HEAD START WELLNESS POLICY INTERVENTION IN HAWAIʻI: A PROJECT OF THE CHILDREN'S HEALTHY LIVING PROGRAM (CHL)

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DEDICATION

This dissertation work is dedicated to my family

for their support and confidence in me.

ABSTRACT

Head Start (HS) preschools present an opportunity for obesity prevention efforts, and their presence throughout the Pacific makes them a potential source of data for monitoring body mass index (BMI) in the region. This dissertation is embedded within the Children's Healthy Living (CHL) Program for Remote Underserved Minority Populations in the Pacific Region, which worked with HS preschools. It includes four manuscripts; 1) identifying HS teacher recommendations for policies to prevent childhood obesity in HS; 2) testing the effect of a HS teacher-informed wellness policy intervention on the HS classroom environment and childhood diet intake and obesity; 3) quantifying the relative validity of HS teachers' anthropometric measurements for potential child BMI monitoring in the Pacific; and 4) quantifying the differences between child BMI assessment with World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) BMI reference data. Findings suggest that HS teachers (n=17) value being role models of healthy eating and nutrition to children and families, but voiced discomfort in sharing BMI information with parents. The intervention had positive effects on the classroom physical activity environment, as measured by the Environment and Policy Assessment and Observation (EPAO) tool (n= 23 classrooms, p=0.002). HS teachers' priorities related to child nutrition mediated the intervention effect on the environment, and improvements in teachers' personal health behaviors and status moderated the intervention effect on the classroom environment. In comparing height and weight assessments, HS measures were not significantly different from the researcher collected data (n=195, difference in height= 0.66cm, p =0.3458, difference in weight 0.09kg, p=0.8522**)**. Kappa statistics showed good agreement; however, percent agreement varied by weight category (weight kappa=0.50, percent agreement= 94%, 87%, 75% and 50% for healthy weight, overweight, obese and underweight).

In a sample of 941 Native Hawaiian and Pacific Islander children, CDC growth reference data significantly underestimated BMI z-scores compared to WHO reference data (zBMI difference=-0.31, $p<0.001$) with age and sex affecting the relationship, and significant differences in BMI classification were observed (chi square=8.95, $p=0.03$). Findings confirmed that HS teachers can be champions for childhood obesity prevention in Head Start, from policy planning to evaluation of intervention efforts.

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LIST OF ABBREVIATIONS

24DR	24 hour diet recall
BMI	Body mass index
CACFP	Child and Adult Care Food Program
CBPR	Community based participatory research
CCC	Child care center
CCPHEA	Child Care Provider Healthy Eating and Activity Survey
CDC	Centers for Disease Control and Prevention
CHL	Children's Healthy Living Program for Remote Underserved Minority Populations in the Pacific
CNMI	Commonwealth of the Northern Marianas Islands
DECAL	Department of Early Care and Learning
DGA	Dietary Guidelines for Americans
ECE	Early Child Education
ENHANCE	Encouraging Healthy Activity and Eating in Childcare Environments
EPAO	Environment and Policy Assessment and Observation
EW	Employee wellness
FFQ	Food frequency questionnaire
FR	Food record
HCAP	Honolulu Community Action Program
HHS	Health and Human Services
HS	Head Start

ICC	Interclass Correlation Coefficient
IOM	Institute of Medicine
MGRS	Multicenter Growth Reference Study
NAP SACC	Nutrition and Physical Activity Self-Assessment in Child Care
NHANES	National Health and Nutrition Examination Survey
NHPI	Native Hawaiian and Pacific Islander
OB	Obese (obesity)
OI	Observed intake
OW	Overweight
OWOB	Overweight and obese (obesity)
PA	Physical activity
PIHOA	Pacific Island Health Officers' Association
PW	Plate waste
RDN	Registered dietitian nutritionist
RMI	Republic of the Marshall Islands
SD	Standard deviation
SE	Standard error
T/TA	Training and technical assistance
US	United States
WHO	World Health Organization
WHO CGS	World Health Organization Child Growth Standards
WIC	The Special Supplemental Nutrition Program for Women, Infants and Children

zBMI	BMI z-score

CHAPTER 1: OVERVIEW OF DISSERTATION

Introduction

In recent decades, the increased prevalence of childhood overweight and obesity across both the United States (US) and the US Affiliated Pacific (USAP) jurisdictions has become a serious public health concern. While a national surveillance system that measures overweight and obesity is present in the contiguous US, Hawaii and the rest of the USAP are not included in the US National Health and Nutrition Examination Survey or any other national surveillance systems that include measures of overweight and obesity.[1-5] Overweight and obesity in childhood, defined as having a body mass index (BMI) for age greater than or equal 85th and less than the 95th percentile (respectively)[6], contributes to an increased risk for cardiovascular disease, diabetes, and cancer, and for being overweight or obese as an adult. However, few interventions have demonstrated significant and long-term success in treating and reducing childhood obesity in preschool aged children.[7-11] In the diverse USAP it is feasible to use either US-based Centers for Disease Control and Prevention (CDC) or World Health Organization (WHO) BMI reference data to assess child height and weight, depending on the purpose of the growth assessments (e.g. population level reporting in comparison to world or to US, or individual counseling); however, differences in the growth assessments produced by each have been noted, depending on the purpose of the growth assessment.[12] The purpose of this dissertation is to 1) develop a child care center (CCC) policy intervention for childhood obesity, 2) test the effect of the CCC policy intervention on childhood obesity, 3) explore the potential for CCCs to contribute to childhood obesity monitoring and 4) measure the effect of reference data source used on child BMI assessment.

Rationale

Especially high rates of childhood obesity have been observed among Native Hawaiian and Pacific Island (NHPI) children, with the highest concentration of NHPIs in the United States residing in Hawai‘i.[13,14] One study found that in 2007 29% of children in Hawai‘i were either overweight or obese at entrance to kindergarten.[15] This prevalence ranged from 15 to 39 percent in different areas across the state with higher rates in low-income areas and areas with larger proportions of Native Hawaiians, other Pacific Islanders and Filipinos.[15]

An obesogenic environment is the environment in which policies, food availability, access to physical activity (PA), social and cultural norms, and nutrition knowledge support people to eat more calories than they expend, leading to obesity.[16] In addition to environmental causes, obesity can result from other interpersonal (family, social networks and friends) and individual (knowledge, attitude and skills) causes.[16] The dynamic interactions between personal and environmental factors contribute to risk for developing obesity which, alongside the already high prevalence of obesity, has created a need for innovative and multi-level interventions.

The early childhood years present a sensitive time when a child’s lifelong eating habits and risk for future obesity are developed; so interventions targeting this age group are needed.[17,] 18 Childhood obesity prevention can be focused on childcare centers (CCC) where nearly half of all children in the US under five years of age spend up to 22.5 hours per week.[19] Children at these centers consume up to two-thirds of their daily nutritional needs through meals and snacks provided by the federal Child and Adult Care Food Program (CACFP) .[20] Many states in the US have made progress towards implementing CCC licensing requirements that address the role of CCCs in preventing childhood obesity, but such requirements are not

currently in place in Hawai‘i.[21] Recommendations for policy changes at CCCs for obesity prevention have also been created by the Institute of Medicine (IOM).[22]

Head Start (HS) is a federally funded preschool program, serving low-income children three to five years of age across the US and its Affiliated jurisdictions.[23] A recent observational study found that HS participation in Michigan had a significant and positive effect on childhood obesity, where obese children who participated in HS (n=43,748) had more significant declines in BMI z-scores (zBMI) at follow-up than children in comparison groups (beta=-0.70, SE=0.05 vs -0.07, SE 0.08, $p<0.001$).[24] However studies of HS effect on childhood obesity in other programs and regions are needed as program policy implementation has been observed to vary across centers.[21] HS teachers have an influential role in assuring compliance with federal nutrition policies. They serve as a potential leverage point for obesity prevention efforts through CCC policy change.[25] Federal policies for HS mandate programs to identify child nutritional needs through nutrition assessments (i.e.: measuring height, weight), questionnaires about family eating patterns, cultural food preferences, and special dietary requirements for children. In addition programs must provide meals and snacks that provide 1/3 to ½ of a child’s daily nutritional needs with foods that meet the USDA child nutrition meal pattern requirements and ensure that these foods are high in nutrients and low in fat, sugar and salt. HS requires that a variety of foods be served in order to broaden a child’s food experiences, that staff not use food as a punishment or reward, nor that children are forced to eat. Meal time policies include allocating enough time for all children to eat, having children, staff, and volunteers eat the same foods together, family style, to the extent possible.[26] While the policies address many nutritional issues that support obesity prevention, there is opportunity for strengthening these policies to support childhood obesity as well as to improve compliance. One example would be

strengthening the statement or requirements for programs to "serve foods high in nutrients and low in fat, sugar and salt." A stronger policy would outline minimum standards for each of the nutrient requirements (i.e.: foods with 20% or less of the daily allowance for sodium). Other opportunities to improve policy implementation could be the introduction of new policies on education, training and technical assistance related to nutrition for HS teachers to promote obesity prevention. HS preschools, throughout the USAP, present a potential source of anthropometric data that could contribute to a monitoring system; but more information on the validity of measurements taken at these preschools is needed.

In the diverse US Affiliated Pacific Region, CDC 2000 and WHO (WHO) 2007 reference data are used to assess child growth. The WHO reference dataset is composed of children who met specific recommended breastfeeding guidelines and were from families reporting high socioeconomic status, while CDC growth charts describe growth of US children where few met those guidelines. The CDC dataset rates of reported infant breastfeeding history were 50% of children ever breastfed, and 33% were breastfed for 3 months.[27, 28] In comparison to WHO, the CDC reference dataset has been found to represent a shorter, heavier sample population. Previous studies have found significant differences in child's growth status between these two reference datasets, where CDC data significantly underestimated childhood overweight and obesity; however, no study included children from the USAP who are of Native Hawaiian and Pacific Islander ancestry.[11]

Statement of Problem

While childhood obesity is caused by a complex interaction between environmental, personal and interpersonal factors, in the past, childhood obesity interventions have generally

focused on just one or two of these contributing factors, such as nutrition or physical activity.[10] Some multi-level and policy approaches for obesity prevention in CCCs have had a positive impact on the CCC environment, but more research is needed to demonstrate the effects of these environmental changes on individual child outcomes (i.e. BMI, dietary intake) and the use of more objective methods for assessing the CCC environment are needed.[29-36] Further, CCC policy interventions have not been tested on NHPI populations. The proposed research project will fill these gaps by testing the effect of a wellness policy intervention on the CCC environment and on child outcomes in a predominantly NHPI population. Objective measurements of the CCC environment will involve direct observations and assessments of child outcomes. Mediating and moderating factors to the intervention effect will be tested.

Research questions

The research questions that this dissertation will address are listed in Table 1.1 below, organized by manuscript.

