves, *pōpōlo* (*Solanum americanum*), and ferns; small amounts of lean fresh animal foods, primarily from the ocean, with some chicken, and, on rare occasions, pig meat²⁸.

Based on this information, the nutritional composition of the pre-Western Hawaiian diet was determined by Dr. Kekuni Blaisdell to be 78% carbohydrate, 10% fat, and 12% protein (Table 2)²⁸. Dr. Aluli served meals in adherence to

Table 2. Evolution of the THD Programs

Year	1987	1989	2000
Name	Moloka'i Diet Study	Wai'anae Diet Study	Uli'eo Koa
Key innovation	28-day isocaloric diet of traditional Hawaiian foods	21-day ad libitum THD	21-day ad libitum THD plus low-fat, low-protein recipes from other cultures plus exercise plus 2 months of 2 meals per week and exercise.
Participant profile	Individuals with elevated blood lipid profiles from the Moloka'i Heart Study	Obese and overweight individuals with medical conditions that could be helped by weight loss.	Normal to moderately overweight individuals that led physically active lifestyles.
Key finding from the study	Changing the source of calories can reduce serum lipids, glucose, and lower blood pressure and resolve or improve some chronic disease conditions.	With the high carbohydrate to fat/protein ratio, participants consumed fewer calories to feel full. They lost weight without feeling hungry and made other health gains.	The THD supports a regimen of high/intense exercise and is therefore appropriate for very active individuals as well as the sedentary.

this ratio in the 1987 Moloka'i Diet Study. In later offerings of THD, foods from other cultures were served to expand menu options for participants, but meals adhered to the same ratio of carbohydrate-fat-protein (78%-10%-12%). This nutrient ratio remains the basis of THD programs, which serve and teach about traditional Hawaiian foods and nutritionally equivalent foods from other cultures.

Next, the developers of the THD examined traditional Hawaiian culture for values that should be incorporated into the program, including *'ohana* (family), *kōkua* (cooperation), *ho'omana* (spirituality), *aloha 'āina* (honoring the land), and *lōkahi* (balance between the environment, God, and humanity). Founded upon respect of these values, THD participants go through the program as a cohort; they eat breakfast and dinner together and are provided a box lunch for midday; the gatherings start and end with *pule* (prayer); the *'ohana* (family) is encouraged to be involved and supportive; in group educational sessions, the health and spiritual values of traditional Hawaiian foods are explained, and food-related activities, such as cooking demonstrations, are provided. In some offerings of the THD, participants learn about *ho'oponopono* (Hawaiian process of mediation; lit. to make right) and other traditions, and in some offerings of the THD, participants also exercise together²⁸.

Medical supervision has been an integral part of every THD program. Prior to starting the diet, participants receive a comprehensive medical evaluation and/or are required to confer with their personal physicians about their participation. Because the THD's plant-based diet is naturally rich in potassium, participants with renal complications are unable to participate. Once in the program, each participant's health status is monitored closely.

Evolution of THD programs

In reviewing the literature, it appears that the THD has gone through three developmental phases, which are labeled as the Moloka'i Diet, the Wai'anae Diet, and the *Uli'eo Koa* Program. These are summarized in Table 3, and described below.

Moloka'i Diet Study. The first program, in 1987, was called the *Ho'okē 'Ai, Moloka'i* Diet Study and was led by Dr. Aluli and Dr. Blaisdell in collaboration with researchers from the University of Hawai'i. It was called an "isocaloric" study because the 10 obese participants were asked to maintain the same calorie intake but to eat only traditional Hawaiian foods. Researchers found that changing the source of calories (from fatty to lean foods) resulted in lower cholesterol, triglyceride, and glucose levels. The goal of this project was not to achieve weight loss²⁹.

Wai'anae Diet Programs. The Wai'anae Diet Programs (WDP) were sponsored by the Wai'anae Coast Comprehensive Health Center. Dr. Terry Shintani began the first program in 1989 and most of the participants were overweight or obese (Table 4). They were allowed to eat until full (*ad libitum*), and all participants lost weight because the lower number of calories per volume in THD foods naturally caused a reduction in calorie intake and resulted in weight loss.