Table 1.1 Research Questions by Manuscript.	
Manuscript 1.	1.1 What are HS teachers' recommendations for policy change to improve nutrition and physical activity promotion in the HS classrooms?
	1.2 What are HS teacher strategies for implementing new and improving compliance with existing policies for promoting nutrition and physical activity in the HS classrooms?
Manuscript 2.	2.1 Did policy implementation result in a significant improvement in the classroom environmental as measured by Environment and Policy Assessment and Observation (EPAO) scores?
	2.2 Is the relationship between wellness policy implementation and the classroom environment mediated by quality of policy implementation or changes in teacher beliefs, attitudes, and knowledge about nutrition?
	2.3 Did policy implementation result in significant change in child fruit and vegetable (FV) intake?
	2.4 Is the relationship between wellness policy implementation and child FV intake mediated by changes in the classroom nutrition environment, teacher beliefs, attitudes, and knowledge about nutrition or quality of policy implementation?
	2.5 Did policy implementation result in significant change in child body mass index (BMI)?
	2.6 Is the relationship between wellness policy implementation and child BMI mediated by changes in the classroom environment, teacher beliefs, attitudes, and knowledge about nutrition and quality of policy implementation?
Manuscript 3.	3.1 Are Head Start (HS) teachers' anthropometric measurements valid, relative to a standardized measurement taken using standardized and calibrated equipment?
Manuscript 4.	4.1 What are the differences in child zBMI and overweight and obesity classification between the CDC and WHO reference data in a sample of primarily Native Hawaiian and Pacific Islander children from Hawai'i?
	4.2 How do child age, sex, race, and breastfeeding history influence the estimated differences in childhood zBMI, overweight and obesity estimated by CDC and by WHO reference data?

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CHAPTER 2: LITERATURE REVIEW

Childhood Obesity Definition and Consequences

Childhood obesity is defined by a body mass index for age (BMI) ≥95th percentile while overweight is greater than or equal to the 85th and below the 95th percentile on the 2000 Centers for Disease Control (CDC) growth charts.[1] Childhood obesity rates from 1980 to 2012 have risen dramatically in the past three decades, from 7% to 18% of six to eleven year olds.[2,3] Children who are obese suffer immediate health consequences such as increased risk for hypertension, bone and joint problems, sleep apnea and low self-esteem.[4-7] Long-term consequences of childhood obesity include increased risk for adult obesity, cardiovascular disease, diabetes, stroke, some forms of cancer and osteoarthritis.[8-12]

Ethnic Disparities in Childhood Obesity across the US and the Pacific

Striking disparities by socioeconomic status and race have been observed in obesity rates. Up to 31% of Hispanic children were obese compared to 16% of Non-Hispanic White children.[13] About one-third of all children participating in the Special Supplemental Nutrition Program for Women Infants and Children (WIC) program were overweight or obese compared to 40% of American Indian/American Native children and 25% of Non-Hispanic White children.[14] Pacific Islanders living in the US also suffer from disparities in rates of chronic disease and obesity, similar to other minority ethnic groups.[15, 16]

The most recent data on children entering kindergarten in Hawai‘i (2007) showed that 29% of children were overweight or obese, with up to 39% of children in some geographic areas.[17] These rates are similar to those that were found in 2003, demonstrating the need for improved strategies on young childhood obesity prevention.[18] The same study found that

communities with higher levels of child overweight and obesity also had lower levels of family education, lower per capital income, higher poverty, higher reliance on government assistance, unemployment and were from more densely populated areas with individuals reporting being Native Hawaiian/Pacific Islander race.[17] A significant decline (p=0.003) in the prevalence of childhood obesity, BMI for age above the 95th percentile, was observed in children two to five years old across the US mainland, where rates dropped from 13.9% between 2003 and 2004 to 8.4% between 2011 and 2012; however, children from Hawai‘i were not included in the study.[2]

Across the Pacific region obesity and chronic disease prevalence has increased rapidly, resulting in a declaration of a State of Emergency by the Pacific Islanders Health Officers' Association (PIHOA) .[19] From the limited data available on the Pacific region, adult obesity rates were twice that of US mainland. Almost three-fourths of adults in American Samoa, 44% in the Republic of the Marshall Islands, and 42% in the Federated States of Micronesia were obese.[20-22]

Childhood Obesity Monitoring and Surveillance in the Pacific

While there are some data on obesity and chronic disease rates in the Pacific Region for adults, fewer data are available for young children. Although Hawai‘i is one of the 50 United States, it is not included in the country-wide nutrition surveillance program, the National Health and Nutrition Examination Survey (NHANES), and the last population-wide anthropometric measurement in Hawai‘i was conducted in 1984.[23-25] Additionally, other Pacific Islands, such as the US territories of Guam and American Samoa, lack a regular surveillance program that includes children three to five years of age. Alarmingly high rates of adult obesity raises need for monitoring early childhood obesity for prevention purposes, as well as to measure the effects of local and regional obesity prevention strategies .While over-nutrition or obesity is of concern in

the Pacific and developing countries, food insecurity also creates concern for under-nutrition and a need for regular BMI monitoring.[26] In addition, the IOM recommends that early childhood obesity prevention policies for child care centers include monitoring growth.[27]

Head Start for Childhood Obesity Prevention and Pacific Monitoring of Young Child Growth

Head Start (HS) is a US federal preschool program, of the Department of Health and Human Services Administration for Children and Families. The main goal of HS is to promote school readiness, though the program also emphasizes child health and growth assessment with mandatory yearly health screenings and bi-annual growth evaluation.[28] HS programs also participate in the Child and Adult Care Food Program (CACFP), which outline specific nutrient requirements for meals and snacks served in classrooms and includes policies about teacher role modeling healthy eating by consuming the same foods as children at meals.[28] One study found that HS participation was associated with healthy changes in BMI.[29] In this study, the anthropometric measures of 43,748 children who participated in HS were compared against the anthropometric measures of two age matched samples of children from a primary care health care system in Michigan; children who received Medicaid (n=5405) and did not receive Medicaid (n=19,320).[29] The change in zBMI from the start to the end of each program year was compared between groups with linear mixed models adjusting for age, sex, and race/ethnicity. The children who participated in HS had a greater decline in zBMI compared to the Medicaid (Beta=-0.70, SE=0.05 vs. Beta=-0.07, SE=0.08, $p<0.001$) and non-Medicaid groups (Beta=-0.70, SE=0.05 vs. -0.15, SE=0.05, $p<0.001$) .[29] All HS preschool classrooms, including those in Hawai‘i, American Samoa, Guam, and Palau are required to measure child height and weight twice each program year and to report some of this data to regional administration; however the recent study from Michigan is the first to aggregate the anthropometric data from multiple HS

programs for longitudinal analysis.[29-31] There is potential for HS to serve as a source of data for surveillance of young child health and nutritional status in the Pacific, given the lack of other available system. One potential limitation of this source of data for BMI monitoring is the accuracy of these anthropometric measurements.

Reference Data used for Interpreting Anthropometric Data

Centers for Disease Control (CDC) 2000 anthropometric reference data are utilized in the US to assess child growth status and to screen for underweight, overweight and obesity, while 2006 World Health Organization (WHO) anthropometric reference data are typically used for child growth assessment in international settings (32, 33). The CDC 2000 data are comprised of five US nationally representative surveys conducted between 1963 and 1994.[1] Studies suggest that this data set represents the growth of children in the US during that specific time period, reflecting the lifestyle pattern of that time.[34] The WHO CGS reference data was created from the WHO Multicenter Growth Reference Study (MGRS). The MGRS collected primary growth data and related information from approximately 8500 children from different ethnic backgrounds and cultural settings (Brazil, Ghana, India, Norway, Oman and the USA). Children were selected for this study to represent optimal growth; inclusion criteria included meeting specific early infant feeding recommendations (i.e.: exclusive breastfeeding for 6 months) as well as maternal socio-economic status that would not place constraints on growth.[35, 36] In comparison, the CDC reference dataset represents a shorter heavier sample population than the WHO data sets and included fewer children who were breastfed; in the CDC data set rates of reported infant breastfeeding were 50% of children ever breastfed, and 33% breastfed for 3 months and the sample represents the diversity of US socioeconomic status and where low-socioeconomic status individuals were oversampled.[32, 34]

Previous studies found significant differences in child's BMI status between these two references. A US study that included 143,787 preschool aged children, primarily white, black or Hispanic, two-to-five years, found that WHO anthropometric reference data estimated a significantly higher prevalence of overweight and obesity compared with CDC (42.2% vs 33.8% $p<0.0001$) and that the difference was greater in children at age two to three years of age compared to those at age four-to-five years.[37] Adult obesity as defined by percent of body fat estimated by dual-energy X-ray absorptiometry in Pacific Islanders was overestimated when National Institutes of Health (NIH)/WHO BMI cut points were used for classification, leading to the creation of ethnic specific BMI cut points for adult Pacific Islanders; but none have been created for children.[38] Native Hawaiian and Pacific Islander children have not been studied in large US surveys.

In the diverse US Affiliated Pacific Region it is plausible, to utilize either CDC or WHO anthropometric reference data. Some authors suggest WHO data may provide optimal reference data for body size in this international setting up to five years of age. However, for authors interested in monitoring body size in comparison with the majority of US publications and in comparison to other US childhood obesity intervention studies, CDC reference data are preferred.[34]

Obesity Causes and Obesogenic Environments

In Hawaiʻi and the Pacific, following colonization, a transition to western diet and lifestyle occurred. In Hawaiʻi, western influences moved Native Hawaiian people away from traditional diets of fish and poi and a lifestyle that included daily vigorous physical activity and labor. This transition promoted availability and consumption of energy-dense imported foods and

decreased energy expenditure, creating an energy imbalance that promoted obesity.[39, 40] This nutrition transition has been cited as contributing to the high burden of obesity in Hawai‘i, across the Pacific, and globally in other developing countries.[41] However, treatment for what seems to be simple energy imbalance is actually quite complex. The conditions that contribute to an obesogenic environment are embedded within the social, political, and economic systems, and the likelihood that a person becomes obese is an interaction between environment, interpersonal, and intrapersonal factors.[42] Obesity interventions that fail to recognize the interaction between an individual and their environment have shown minimal effect on obesity; thus, a call for multi-level, environmental approaches has been made.[43]

Obesogenic environments can be broken down into four components, the physical, economic, political and socio-cultural, with each type holding potential to prevent or favor obesity.[44] At the community or school level, the physical environment includes food availability and access to physical activity (PA). Associations between food availability, described as the number of supermarkets, fast-food outlets, or the nutritional value of foods available for purchase at these food outlets, and diet quality, risk for chronic disease and obesity have been observed.[45, 46] Economic environments at the community level describe the costs associated with purchasing nutrient-dense foods as well median income. BMI has been positively associated with economically disadvantaged communities.[17, 47] The political environment includes the policies or regulations regarding food; such policies in the school environment restrict what can be sold in vending machines or the cafeteria. In the broader environment, policies determine how food can be advertised to children.[48]. At the policy level, PA can be facilitated through city planning regulations that require sidewalks or biking paths.[48] Past public policy health initiatives, such as bans on smoking in public areas, have had significant and positive effects on individual behavior,

supporting the role of policy initiatives on behavioral outcomes.[49] The socio-cultural environment includes the beliefs, traditions, and attitudes held by a community or group of people that may influence diet and PA habits. One socio-cultural example from the HS program is that teachers did not believe obesity was an issue in young children, which prevented them from addressing obesity and diet-related issues in their classrooms.[50]

Obesity Causes and Behaviors of Individuals

At the individual level, obesity is the result of excess storage of energy when intake is in excess to energy expenditure. While environments influence the likelihood of this energy imbalance to occur, individual behaviors, such as dietary intake and level of PA, directly contribute to the energy balance. The Dietary Guidelines for Americans (DGA) recommend that individuals consume five servings of fruits and vegetables each day; and one Healthy People 2020 goal from the US Department of Health and Human Services (HHS) is to increase the contribution of fruits and vegetables to individuals' diets.[51, 52] Additionally, an IOM plan includes assessing fruit and vegetable consumption as a way to measure progress in obesity prevention efforts.[53] Fruits and vegetables are dietary sources of essential and non-essential nutrients, and they are relatively low in energy (calories) .[54] The energy density of foods can contribute to overall energy intake and weight management, where more energy dense foods are associated with greater energy intake and vice versa.[55] Fruit and vegetable intake can support decreased dietary energy density, thus supporting a healthy energy balance.[56-59] PA recommendations also support health and obesity prevention through increased energy expenditure to improve energy balance.[60]

Child Care Center Environments and Obesity Prevention Policy

A literature review of CCC obesity interventions informed the conceptual framework for the proposed project. The PubMed database was searched using these terms: child care, preschool, nursery school, dietary intake, nutrition, physical activity, intervention, obesity, overweight and environment. Review of controlled trials, randomized controlled trials, multicenter studies, observational studies and literature reviews from 2000 to present resulted in 1,853 articles. Inclusion criteria were target populations that included minority groups (Hispanic, Black, Asian and/or Pacific Islander), children ages 2-5 years, and preschool or CCC based interventions carried out in the US or Pacific region, where at least one of the following outcomes was measured; anthropometry, dietary intake, the child care environment, child care providers or teachers' knowledge or attitudes, or CCC policy. Articles were excluded if interventions were delivered outside of CCCs (outpatient, after school, clinical), if the target population was not between two and five years of age, or if the intervention was not related to childhood obesity or overweight (e.g., asthma, autism). Eighteen articles describing 7 interventions were found and included in the review. A summary table of the literature on childhood obesity prevention interventions in CCC is in Appendix A.

CCC policies supporting fruit and vegetable availability and encouraging PA are recommended for obesity prevention by both the IOM and the Academy of Nutrition and Dietetics.[27, 61] Research on the role of CCCs in obesity prevention resulted in intervention studies that demonstrated the effect policies can have on changing the nutrition and PA environment in CCCs.[62-66] While evidence supports the positive influence that these policies can have on the obesogenic CCC environment, other cross-sectional studies have found a wide variation in obesity prevention policies across the US mainland.[67]

Recommendations for early childhood obesity prevention policies have been outlined by the IOM.[27] These policies encourage monitoring of young child growth, facilitating and creating opportunities for PA, supporting intake of healthy foods by making these foods accessible to all children, limiting marketing of unhealthy foods to children, limiting screen time, and promoting adequate sleep.[27]

Effective CCC Policy Intervention Programs

Seven CCC policy intervention programs from the literature (Appendix A) demonstrated a positive effect on at least one nutrition or environmental factor or child growth outcome: Encouraging Healthy Activity and Eating in Childcare Environments (ENHANCE)[62], Nutrition and Physical Activity Self-Assessment in Child Care (NAP SACC)[63-66], Romp N Chomp[67-68], Georgia's Department of Early Care and Learning (DECAL) intervention[69] and the Contra Costa County worksite wellness program in CCCs [70], and Tooty Fruity Veggie [71].

The Tooty Fruity Veggie intervention, conducted in Australia, demonstrated the effect of a policy on fruit and vegetable availability in CCC settings where the policy encouraged parents to pack fruits and vegetables instead of energy-dense, nutrient-poor foods in their child's lunch. The intervention had a significant impact on the foods brought to school with a 0.6 serving increase in vegetables packed in lunches ($p=0.001$) and a 0.15 decrease in child BMI z-score ($p=0.022$). One limitation of the study was that actual fruit and vegetable consumption was not assessed.[71]

Romp N Chomp was a community-wide obesity prevention multi-component intervention trial in Australia where policy interventions and child level assessments were done.[67, 68] The Romp N Chomp intervention activities included a physical activity policy for

CCCs as well as training on PA for child care providers and professional development for child care providers on healthy eating messages.[68] The Romp N Chomp study demonstrated positive effects on the prevalence of childhood overweight and obesity where a 3.4% vs. 0.7% decrease in prevalence was observed in intervention vs. control communities ($p<0.05$) and a significant decrease in fruit juice consumption (0.5 serving decrease) was observed ($p<0.05$) .[67]

In the US, Alkon and colleagues conducted a seven-month randomized controlled multi-state and multi-component CCC policy intervention trial in a sample of 209 children. The intervention was based on the NAP SACC model where child care providers and staff were offered five one hour workshops were held on topics such as childhood obesity, healthy eating for young children, PA for young children, and working with families to promote healthy behaviors. The intervention is delivered by local trained nurse child care health consultants (one per state). These consultants worked directly with CCC directors to write and/or update center nutrition and PA policies, and provided monthly on-site visits and email/phone consultations as needed to support policy implementation.[66] A hierarchical linear model showed that after controlling for state, parent education and family poverty, there was a significant difference in change in mean zBMI between intervention and control preschools (effect of the intervention on change in child zBMI score coefficient (SE)=-0.14 (0.06), $p=0.02$) (66). In these policy interventions, environmental outcomes were measured; however, the reliance on self-assessment of the CCC environment, where CCC directors and/or staff reported environmental characteristics is a limitation.[66]

Also in the US, a NAP SACC pilot study measured significant improvements in nutrition and PA self-assessment scores in intervention classrooms from 105 at baseline to 118 at follow up ($p<0.001$) and another pilot study found a significant increase in the number of reported best

practices for obesity prevention in childcare centers being implemented from 36 to 44 (n=17 centers, p=0.003) .[63, 65] Similar to the Alkon study, these NAP SACC interventions offered workshops on childhood obesity, child nutrition and PA, and then offered support, consultation services, and or training and technical assistance in creating or improving policies on nutrition and PA for child care centers.

Other interventions used direct-observations to assess the CCC environment, but were lacking in measuring the effects of the intervention on child behaviors and BMI.[62, 69] The DECAL study, conducted in Georgia, offered trainings to caregivers on adoption and implementation of six wellness policies to improve the nutrition and PA environments of their CCCs. In this study, centers were asked to select and adopt 6 of 12 wellness policies and were provided technical assistance from a registered dietitian and $2000 for implementation. In addition, CCC directors and staff were given four trainings on nutrition and PA that supported their wellness policies.[69] Environmental and Policy Observation and Assessment scores significantly increased following this intervention ($p<0.001$) .[69]

Lanigan's ENHANCE study took a collaborative approach to intervention development and implementation. Participating CCCs were asked to form wellness committees that included a child care provider, ENHANCE wellness liaison, parent, and other community partner. The wellness committees participated in a 7-hour wellness retreat which included topics such as child obesity prevention, child feeding and physical activity. Committees were provided with baseline center observations and were asked to develop wellness plans that created four to five specific goals for improving center policies and practices. ENHANCE project staff supported implementation of the plans through resources, curriculum, mini grants, and training.[62]

Improvements in observed classroom feeding practices were measured as a result of the EHNANCE policy intervention ($p<0.01$) .[62]

CCC Policy Intervention Strategies

From the interventions mentioned above, a variety of strategies were employed to successfully implement new wellness policies.[62-71] Three intervention programs offered training and technical assistance (T/TA) for new policy implementation only[66, 64, 69] and one included T/TA and employee wellness (EW) activities in the intervention.[70] Another program took a collaborative approach to policy intervention planning with T/TA and EW activities [62] while one followed a community-based participatory research (CBPR) model during planning.[67]. The CBPR approach establishes an equal partnership between researchers and community members and recognizes the strengths possessed by each party, fostering empowerment of community members [74], and a strengthening of intervention effects.[62, 67]

Findings from both Lanigan and Gosliner support the inclusion of CCC staff in intervention activities to strengthen the effect of interventions on the CCC environment.[62, 70] The EHNANCE intervention program found that increases in feeding knowledge and decreases in misconceptions reported by teachers were significantly associated with observed improvements in feeding practices ($r=0.22$, $p<0.05$; $r=0.52$, $p<0.01$). Teacher changes in efficacy, misconceptions, knowledge and priority were all significantly associated with improvements in nutrition education ($r=0.68$, $p<0.01$; $r=0.51$, $p<0.01$; $r=0.35$, $p<0.05$, $r=0.26$, $p<0.05$, respectively). Similar, significant correlations were found between teacher outcomes and family communication.[62] Similarly, Gosliner's intervention assessed the impact of an EW program on teacher and child outcomes.[70] The study demonstrated a positive effect of the EW program on

teachers' reported self-efficacy for communicating nutrition information to parents ($p<0.05$) and on the likelihood of including fresh fruits ($p=0.004$) and vegetables ($p=0.03$) as a part of meals and snacks served at centers.[70] Neither program tested the effect of these environmental outcomes on child outcomes but both demonstrated a mediating role that CCC staff has on policy implementation at the classroom level. Past cross-sectional studies identified an influence of teachers' feeding style on child food consumption[74], disparities between CCC policies and classroom practices [73], and that beliefs held by HS program teachers (e.g., a lack of priority placed on childhood obesity), are barriers to obesity prevention [50]. Table 2.1 summarizes the outcomes measured and intervention activities employed by past CCC policy interventions.

The remaining articles and interventions in the literature review incorporated nutrition and/or PA interventions, but not policy level changes. Effects on childhood obesity outcomes were inconsistent, supporting the need for broader environmental changes and information about implementation processes.[75-82] Some of the interventions did, however, provide evidence for effective practices for consideration when planning obesity prevention policy interventions. For example, one intervention, *Miranos!*, showed that incorporation of the Healthy Habits for Life curriculum along with parent education supported a healthy CCC environment that was effective at reducing BMI z-score. While *Miranos!* did not incorporate policy level change, it did offer insight on what practices could be effective at reducing childhood obesity.[80] Since interventions have demonstrated varying levels of effect on environmental and child outcomes, further investigation on factors that may mediate or moderate this relationship is warranted, such as the influence of the teacher and of fidelity of implementation.