Dr. Shintani expanded on the THD by including low-fat, high-carbohydrate meals from other cultures that met the THD criteria in the maintenance phase of the WDP. This change was made for three reasons: 1) some people felt that a diet restricted to traditional Hawaiian foods was "boring"; 2) some Hawaiian foods (like taro and poi) were not always available or affordable; and 3) many WDP participants were of mixed ethnicity. Because of the success with the first

Table 3. Wai'anae Diet programs

Year	Sessions of Wai'anae Diet Program	Participants
1989	Wai'anae Diet Program I, II	39
1992	Wai'anae Diet Program III, IV, plus addn'l	60
1993	Wai'anae Diet Program V, VI, VII	60*
1994	Wai'anae Diet Program VIII, IX	36*
1995	Wai'anae Diet Program X, XI, Retreat, XII	66*
1996	Ho'omau Ke Ola	19*
1996	Wai'anae Diet Program XIII, XIV, XV	0
	Papakolea, Wai'anae	43*
TOTAL PARTICIPANTS		323
OHA FUNDED PARTICIPANTS		264

*These programs were sponsored by OHA.
The numbers of participants for programs II - VIII are estimated at 20.

WDP, the protocol was repeated many more times in Wai'anae and exported through the Department of Health to the islands of Kaua'i, Maui and Hawai'i, and to local public schools (Table 5). Since 1989, more than 500 individuals have participated in the WDP.

The structure of the 'Ai Pono Program, a THD offered by Mr. Herbert Hoe, is very similar to that of the WPD. More than 1,000 individuals have participated in 'Ai Pono programs since 1992. Key sponsors of these programs included the Queen Lili'uokalani Children's Center, Moloka'i General Hospital, The Queen's Medical Center, the Native Hawaiian Health Care Systems, several Hawaiian-language immersion schools, and extended family groups (Table 5).

Table 4. DoH sponsored programs

Island	Program	# Participants
O'AHU	DoH Sponsored school programs	135
KAUA'I	Kaua'i Native Hawaiian Diet Program	20
	Ho'ola Lāhui Hawai'i	100
HAWAI'I	Hui Mālama Ola Nā 'Ōiwi	20
MAUI	Maui Memorial Hospital Dietary Participation Program	17
	Lā'au No Ka Mea 'Ai - Maui THD Program	42

Uli'eo Koa. In the *Uli'eo Koa* (Warrior Preparedness) Program, conducted in 2000, Dr. Hughes added a vigorous exercise component to the THD program. Participants were generally healthy, and in Phase I of the program, they ate and exercised together for 21 days. In the first week they ate traditional Hawaiian foods, and during the second and third weeks they ate multi-cultural low-fat, high complex carbohydrate meals. Overall, participants reduced body fat and increased strength and stamina during this 21-day phase.

To continue supporting one another's commitment to a healthy lifestyle after Phase I, members of *Uli'eo Koa* program met 3 times a week for a THD meal and an exercise session, hike, or community service project for another 2 months. For the 9 months following, there was no regular

intervention, and individuals were expected to independently maintain the regimen. At 12 months, follow-up data were collected to determine how well participants were able to maintain the improvements they realized with the 3-month intervention.

Other THD programs have also included exercise components. For example, the THD programs sponsored by the Native Hawaiian Health Care Systems on Kaua'i (Ho'ōla Lāhui Hawai'i) and Maui (Hui No Ke Ola Pono) included moderate exercise components, and THD programs offered by Nathan Kapule for firefighters included vigorous exercise.

Effectiveness of THD programs

Appeal. THD programs are appealing to Native Hawaiians because they incorporate Native Hawaiian values and traditions, encourage participation of whole families, instill pride, and build community capacity. As noted in a program report on the THD programs on Kaua'i, the program's "unique quality is the strong cultural component that encourages the embracing of spiritual values, ethnic pride, and a sense of familial cohesion. This component appears to be the most enticing element of the program despite the stringent food limitations and the expectations of the program. Participants were willing to commit to a Hawaiian program out of cultural pride and a sense of oneness³⁰." Advisors to this program mentioned that THD programs often are the only diet programs that Native Hawaiians will participate in.