Evaluation of Policy Interventions

Past researchers suggest the importance of direct observation to objectively assess the effect of a CCC policy on the classroom environment.[63] While NAP SACC trials found self-reported measures of the CCC environment had a high degree of inter-rater and test-retest reliability, creators of NAP SACC environmental self-assessment tool suggest using direct observations [83], since disparities between self-reported and actual adherence to policies were observed.[84].

The Environment and Policy Assessment and Observation (EPAO) tool was created to quantitatively assess the nutrition and physical activity practices and policies within the CCC environment [85], as part of the NAP SACC intervention project. The EPAO uses direct observation, which reduces self-report bias and comprehensively quantifies that nutrition and PA environment through observations of foods offered, staff behaviors related to nutrition and PA, and the PA equipment that is accessible to children at centers. The EPAO protocol involves one day-long observation of the CCC classroom, including a document review.[85]

Teacher Level Evaluation

To assess the socio-cultural environment at the CCC classroom level, teachers' beliefs, knowledge, and attitudes should be included in the evaluation. Since teachers' belief systems have been cited as barriers to obesity prevention efforts[50, 72], one group sought to quantify the relationship between teacher's beliefs and CCC classroom practices related to nutrition promotion and healthy eating.[62] The Child Care Provider Healthy Eating and Activity Survey (CCPHEA) was utilized by Lanigan and colleagues to assess the relationship between CCC staff's child-nutrition related efficacy, misconceptions, feeding knowledge, and priorities and adherence to new wellness policies and practices in a policy intervention. The CCPHEA consists

of 14 questions, answered on a Likert scale. The creators of the assessment tool conducted a factor analysis to determine the questions associated with each factor: efficacy, misconceptions, feeding knowledge, and priorities. Thus, the CCPHEA survey provides evidence for exploring the mediating relationship between teachers' child-nutrition efficacy, misconceptions, feeding knowledge, and priorities on wellness policy implementation effects on CCC environmental and child outcomes.[62]

Child Level Evaluation

While studies demonstrated that policy level interventions can in fact alter the CCC environment, to understand how these environmental changes contribute to childhood obesity prevention, measures of child level factors are needed. As one goal of policy intervention is to alter the foods offered to children and staff behaviors that encourage child intake of these healthy foods, assessing actual child dietary intake is necessary.

Research methods for dietary assessment include food frequency questionnaires (FFQ), 24 hour dietary recalls (24DR), food records (FR), observed intake (OI), and plate waste (PW).[86, 87] FFQs, 24DRs, and FRs rely all on reported dietary intake; since preschool aged children are unreliable reporters of this information, parents or caregivers act as a proxy to report intake.[87] Proxy reports of dietary intake introduce bias as well, especially when the proxy is not present during meals times, as is often the case in CCC settings.[86, 89] These research methods provide information on dietary intake throughout the day, not just intake in the CCC classroom.

OI methods can be utilized to visually estimate the amount of food consumed by individuals at a given meal.[90] Protocols for OI have found that one researcher can observe up to three children simultaneously, limiting the number of OI that can be completed at a given meal

period.[91] Past intervention studies employed OI for dietary assessment of children but were unable to detect changes in dietary intake.[66]

PW methods can quantify the amount and types of food consumed at a single eating occasion and in the past have been used to assess change in dietary intake in CCC interventions.[92] In a report on research methods to assess dietary intake in CCC, IOM recommends the use of PW methods, citing a strength of the method as precise estimation of food served and consumed.[93] PW methods require a trained researcher to identify foods served to participants and to collect pre- and post-meal food weights.[87] Past interventions aimed at altering dietary intake at CCCs and schools utilized PW methods to successfully detect changes in dietary intake in these settings.[92, 94-97] For example, in Ramsay et al.'s study [94], researchers were able to determine significant differences in child dietary intake when children were offered a standard portion or self-selected portion of chicken nuggets.[94] In another study quantifying the effects of a school-based intervention, aimed at increasing child fruit and vegetable consumption, researchers employed plate waste methods to determine fruit and vegetable consumption at school lunch. In a sample of 298 children, Hoffman and colleagues were able to detect a significant 0.28 difference in servings of fruit and vegetable consumed by children in the intervention group.[97] Studies assessing the effects of policy changes on dietary intake in a specified environment can utilize PW methods to determine the effect of the intervention on a given meal. Weighed PW methods can be labor intensive, so observed PW methods have been tested against weighed PW methods. Observed PW employs similar steps for determining dietary intake but rely on a researcher visually estimating the proportion of food remaining on the plate, 100%, 75%, 50%, 25% or 0%. The two PW methods, observed and weighed, have a high degree of correlation 0.90 ($p<0.001$) and agreement but observed PW methods can be time-saving for researchers.[98-100]

PA is a measure of the energy expenditure side of the energy balance equation. In classroom interventions, methods for determining PA level include the use of pedometers, accelerometers, reported PA levels and direct observations. Limited resources may prevent the use of pedometers, accelerometers and direct observations. Methods relying on reported PA level also rely on a proxy reporter of PA level for young children, and when attempting to quantify PA level while present in a specific setting a proxy may not always be available to accurately report PA.[101] The EPAO instrument allows for quantifying PA opportunities at the classroom level and can provide some information on energy expenditure in the CCC environment.[85]

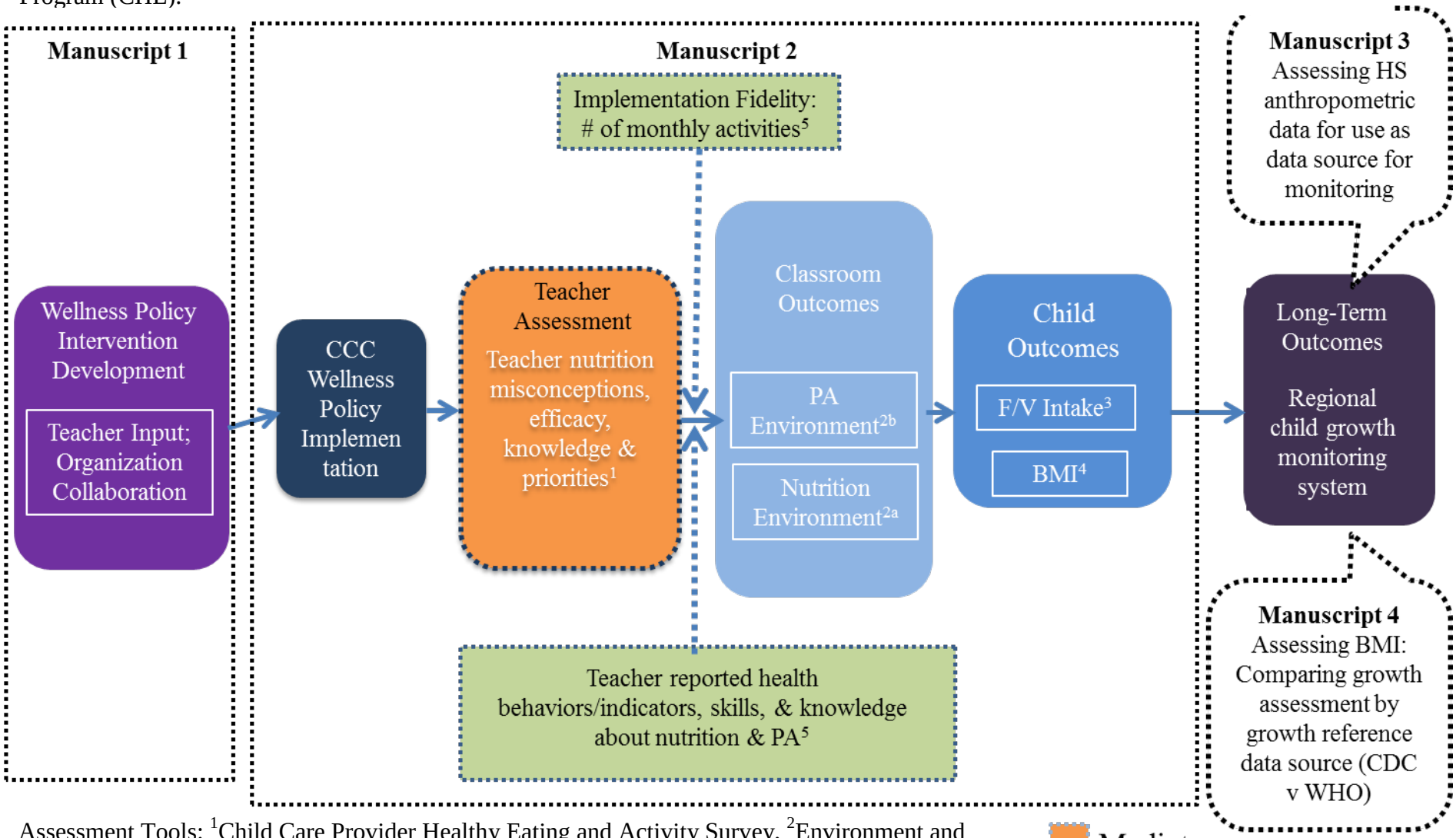
Anthropometric measurements are necessary to determine the effect of a policy intervention on obesity and, by measuring height and weight, BMI can be calculated. BMI along with information on child sex and age allows for determination of weight status, healthy weight (BMI for age and sex $\geq 5^{th}$ percentile and $<85^{th}$ percentile), underweight (BMI for age and sex $<5^{th}$ percentile), overweight, (BMI for age and sex $\geq 85^{th}$ percentile and $<95^{th}$ percentile) or obese (BMI for age and sex $\geq 95^{th}$ percentile).[1] Both CDC and WHO anthropometric reference data are available to assess weight status in children. However, utilizing CDC growth charts facilitates the comparison of intervention effects with effects of past interventions that used those reference data.[32-34]

The purpose of this dissertation is to determine effects of CCC wellness policy, designed from HS teacher input, that promotes intake of fruits and vegetables, HS staff role modeling, and nutrition education, on the CCC obesogenic environment, child intake of fruit and vegetables and BMI in Hawai‘i. Methods include qualitative and quantitative research resulting in three manuscripts. Manuscript one describes the relative validity of HS teachers’ anthropometric measurements against researcher measurements following standardized procedures, and for their

potential to contribute to a young childhood obesity surveillance system in the Pacific. Manuscript two describes HS teachers' recommendations for CCC policy changes that support nutrition and physical activity promotion in HS classrooms to inform the CCC policy intervention. Manuscript three examines the effect of the HS teacher informed policy intervention on the HS classroom environment and child outcomes (BMI and fruit and vegetable intake), including an assessment of the mediating relationship between quality of policy implementation and HS teachers' nutrition-related beliefs and knowledge on the intervention effects. Manuscript four quantifies the differences in BMI z-scores calculated from WHO and CDC anthropometric reference data adjusting for breastfeeding history and birth weight history.

Conceptual Framework

Figure 2.1 Conceptual Framework for Head Start Wellness Policy Intervention in Hawaii: A project of the Children's Healthy Living Program (CHL).



Assessment Tools: [1]Child Care Provider Healthy Eating and Activity Survey, [2]Environment and Policy Assessment and Observation Tool [a.]Nutrition and [b.]Physical Activity, [3]Observed Plate Waste, [4]CDC 2000 Growth Charts, [5]Monthly Implementation Survey

Mediator

Moderator

The conceptual framework (Figure 2.1) depicts the relationship of CCC Wellness Policy implementation (independent variable) on child fruit and vegetable intake and childhood obesity (dependent variables) (manuscript 2). The framework also displays the relatedness of the four manuscripts; intervention development (manuscript 1), policy implementation and testing (manuscript 2), assessing the validity of HS measurements for the potential contribution to a long-term growth monitoring of childhood obesity (manuscript 3), and examination of the differences between childhood obesity prevalence rates and estimates using CDC and WHO anthropometric reference data for calculating BMI z-scores (manuscript 4).

The framework incorporates findings from the literature in an social-ecological approach, building on the theory that risks for childhood obesity are affected by upstream drivers such institutional policies which can affect food availability and the socio-cultural norms that contribute to an obesogenic environment.[42] The intervention targets interpersonal and individual levels, as well as institutional policy, i.e., HS policy, to create environmental changes that prevent childhood obesity.[102, 103] Aspects of the CBPR approach are incorporated into the framework, with teacher input and organizational collaboration during intervention planning (manuscript 2). Lastly, the framework depicts a BMI Monitoring system to evaluate long-term intervention outcomes. Manuscript three identifies a potential BMI monitoring system and Manuscript four provides evidence for determining the appropriate growth reference data set when interpreting anthropometric measurements in Native Hawaiian and Pacific Islander children.

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Table 2.1 Literature review: summary of effective early childhood education policy intervention outcomes measured and intervention activities.						
	Outcomes Measured			**Intervention Activities**		
Study	**Child**	**Class**		**CBPR**	**EW**	**T/TA**
		Ob	**SR**			
ENHANCE (62)		x		x	x	x
Gosliner (70)		x			x	
NAP SACC (63-65)			x			x
DECAL (69)		x				x
Romp N Chomp (68)	x		x	x		
Alkon (66)	x	x			x	x
Ob= Observed, SR= Self-Report, CBPR=Community Based Participatory Research, EW= Employee Wellness, T/TA= Training and Technical Assistance						

CHAPTER 3: Engaging Head Start Teachers on Wellness Policy Implementation to Improve the Nutrition and Physical Activity Environment in Head Start Classrooms: A Qualitative Study of the Children's Healthy Living Program (CHL) in Hawai‘i.

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Abstract

The objective of this study was to engage Head Start (HS) teachers to inform a preschool wellness policy intervention for childhood obesity prevention. Two focus groups on preschool wellness policy were conducted with HS teachers from two communities in Hawaii. Focus groups were facilitated by one researcher and took place in May 2014. Sixteen teachers participated in one of two focus groups (n=6 and n=10) and were asked to give recommendations for classroom and program policies to support childhood obesity prevention in their classrooms. Audio recordings were transcribed verbatim. Three researchers identified themes following an inductive method. Findings suggest that teachers: 1) valued being a positive influence on the development of children; 2) saw that policy supported a safe classroom environment and encouraged consistent role modeling; and 3) saw gaps in resources as a barrier to promoting health. Therefore, policies are needed that facilitate teachers being role models of health and teachers' efficacy in addressing nutrition with parents through training and technical assistance. The necessity of a Registered Dietitian Nutritionist was identified to support these efforts. Findings informed policy changes for an intervention study.

Introduction

Increases in the prevalence of obesity and associated diseases in the past decade have increased the need for innovative and multi-level interventions to prevent obesity at an early age.[1, 2] The early childhood years, between three to five years of age, are a sensitive time when a child's eating preferences and risk for future obesity can be shaped. Childcare centers (CCC), where approximately 60% of US children in this age group spend 22.5 hours or more per week, are suggested to be a good venue for childhood obesity prevention efforts.[3]

Head Start (HS) is a US federally funded preschool program that serves low-income children ages three to five years. HS preschools participate in the Child and Adult Care Food Program (CACFP).[4] In compliance with HS Performance Standards and CACFP regulations, children at these centers are provided meals and snacks that provide from one-half to two-thirds of their daily nutritional needs. CACFP regulations also require centers to follow additional polices related to nutrition requirements for foods and beverages served, the mealtime environment, and staff behaviors at meal times.[5] While HS policies address many nutritional issues that support obesity prevention, there is an opportunity for strengthening these policies to support childhood obesity as well as improve compliance. One example is in strengthening the statement or requirements for programs to "serve foods high in nutrients and low in fat, sugar and salt."[5] A stronger policy would outline minimum standards for each of the nutrient requirements (i.e.: foods with 20% or less of the daily allowance for sodium). Other opportunities to improve policy implementation could be the introduction of new policies on education, training and technical assistance related to nutrition for HS teachers to promote obesity prevention. HS participation has been associated with healthy changes to child BMI.[6]

An obesogenic environment is one that creates an energy imbalance that can contribute to obesity through policy, food availability, access to physical activity (PA), social and cultural norms, and knowledge about nutrition and PA.[7] Policies in CCCs that support nutrition and physical activity have been found to vary greatly between states and by funding agencies. Generally policy interventions have shown positive effects on childhood obesity through improving the nutrition and PA environment at participating centers.[2, 8-11] However, a lack of resources, child dislike for healthy foods, insufficient training and technical assistance for center staff, and staff beliefs are previously cited barriers to implementing these types of policies.[12-16] In particular, HS teachers' and CCC providers' beliefs and attitudes have been found to create barriers to obesity prevention efforts and influence obesity prevention practices in centers.[13, 15] For example, children were less active in classrooms where the preschool teacher reported low self-efficacy for PA and a dislike for the outdoors.[12] In another study, providers' feeding knowledge, efficacy and misconceptions about child feeding were related to promotion of classroom nutrition and mealtime practices.[15] Thus, CCC providers and HS teachers have been recognized as potential facilitators for policy and environmental changes focused on childhood obesity prevention, though they may need additional support.

A collaborative approach may help to bridge the gap between CCC policy and classroom practice to improve effectiveness of interventions. Positive, dose-dependent results on child outcomes such as television viewing and fruit and vegetable consumption have resulted from past parent-researcher intervention collaborations.[17] Child care provider participation in intervention planning has been tested in a policy intervention, Nutrition and Physical Activity Self-Assessment for Child-Care (NAP SACC), with some success.[18] Teacher engagement in the research process through teacher-researcher collaboration has improved teacher efficacy and

facilitated teacher empowerment to promote healthy eating behaviors.[19, 20] Interventions following a community-based participatory research (CBPR) model, including teacher-researcher collaboration, may also empower teachers and, thus, improve compliance with policy interventions, but more evidence is needed. Thus, the purpose of this qualitative study was to engage HS teachers through focus groups on wellness policy implementation to improve the nutrition and physical activity environment in HS classrooms to prevent childhood obesity. These data were gathered to inform the development of a HS-based wellness policy intervention for childhood obesity prevention in Hawaii.

Methods

Participants and Recruitment

HS teachers from two communities that were selected for the Children's Healthy Living in Remote Underserved Minority populations of the Pacific (CHL) randomized controlled trial were the target population for this qualitative study.[21] Approximately 60 HS teachers from 29 classrooms in these two communities in Hawaiʻi were invited to participate in a focus group held at a school within their respective geographic cluster. Teachers were invited to one of the two focus groups in various ways including via email from the researcher (ME) and/or area manager, announcements at their monthly meetings, by telephone contact from the researcher (ME), and/or in-person from the researcher (ME).

HS teachers provided informed consent prior to the focus groups (Appendix B). Snacks and a $10 gift card were provided to participants. The project was approved by the University of Hawaiʻi Institute Review Board Human Studies Program.

Procedures

Focus groups were scheduled at a time and location convenient to participating teachers between April and May 2013. Focus groups were held in HS preschool classrooms and were moderated by one researcher (ME) with only HS teachers present. HS teachers were encouraged to share their thoughts and opinions freely. HS managers and other superiors were not present at the focus group. Audio recordings were taken of each focus group. Each session was between 60 to 90 minutes long. Questions were aimed at identifying teachers' strategies for policy change to improve nutrition, physical activity and health promotion within HS, as well as their perceived role in promoting nutrition and physical activity in the classroom and among HS children (See Table 3.1).

Data Analysis

Audio recordings were transcribed verbatim by one researcher (ME). Focus group transcripts were given to three independent researchers (*MKF, TA, RN*) with varying experience in focus group analysis (none to expert). Researchers were asked to review both focus group transcripts and identify themes present in both, following an inductive method where preconceived codes were not provided.[22] Some criteria for identifying themes were provided to researchers, including the frequency of statements or comments, specificity of responses, emotion noted from respondents, and extensiveness or the number of times different participants made a similar comment.[22] Researcher's themes were synthesized by one researcher (ME) and transcripts were then coded for each theme to identify specific quotations and underlying ideas within each theme.

Results

Of the 60 teachers invited, 16 HS teachers in Hawai'i participated in two focus groups between April and May 2013, six of 30 teachers in one community's focus group and ten of 30

teachers in the other community's focus group. Three main themes emerged from the focus groups: 1) HS teachers value being a positive influence and enjoy witnessing growth and development of children; 2) teachers see policies as guidelines that can support a safe classroom environment and encourage the role modeling of consistent messages to children and families in the program; and 3) teachers identified gaps in resources and professional support as barriers to strengthening the program's impact on eating and physical activity habits of children and their families.

Theme 1: Teachers value being a positive influence and enjoy witnessing growth and development of children.

Fifteen of the 16 teachers stated that being a positive influence on the growth and development of children was their favorite thing about being a preschool teacher. For example, one teacher shared her value for the impact she had on children's lives.

> *I just like to be an impact in the children and family's lives, no matter what background they are at. We are probably the first or second person in that child's life to teach them and to know that we have such a major impact and we can be positive*.

Most (13 of 16)teachers also enjoyed witnessing how children grew confident and independent in various activities, including trying new foods, over the course of a program year. Teachers also mentioned that parents recognize their child's development at home. This sentiment is expressed in the statement below from one of the teachers.