Short-Term Effectiveness. Community Resources, Inc., in their 1994 evaluation of the WPD, produced a table comparing the results from the WDP to other Western diet programs such as the Pritikin and McDougall diets³¹. In

Table 7, findings were added from the *Uli'eo Koa* program. The results should be interpreted with caution, as each program attracted a different group of participants (for example, *Uli'eo Koa* targeted relatively healthy Hawaiians, while the other THD programs targeted individuals who were overweight). Despite limitations in study design and cross-study comparisons, the literature suggests that THD programs are effective in helping individuals lose weight and improve health over 21 days.

Long-Term Effectiveness. Three studies examined long-term effectiveness of the THD. In *Uli'eo Koa*, measurements were taken at baseline, 3 weeks, 3 months, and 12 months. After one year, those individuals who maintained healthy eating and exercise patterns also maintained their weight

Table 5. Herbert Kealooha Hoe 21-Day 'Ai Pono Programs

Year	Sponsor	Location	Nos.
1992	Hakipu'u 'Ohana	Hakipu'u	50
1996	Mt. Zion Church 'ohana	Punaluu	25
1997	QLCC Honolulu Units	Kaumakapili Church	50
	QLCC Hale Aha	Hale'iwa, Waialua, Hakipu'u	125
1998	QLCC	QLCC, Anahola, ALCC, Lāna'i	125
	Moloka'i General Hospital, QMC, Dr. Blane Chong	Moloka'i Wellness Center	25
1999	QLCC Hale Aha	Mālaekahana, Hakipu'u, Hale Aha	103
	Kaiser Permanente and QLCC, Ko'olaupoko Unit	QLCC, Ko'olaupoko Unit	17
2000	QLCC, Hale Aha, Ke Ola Mamo	Hale Aha	27
	QLCC Hale Aha, Ke Ola Mamo, Kahuku Hospital, Hawai'i DoH	BYU Hawai'i	40
	Moloka'i General Hospital, QMC, Dr. Blane Chong	Moloka'i Wellness Center	25
	Herbert Hoe 'Ohana	Moloka'i Ka Olu Kai	25
2001	Ke Kula 'o Samuel Kamakau 'Ohana,	Ke Kula 'o Samuel Kamakau	100
	QLCC Hale Aha, Ke Ola Mamo	QLCC Hale Aha	25
2002	Hakipu'u Learning Center	Hakipu'u Learning Center	50
	Ke Kula 'o Samuel Kamakau 'Ohana,	Ke Kula 'o Samuel Kamakau	100
2003	Ke Kula 'o Samuel Kamakau 'Ohana,	Ke Kula 'o Samuel Kamakau	100
TOTAL PARTICIPANTS			1012

loss. However, many fell back into old eating and exercise patterns, and they regained the weight they had lost.

In 1998, Dr. Shintani attempted to follow up with the 173 WDP participants who had completed the program at least 12 months prior to follow up, and 82 were located and agreed to join the study. These individuals had lost an average of 14 pounds over the 21-day program. About two-thirds weighed less at follow-up than before starting the program, and the retained mean reduction of weight remained fairly constant over time (about 15 pounds) when participants were stratified into two-year follow-up periods³². This study was limited by the possibility of selective follow up, i.e., that individuals who regained weight after completing a WDP program were unwilling to participate in this study. Also, follow-up weights of participants still were high, around 245 pounds, and very few participants maintained a "medically significant weight loss," defined as a loss

of at least 10% of pre-intervention weight.

Dr. Hughes conducted a qualitative study of long-term impact of the WDP as part of her dissertation research³³. Her goal was to examine factors that influenced participant motivations to modify their dietary behavior. From the 131 living individuals who had participated in a WDP between 1989 and 1994, a random sample of 85 past participants was invited to participate in focus groups. From the 28 who attended, Dr. Hughes found that almost all WDP participants were motivated to join because of health problems and excess weight. The group support and fellowship associated with the THD were major reasons for staying with the 21-day program. A second reason was the fact that many individuals felt healthier and realized weight loss after a week in the program. Most were impressed and inspired to learn about the cultural and health values of traditional foods. Seven (25%) reported that they had kept off the

Table 6. Comparison of short-term outcomes among various diet programs

Program	Duration	WT (lbs)	Mean decrease in:					BMI
			Cholesterol (mg/dL)	Triglycerides (mg/dL)	Glucose (mg/dL)	Syst BP (mm/Hg)	Dias BP (mm/Hg)	
WDP VI	21 days	14.3	36.10	63.5	21.5	15.5	5.9	
Uli'eo Koa	21 days	3.35	38.82	23.0	10.6	7.0	5.0	0.47
Pritikin	26 days	13.00	43.7	97.5	50.3	5.1	4.3	
McDougal	12 days	2.00-11.00	27.6			10.3	6.0	

weight they lost during the program, and several of these individuals continued losing weight after the program. Barriers to staying on the THD after the 21-day program included lack of continued group support and difficulties accessing low-fat foods, especially produce.