> *When they first start, they just look at it [food] they never ate it at home before. At the end of the year they are eating it, they want it and they ask their parents, they see it in the store they point at it.*

Roughly two-thirds (n=16) of teachers also identified themselves as role models for promoting the growth and development of children. Most teachers voiced pride in their ability to role model healthy eating at meal times by eating and drinking the same foods served to the children as well as by drinking water throughout the day. Teachers also recognized the value in their participation in physical activity as a way to role model different movements and encourage child participation. One teacher acknowledged the value of participating on their own mental and physical health status.

> *I think just modeling, being an active person yourself… My favorite thing is to blow off steam and run around and the kids are more excited to do that if we do.*

Theme 2: Teachers saw policies as guidelines that could support a safe classroom environment and encourage role modeling of consistent messages to children and families in the program.

Teachers shared that particularly helpful policies were ones that supported a safe classroom environment. These policies encouraged sanitation through hand washing and safety, and prevented injury by restricting running on hard surfaces. Teachers considered these policies as highly beneficial and necessary for ensuring the wellbeing of children while in the classroom.

In addition, teachers identified that policies encourage consistency in messages delivered to parents in the classroom and throughout the program. For example one teacher stated,

> *[Policy] helps us as an educator and role model to look at that and say ok this is the policy and this is something that I need to follow.*

Teachers also recognize that policies promoting health are beneficial in helping to address their own health and wellness as exemplified by one teacher below:

Something that will help others, because it is meant to help us help them and help ourselves too because we all should be healthy we should be eating what they are eating.

Policies mentioned included restricting outside foods and beverages, types of foods served in the classroom, and meal service style. One specific policy that many teachers appreciated was the restriction of outside foods in their classrooms. Teachers shared that despite their personal feelings about restricting outside foods in the classroom, they all had to follow the same policy. Teachers perceived this policy as support for addressing the issue when parents request bringing food to celebrate birthdays or holidays. One teacher stated that having this policy empowered the teachers to restrict the parent from bringing less healthy food items into the classroom.

They spend so much money on those things but I hand them a piece of paper (with the policy) and say it's not my fault.

With regard to policies on foods and beverages served in the classroom, most teachers recognized that HS policies encourage the expansion of children's food preferences that may positively impact their willingness to try different foods. The teachers recognized that children in their classrooms come from low-income families with sometimes limited access to various foods such as fruits and different grain products. Thus, the HS policy facilitated children having the experience of trying these foods. Two statements from two different teachers demonstrate this recognition.

Teacher 1: There is a lot of influences out there but just us alone having the capability to purchase these items and prepare them and introduce them on a daily basis hopefully we start something.

Teacher 2: They didn't realize that all these components have a name so now the children are trying different types of fruit, vegetables are still kind of iffy but they are at least trying. What is the most important thing is that they are giving an opportunity to experience and try.

Focus group participants also acknowledged the benefits of serving foods that are consistent with foods provided by the Supplemental Food and Nutrition Program for Women Infants and Children (WIC), which some HS families receive. For teachers, this was seen as an opportunity to show parents that their children will eat the lower-sugar WIC cereals and to demonstrate different ways of serving the cereals as stated below by one teacher.

What is amazing too is that most of the families we service they are on WIC so that being said the cereal we serve they should be eating it and yet a lot of them don't want to eat that cereal… You know it's like you know they are getting WIC so they should have been used to this cereal and then we keep serving it all the time then they say it tastes good.

Teachers whose classrooms participated in family-style meal service observed that this practice supported the policy and idea that children should be encouraged to try but not forced to eat foods, as well as, reinforced the message that children should decide the quantity of food they consume. In classrooms where children did not participate in family-style meal service, but food is provided pre-portioned, teachers reported that the pre-portioned meals could help parents to understand age-appropriate food portions and help children to develop the skills for eating independently, which is needed as they progress to elementary school. One teacher shared,

The fruit, the serving size that they have is right, this is the serving, the parents don't understand, how come it is so little. I think we have to go backwards and teach them what the portions are so you will have a healthy child.

Theme 3: Teachers identified gaps in resources and professional support as barriers to strengthening the program's impact on eating and physical activity habits of children and their families.

Most teachers mentioned a lack of resources and professional support as barriers to increasing their impact on healthy eating and physical activity habits of children and their families. Teachers from both focus groups identified that their programs encouraged the use of a nutrition and/or physical activity curriculum for promoting health and gross motor movement development. However, many stated that implementing these activities required more support to obtain program funds for purchasing supplies. Most teachers shared that they occasionally use their personal funds to purchase classroom materials for nutrition activities or food demonstrations when purchase orders were not processed efficiently, which limited the frequency of such activities. One teacher shared a common situation that is encountered:

> *We can get a PO but it takes a long time, I just end up buying out of my pocket. If you get a PO you have to go to your supervisor and get it approved and then she goes to buy it and by then it's so late. They don't like us to do this but it happens a lot.*

A lack of professional support in the form of a Registered Dietitian Nutritionist (RDN) was also reported as a barrier in communicating BMI with parents. Funding cuts replaced the once-fulltime RDN with a contracted RDN with limited availability. In one focus group, all teachers shared frustration with having to address childhood overweight and obesity concerns with parents of children with an elevated Body Mass Index (BMI) in the previous program year. Some of teachers' commented specifically on their discomfort and lack of training in addressing BMI with parents:

Teacher 1: This is the first year that we had to chart it [BMI] and share it with the parent, but there was no training for us.

Teacher 2: We need to, actually, identify whose role it is. We don't have a nutritionist now at HS at all and it's a problem.

Teacher 3: That is the part that makes me feel uncomfortable, it's not my field. I am overweight myself and I have to go to the doctor and he tells me what to do, and it doesn't happen tomorrow. It happens next week, when I accept the information.

Teacher 4: How do we be a positive influence for the parent but not tell them what to do, but approach them in a positive way. Try to communicate with them, we can force it on the children as much as we want but parents are doing it. Maybe training on how we could support the parents more.

In addition, teachers expressed that with the loss of the fulltime RDN position, the new responsibility lessened the time they could dedicate to planning other classroom activities to promote nutrition, with one teacher stating,

As times go and as guidelines come down, you know, our plate now is overflowing. And how do we implement this part of our so-called policy stuff to make it worthwhile for our families and not make us get stressed?

Teachers also identified other ways that an RDN could support the program, including educating parents on healthy eating with trainings and newsletters and providing teachers with support in planning and delivering classroom nutrition activities.

Discussion

This study engaged HS teachers in Hawai‘i through focus groups for recommendations for future policy implementation to promote nutrition, PA and prevent childhood obesity. As past

literature suggests a collaborative approach to intervention planning can yield improved outcomes[17-20], the involvement of HS teachers in intervention planning was done for two main reasons 1) to increase teacher buy-in during intervention and 2) to draw upon the specialized experience and expertise that HS teachers hold with regards to classroom policy and practice.

Data from these focus groups demonstrated that teachers place high value on how they can role model healthy eating and PA habits to children and families. These are characteristics that can be considered and built upon when planning a CCC-based childhood obesity intervention. Previous qualitative studies have shown similar results, where HS teachers feel empowered to mold the eating habits of children and be responsible for promoting healthy eating for young children.[20, 23] The findings from these focus groups underscore the motivation and the joy that teachers feel for facilitating the development of healthy eating habits, as well as their recognition of the benefits of policies in supporting their role in this process. Further, teacher role modeling has demonstrated an effect on child dietary intake.[24] Together the themes from this study support the inclusion of preschool teachers in policy- level intervention planning, as an opportunity for empowerment, ownership and possibly facilitating greater compliance with policy changes.

HS teachers voiced the need for support from a nutrition professional, such as an RDN, for addressing healthy eating, weight and nutrition. This is in-line with the Academy of Nutrition and Dietetics' position on the role of RDNs in health promotion, where RDNs are recognized as leaders in providing preventive health services in community nutrition.[25] In another qualitative study on the barriers and supports to implementing changes in nutrition practices, child care directors found that training and technical assistance from an RDN was invaluable in improving these practies in their centers.[26] In other areas of CCC policy and practices, research on health

and safety in centers has found that CCCs with access to health consultations, up to 20 visits per center per year, had improved healthy and safety policies and practices.[27] While the HS agencies do have access to an RDN for consultation, teachers voiced that this was not sufficient. Together the previous and the current findings support the benefit and necessity of professionals to support implementing new policies and practices in CCCs.

Findings also indicate that the HS teachers feel uncomfortable communicating BMI and nutrition-related information to parents of overweight and obese children. These results are in line with previous literature[23] that has suggested the implementation of employee worksite wellness initatives to address barriers related to staff perceptions about obesity and to improve their ability to serve as role models of healthy behaviors. In addition, one study found that an employee wellness initiative targeted at improving the eating and PA habits of HS teachers increased the teachers' comfort with addressing similar topics with parents of HS children.[28]

Limitations from the current study include a low recruitment rate, limited generalizability to HS classrooms, and unlikely saturation of themes. Only 16 of 60 (6 of 30 in one community and 10 of 30 in the other) invited HS teachers participated in the focus groups, and it is possible that these teachers were particularly motivated or held strong beliefs regarding policy, nutrition, and/or obesity prevention. Both focus groups were held towards the end of the program year, when competing deadlines may have taken precedence over participation. Secondly, generalization of these findings could be limited to only HS classrooms in the participating HS agencies. HS teachers from other agencies or regions as well as child care providers working for other centers may have different beliefs and barriers. The implications of these findings may, however, support the inclusion of HS teachers in future policy planning for optimized

implementation. Lastly, with only two focus groups, it is unlikely that saturation of themes was met. Continued input should be sought for further development and assessment of policy needs.

Implications for Research and Practice

Implications from these focus group findings are listed below as they relate to future intervention development and policy changes. The findings from this qualitative study will help to form a HS policy intervention study. They also support taking a collaborative approach with HS teachers to identify policies for childhood obesity prevention. Findings suggest that a successful intervention would incorporate nutrition and PA promotion, employee wellness, enhanced teacher knowledge about and control of foods and beverages served, assistance from an RDN, and community partnerships to develop an intervention. Table 3.2 outlines the potential policy intervention areas as they relate to the three focus group themes that emerged and are discussed below.

Integration of Nutrition and Physical Activity Promotion at Monthly Meeting

At HS monthly meetings, materials for a classroom nutrition and/or PA activity, a family newsletter for HS children parents, and employee wellness activity could be provided. Integration of these messages may support role modeling of healthy behaviors and streamline the process of teachers gaining access to materials necessary for activities. This time can also be used to provide trainings on child nutrition and health for teachers and staff. These activities will support themes one, two and three identified through promoting teachers' positive influence on child development, encouraging consistent role modeling, and providing support and resources for nutrition promotion.

Employee Wellness Activities

Monthly employee wellness initiatives in-line with nutrition and PA classroom and parent activities at each of HS's monthly meetings could be implemented. For example, when a classroom activity encourages children to build a healthy salad, the employee wellness initiative could include a salad bar tasting at the monthly meeting to demonstrate how healthy foods can be incorporated into meetings and other group activities. By mirroring employee wellness and classroom activities, the teachers' position as role models may also be supported.