None of the short- or long-term studies identified adverse health consequences of the THD, even with rapid weight loss among individuals with existing co-morbidities. However, the long-term studies were compromised by selective follow-up, in that it is very likely that individuals who regained weight were unwilling to participate in the follow-up. Future studies of long-term impact could be strengthened if at least 80% of participants would agree to participate in follow-up and if participants could show the maintenance of a 10% weight loss.

Discussion

Based on this review, THD programs appeal to Native Hawaiians, are safe for people without renal disease, and result in short-term improvements in health for the majority of participants. However, only a few participants maintain a medically significant weight loss after the program is over, in part due to barriers to accessing fresh, affordable produce and the lack of support systems and environments that embraces healthy lifestyles. Thus, although the THD approach may be more appealing to Native Hawaiians than other cognitive approaches to weight loss, it does not appear to be any better at helping participants maintain significant loss¹⁸.

These findings suggest that future programs need to do more to help Native Hawaiians make and maintain lifestyle changes. Recommendations are offered in two areas: 1) increased support for “environmental” approaches to weight control, for example, advocating for policies that will support healthy lifestyles and 2) ensure future offerings of THDs include components that will increase participants chances of long-term success and submit to more rigorous evaluation methods with longer follow-up of more participants.

Support for environmental approaches to weight control

There is ample evidence to suggest that the increasing prevalence of obesity worldwide is due to environmental factors, specifically the increased availability of food and the decreased demand and opportunity for physical activity in our lives. Thus, health advocates should support environmental solutions to the problem of obesity²⁴.

For example, individuals interested in improving Native Hawaiian health should consider working with the Hawai'i State Departments of Education and Health to improve the healthfulness of the school environment, for example by

establishing “healthy food” policies in schools; removing junk-food vending machines from campuses; improving the nutritional value of cafeteria food; mandating daily physical education classes in schools and after-school programs; and promoting physical activity through activities of daily living, such as biking or walking instead of driving to school.