Foods and Beverages Served

Since teachers are already in support of the policies, determining foods served at meals and snacks and implementing nutrition standards beyond what is required by federal CACFP guidelines can improve the dietary quality of foods and beverages served. Limiting the frequency of 100% fruit juice and high-fat menu items, such as fried noodles and potatoes, are two such standards recommended by Institue of Medicine for childhood obesity prevention policies in child care centers, that could be incorporated.[30] This intervention component is supported by theme two, as it promotes consistent role modeling between classrooms in the types of food served to children.

Community Partnerships

Partnerships with community organizations can be sought to support wellness promotion activities for HS teachers and ensure sustainability of activities. Key community partners can be approached to adopt one of the employee wellness monthly activities. Some examples are for local farmers to provide vegetables for employee taste testing, for local health centers to provide information about PA, and for local meal vendors to incorporate nutrition training and education for staff and parents. Identifying and engaging key community partners can address some of the resource limitations that HS faces while engaging more people in supporting the health of the

community's children. Community partnerships can address HS teachers' need for support and resources for promoting nutrition in HS classrooms as identified in theme three.

Potential Policy Changes

Findings suggest that policies can empower teachers to be role models of healthy lifestyle habits. Policies that incorporate employee wellness initatives can help teachers to communicate health information with HS parents and increase their capacity as role models. Additional policies could establish a formal wellness committee for overseeing classroom, staff and family wellness activities at the cluster and agency levels. The wellness committee could also look to the community to identify resources, organizations and obtain the support of a RDN. Lastly, the committee could continue to seek input and expertise from HS teachers to build upon their motivation and value of their role in developing children, for obesity prevention policy.

CONFLICT OF INTEREST

There are no conflicts of interest pertaining to this research study.

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Table 3.1 Focus group questions/guide for Head Start (HS) teachers on preschool wellness policy to improve the nutrition and physical activity environment in HS classrooms in Hawai‘i.

1. What is your favorite thing about being a preschool teacher?
2. As a preschool teacher, describe how you help keiki (children) to develop healthy eating and physical activity habits?
3. What is a “policy” to you?
4. What are helpful policies that you can think of?
5. If you were going to make one policy change to your classroom that would help promote nutrition, healthy eating or physical activity what would it be?
    a. What would stop you from making this change?
    b. What steps do you envision would be necessary to make these changes?
6. Proposed wellness policies include changing the types of foods served, how food is served, parent trainings and teacher trainings on healthy eating, proper child feeding and overall personal wellness.
    a. How hard or easy do you think these changes would be?
    b. What could make them easier?
    c. What specific suggestions do you have for these?

Table 3.2 Potential Policy Intervention Areas as Related to the Three Focus Group Themes Identified from Engaging Head Start (HS) Teachers on Wellness Policy Implementation to Improve the Nutrition and Physical Activity (PA) Environment in HS Classrooms in Hawai‘i.

Policy Intervention Area	Intervention Activities	Relation to Focus Group Theme
Integration of Nutrition Promotion	Incorporate nutrition and PA promotion at regular monthly HS meetings Examples: 1) Provide nutrition & PA related materials for classroom activities, family newsletters, & employee wellness activities 2) Provide HS staff and teachers with trainings on nutrition & health topics	Theme 1: Supports teachers' ability to be positive influence on child Theme 2: Support teacher role modeling Theme 3: Provide classroom resources
Employee Wellness	Deliver employee wellness activities that coincide with HS classroom nutrition & PA activities at monthly meetings	Theme 1: Supports teachers' ability to be positive influence on child Theme 2: Support teacher role modeling
Foods and Beverages Served	Create nutrition standards above CACFP to improve the dietary quality of foods and beverages served Examples: 1) Limit the frequency of offering 100% fruit juice to increase availability of fruit 2) Limit high energy, low nutrient menu items, such as fried noodles and potatoes	Theme 1: Supports program's positive influence on child by offering fruit and other nutreint dense foods. Theme 2: Support teacher role modeling as teachers consume the same foods and beverages as children.
Community Partnerships	Actively pursue partnerships to ensure sustainability of monthly activities Examples: 1) Local farmers for vegetables for employee taste testing 2) Local health centers/professionals to provide information about PA 3) Meal vendors provide nutrition training and education	Theme 3: Addressing gaps in resources to nutrition and health promotion

CHAPTER 4: Head Start Wellness Policy Intervention in Hawai‘i: A project of the Children’s Healthy Living Program (CHL)

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Abstract

The increased prevalence of childhood overweight and obesity across both the United States (US) and the Pacific has become a serious public health concern, with especially high rates among Native Hawaiian and Pacific Islander (NHPI) children. This study aimed to measure the effect of a Head Start (HS) policy intervention for childhood obesity prevention.

Twenty-three HS classrooms located in Hawai‘i participated in the trial of a 7- month policy intervention with HS teachers. Classroom and child-level outcome assessments were conducted which included: the Environment and Policy Assessment and Observations (EPAO) of the classroom environment; plate waste observations to assess child intake of fruit and vegetables; and child growth. The moderating effect of implementation fidelity and teachers' own health behaviors and indicators and the mediating effects of teachers' misconceptions, priorities, knowledge, and efficacy around child nutrition assessed by the Child Care Provider Healthy Eating and Activity (CCPHEA) survey were also examined.

The intervention showed a positive and significant effect on classroom EPAO-physical activity and EPAO-total scores, with the relationship being mediated by teachers' CCPHEA-priority scores and moderated by teacher reported improvement in their health behaviors and indicators.

These findings contribute evidence on the potential for HS wellness policy to reduce childhood obesity and modify child intake of fruit in HS classrooms. They also support the significant effect that HS teacher priorities regarding child nutrition play in the effectiveness of policy interventions on classroom environments and child outcomes.

Introduction

The increased prevalence of childhood overweight and obesity (OWOB) across both the United States (US) and the Pacific has become a serious public health concern[1-3]. Childhood OWOB, defined as having a body mass index (BMI) for age above the 85th percentile, contributes to an increased risk for cardiovascular disease, diabetes, cancer, and for adult OWOB[4-8]. Especially high rates of childhood obesity have been observed among Native Hawaiian and Pacific Islander (NHPI) children, with the highest concentration of NHPIs in the US residing in Hawai‘i [9, 10] and up to 39% overweight and obesity prevalence in Hawai‘i among children entering kindergarten [11-13].

An obesogenic environment refers to the social and built environments that through policies, food availability, access to physical activity (PA), social and cultural norms, and nutrition knowledge support people eating more calories than they expend, leading to obesity [14]. The dynamic interactions between personal and built environmental factors contribute to risk for developing obesity which, alongside the high prevalence of obesity has created a need for innovative and multi-level interventions.

The early childhood years present a sensitive time when a child’s lifelong eating habits and risk for future obesity are developed; so interventions targeting this age group are needed [15,16]. Childhood obesity prevention can be focused on childcare centers (CCC) where nearly half of all children in the US under five years of age spend up to 22.5 hours per week [17]. Children at these centers consume up to two-thirds of their daily nutritional needs through meals and snacks provided by the federal Child and Adult Care Food Program (CACFP) [18]. Many states in the US have made progress towards implementing CCC licensing requirements that

address the role of CCCs in preventing childhood obesity, but such requirements are not currently in place in Hawai‘i[19]. Recommendations for policy changes at CCCs for obesity prevention have also been created by the Institute of Medicine (IOM) [20].

Head Start (HS) is a federally funded preschool program serving low-income children three to five years of age across the US including its affiliated jurisdictions [21]. HS participation has been associated with healthy changes in child BMI and obesity[22]. HS teachers have an influential role in assuring compliance with nutrition policies, thus serving as a potential leverage point for obesity prevention efforts through CCC policy change[23].

Some multi-level and policy approaches for obesity prevention in CCCs have had a positive impact on the CCC environment, but more research is needed to demonstrate the effects of these environment changes on individual child outcomes (i.e. BMI, dietary intake). To date, CCC policy interventions have not been tested in NHPI populations. The proposed research project will fill these gaps by testing the effect of a wellness policy intervention on the CCC environment and on child outcomes in a predominantly NHPI population.

Child Care Center Environments and Obesity Prevention Policy

CCC policies supporting fruit and vegetable availability and encouraging PA are recommended for obesity prevention by the IOM [20] as well as the Academy of Nutrition and Dietetics [20, 24]. A call for research efforts on the role of CCCs in obesity prevention resulted in intervention studies that have demonstrated the effect that policies can have on changing the nutrition and PA environment in CCCs [25-29]. While evidence supports the positive influence that these policies can have on the obesogenic CCC environment, other cross-sectional studies have found a wide variation in obesity prevention policies across the US mainland[19].

Recommendations for early childhood obesity prevention policies have been outlined by the IOM [20]. These policies encourage monitoring of young child growth, facilitating and creating opportunities for PA, supporting intake of healthy foods, limiting marketing of unhealthy foods to children, limiting screen time and promoting adequate sleep [20].

Effective CCC Policy Intervention Programs

Five policy intervention programs have demonstrated a positive effect on at least one nutrition or environmental factor in CCCs- Tooty Fruity Vegie, Nutrition and Physical Activity Self-Assessment in Child Care (NAP SACC), Encouraging Healthy Activity and Eating in Childcare Environments (ENHANCE), Romp N Chomp and Georgia's Department of Early Care and Learning (DECAL) intervention [25-29, 31-35]. While effective at altering the CCC environment, only two of seven studies include child outcome assessments (dietary intake or growth) and three relied on self-reported data for environmental assessments[35]. Two interventions did assess child outcomes[30, 32] and one was able to demonstrate a significant, positive effect of a policy intervention over seven months on child BMI z-score (zBMI) in a sample of 209 children[32].

CCC Policy Intervention Strategies

Intervention strategies to successfully implement new wellness policies included: training and technical assistance (T/TA) for new policy implementation [27, 31, 32], T/TA with employee wellness (EW) activities [33], collaborative approaches to policy intervention planning with T/TA and EW activities [25] and community-based participatory research methods (CBPR) for intervention planning [35]. Past research findings also support the inclusion of CCC staff in intervention activities to strengthen the effect of interventions on the CCC environment, e.g.,

Lanigan's ENHANCE intervention program found positive correlations between center staff's efficacy, misconceptions, and feeding knowledge and observed CCC meal time feeding practices, nutrition education and family communication[25]. An EW intervention program demonstrated a positive effect on teachers' self-efficacy for communicating nutrition information to parents and on frequency of fruits and vegetables served at centers; however neither program tested the effects of these environmental outcomes on child outcomes. Both studies did demonstrate a mediating role of CCC staff on policy implementation at the classroom environment level. Further, past cross-sectional studies supported this effect and identified an influence of teachers' feeding styles on child food consumption [36], disparities between CCC policies and classroom practices [20] and that beliefs held by HS program teachers, especially a lack of priority placed on childhood obesity, were barriers to obesity prevention efforts [23].