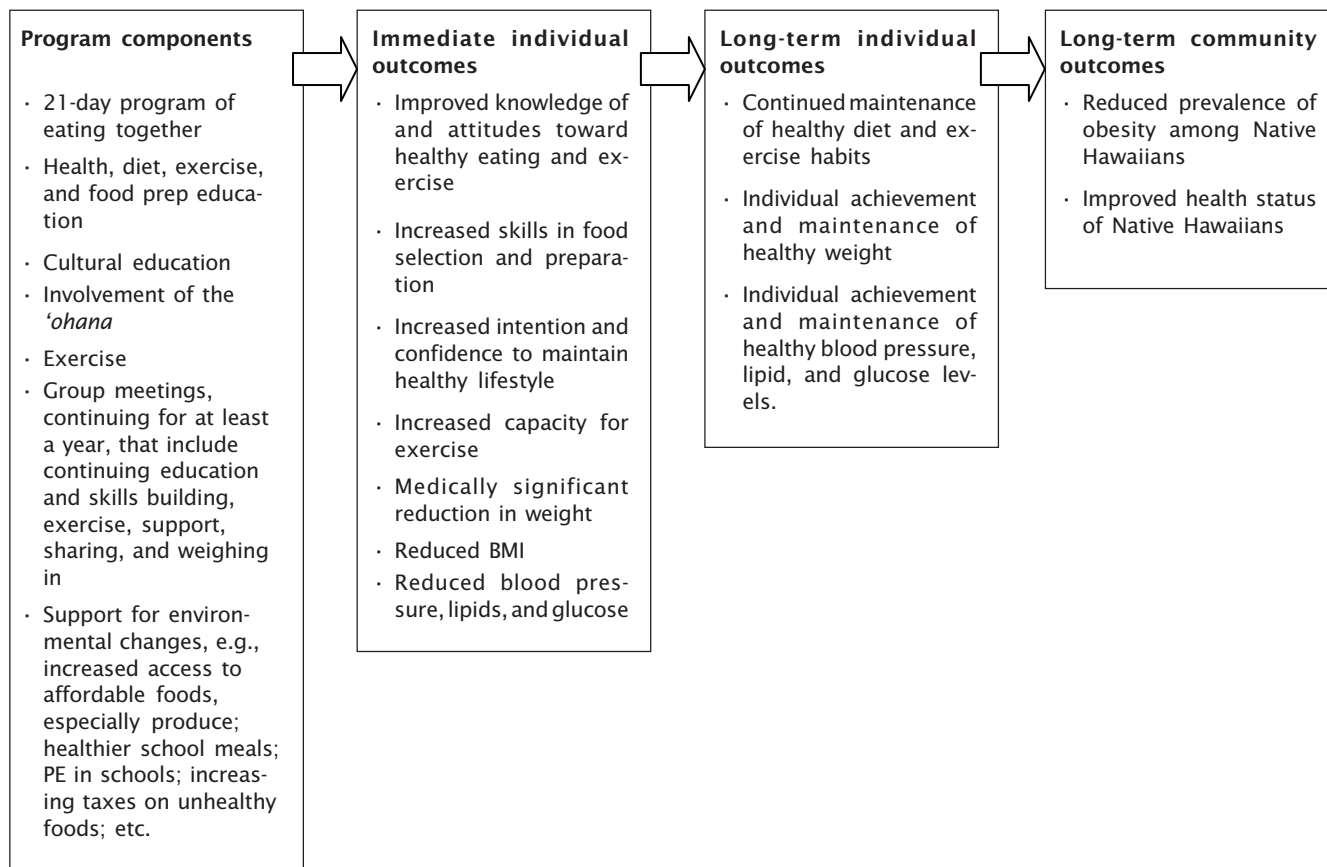
Health advocates should also work to increase the availability and affordability of healthy foods by working to provide full access of Native Hawaiians to their lands and seas; providing land for home and community gardening; supporting local farmers; establishing healthy-food buying clubs and cooperatives; supporting local industries that prepare, distribute, and sell healthy foods at reasonable prices; supporting restaurants that offer healthy food options; and supporting increases in taxes on unhealthy foods. Individuals and groups should also advocate for increasing access to parks, forests, mountains, beaches and exercise facilities; creating biking and walking paths; and supporting other efforts to support physical fitness.

Strengthening THD program and evaluation components

Existing studies have found that participants value the group support offered by THD programs and miss it once the program is over. Thus, future THD offerings should be structured and funded so that participants continue to meet together, for perhaps a year or longer. This portion of the program would focus on improving knowledge and skills in choosing and preparing low-fat foods, exercising together, sharing stories, weighing in, and generally supporting each other in making and maintaining healthy lifestyle changes²⁰. Similar to the 'Ai Pono program, entire families, including children, should be involved²³.

Existing studies have identified a number of methodological limitations, which future studies should strive to overcome. Because only a small number of individuals participate in any one THD program, data from participants from multiple programs may need to be combined to determine if changes are statistically significant. Thus, future studies should be based on the logic model shown in Figure 2, and investigators should consider contributing to a master evaluation database. Such a database should include: demographics, anthropometrics (weight, height, waist size, BMI, and skinfolds); blood chemistries (total cholesterol, HDL, LDL, triglycerides, and glucose); measures of strength and endurance; individual dietary intake; and program costs. Funding should be available to support studies of long-term outcomes, with mechanisms to encourage 100% of THD graduates to participate in follow-up activities and re-measurement. Finally, investigators should base claims of success on significantly medical weight loss (at least 10% of pre-intervention weight) or on significant changes in BMI.

Figure 2. Logic model for THD programs



Conclusion

THD programs can produce short-term improvements in health. To increase chances of long-term success, future THD offerings should be funded to provide longer-term support to and follow-up of participants, and health organizations should advocate for environmental and policy changes that will support healthy lifestyles in Hawai'i.

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