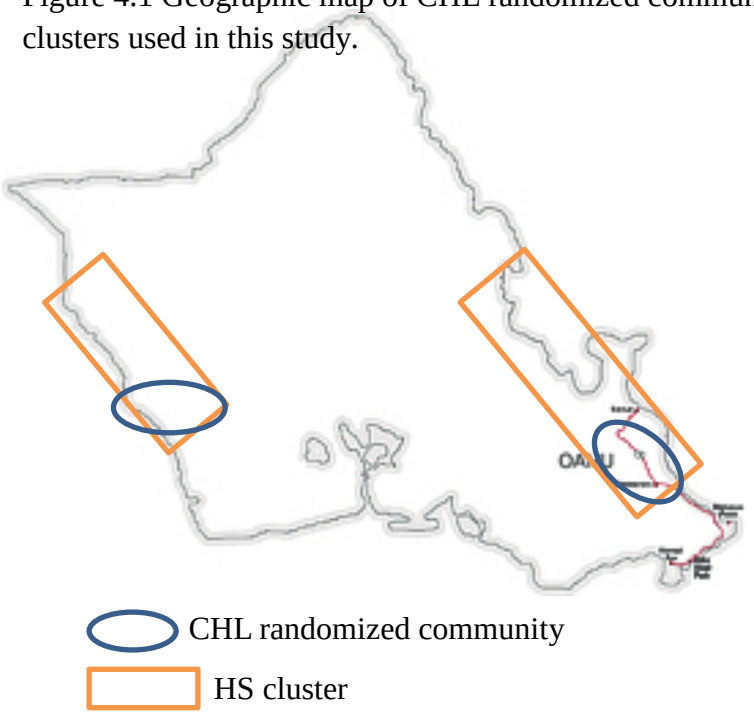
The primary objective of this study was to build evidence on the effectiveness of CCC wellness policies that promote intake of fruits and vegetables, HS staff role modeling, and nutrition education on the classroom environment, and child intake of fruit and vegetables and BMI in Hawai‘i. We hypothesized that the intervention would result in change at post-intervention in class-level environmental scores as measured by EPAO scores and child-level BMI z-scores (zBMI) or fruit and vegetable intake. We further hypothesized that changes in class-level environmental change or child level zBMI or fruit and vegetable intake would be mediated by changes in teacher scores, as measured by the child care provider healthy eating and activity survey (CCPHEA), or would depend on implementation fidelity or improvements in HS teacher health indicators and behaviors, i.e. teacher self-reported changes in eating and drinking habits, PA level, stress management, weight control, blood pressure, etc.

Methods

Settings and Study Population

This research was embedded within the randomized community trial, the Children's Healthy Living Program for Remove Underserved Minority Populations in the Pacific Region (CHL) [37]. Communities for the research project were chosen from the four randomized CHL communities in Hawai‘i and included one CHL intervention and one CHL delayed intervention community on Oahu intervention and control, respectively, for the present study). Head Start (HS) classrooms located within these two Oahu CHL communities were included in the study. For administrative purposes, HS manages their classrooms by geographic cluster. Additional HS classrooms located within the same geographic school cluster as the selected CHL study communities were also included in the present study, resulting in a total of 23 HS classroom from 18 HS centers (e.g., 5 HS centers had 2 classrooms). Eleven HS classrooms located in one cluster area comprised the intervention group (where CHL was also conducting intervention), and the other 12 HS classrooms in another cluster comprised the control group (delayed-intervention for CHL). All teachers completed informed consent for surveys (Appendix C) at monthly cluster meetings. Children from the 23 HS classrooms were recruited to participate at HS orientation meetings and at their classrooms by the researcher and/or HS teacher. Parents of children at HS completed the child consent form (Appendix D).

Figure 4.1 Geographic map of CHL randomized communities and HS geographic clusters used in this study.



Intervention Description

The intervention was developed based on findings from focus groups conducted with HS teachers at an earlier time point. Specifically, the seven-month intervention aimed to support teachers as role models through: 1) monthly employee wellness activities for teaching staff, 2) providing resources for classroom nutrition and PA activities with monthly lessons from the "Healthy Habits for Life" curriculum; and 3) monthly family newsletters. "Healthy Habits for Life" was previously found to have a positive effect on child BMI when delivered in a CCC setting and the intervention transmitted lessons from this curriculum related to physical activity and its' benefits and the benefits of eating fruits and vegetables[38]. Training and technical assistance were provided to teachers for implementing family-style meal service and communicating child BMI and growth information with parents. Changes to policy resulted in

the intervention HS's eliminating juice from breakfast, lunch, and snacks and implementing family-style meal service. Training was also provided to HS teachers on how to effectively communicate BMI information with parents of overweight and obese children, following the trans-theoretical model for change. Policy implementation started in October, the second month of the HS program year, immediately following baseline data collection.

Assessment

The effect of the wellness policy intervention was tested using both classroom and individual child-level outcomes. HS classroom level outcomes included assessment of the classroom environment with the Environment and Policy Assessment and Observation (EPAO) tool (Appendix F), the Child Care Provider Healthy Eating and Activity Survey (CCPHEA) (Appendix G) and monthly implementation surveys (Appendix H) [25, 38, 39].

Child Level

Child demographic forms solicited sex, age, date of birth and race (Appendix E) and were completed by the parent or guardian at the time of consent or enrollment into the study.

Dietary intake of children was assessed by observed plate waste, as recommended by the IOM's plan for measuring obesity prevention efforts [40, 41]. Children were provided with their typical lunch tray with study identification number on the tray. The researcher collected all labeled lunch trays and recorded the percent of food remaining on the child's plate as 100%, 75%, 50%, and 25% or less or none for fruit and vegetable servings. The dietary assessment method chosen for the study did not measure child fruits and vegetables consumed outside of the HS classroom or consumption of other food items. Since the objective of the research project was to quantify the effect of policy change on the CCC environment and the effect those changes

had on child diet intake, it did not focus on altering child diet intake outside of the classroom which was assumed to be held constant. Child dietary intake in the classroom was the primary outcome of interest.

Child Growth Assessment

Height in centimeters and weight in kilograms of children were measured in intervention and control classrooms at the start and end of the HS program year. Child height was measured by a Portable Adult/Infant Measuring Unit stadiometer (Model PE-AIM-101, Perspective Enterprises, Portage, MI, US) to the nearest 0.1 cm. Child weight was measured using a portable SECA 876 scale (SECA 876, Hamburg, Germany) to the nearest 0.1 kg.

Three measurements of each anthropometric measure were taken and recorded on an anthropometric recording sheet. If no two measures among the three readings were within 0.2 units of one another (0.2 cm for height and 0.2 kg for weight), more readings were taken again until there were at least 2 measures within 0.2 units. The Lohman et al. Anthropometric Standardization Reference manual was used for the form and protocol development [42]. The protocol for reading anthropometry was adapted from the CDC's training module: Accurately Weighing and Measuring Infants, Children and Adolescents as well as The University of California Berkeley's guidelines for collecting heights and weights on children and adolescents in school settings [43].

BMI was calculated using the measured median height and weights, age, and sex. Child BMI variables were calculated based on 2000 CDC Growth Charts, BMI for Age and Sex. Z scores for BMI for age and sex (zBMI) and change in zBMI over the program year were calculated to measure change in BMI status, adjusting for age and sex.

Classroom Level Assessment

The Environment and Policy Assessment and Observation (EPAO) instrument is a validated tool that was used to objectively and quantitatively assess the obesogenic environment of the participating HS classrooms; it includes assessments of both nutrition and physical activity related factors [39]. The EPAO protocol described elsewhere consists of a full-day visit to a childcare center with direct observations and review of documents [39]. The strength of this tool is its objectivity and comprehensiveness. EPAOs were completed by graduate student interns who received one half-day training with the student investigator on completing an EPAO and who were blinded to the treatment group of the classrooms being observed. One or two researchers simultaneously observed each of the control and intervention classrooms for one day at baseline, April-May 2013 and again at the end of the HS program year April-May 2014.

The EPAO is broken down into eight nutrition and eight PA sub-areas, where possible scores range from 0 to 20, with 20 being the most optimal score. The EPAO-nutrition score is the average of the eight nutrition sub-areas (beverages, fruits and vegetables, whole grains and low-fat meats, high sugar and high fat foods, nutrition environment, nutrition policy, nutrition training and education, and staff nutrition behaviors) and EPAO-PA score the average of the eight PA sub-areas (active opportunities, sedentary opportunities, sedentary environment, portable play environment, fixed play environment, staff PA behaviors, PA training and education, and PA policy) with the EPAO-total score being the average of the EPAO-nutrition and EPAO-PA scores.

The Child Care Provider Assessment (CCPHEA) is a validated survey, developed by Lanigan and colleagues consisting of 14 forced-choice items, answered on a 4-point Likert scale

related to child feeding, healthful eating, and obesity prevention, resulting in scores on HS staff's knowledge, beliefs, priorities, and misconceptions around child nutrition [25]. HS staff in intervention and control classrooms completed the survey prior to participation in the wellness policy training in August 2013 and at the end of the HS program year in April-May 2014. One or two teachers from each HS classroom completed the survey and their scores were averaged to create one classroom CCPHEA score. The CCPHEA score was used to measure the effect of policy implementation on HS staff's knowledge, beliefs, priority and misconceptions related specifically to child nutrition and as a mediating variable between policy implementation, environmental change and child outcomes.

Intervention Implementation

Monthly implementation surveys, adapted from Yin et al, were completed in each classroom to assess implementation frequency and variety, the frequency of nutrition activities and number of different activities completed in the past month throughout the intervention[38]. Policy implementation was evaluated for fidelity based on teachers' responses to a monthly survey, which asked the frequency of implementation, and variety was assessed by the number of different activities that took place[44]. The implementation frequency and variety score was then calculated taking the mean frequency and variety response calculated for each classroom. Possible scores for implementation frequency ranged from 0 to 5 for the number of classroom level "Healthy Habits for Life" activities completed per month and 0 to 4 for variety or the number of different classroom "Healthy Habits for Life" activities completed per month. A minimum mean score of 1 was expected for intervention classrooms, with scores greater than one demonstrating implementation above the required frequency and variety.

Teacher Health Indicators and Behaviors

The monthly implementation survey also assessed changes in teacher's own knowledge and skills regarding nutrition and PA, as well as changes to HS teachers' own health indicators and behaviors (i.e.: improved blood pressure control, increased water consumption). Table 4.1 contains a full list of the items asked. The sum of each month's responses (yes=1, no=0) was calculated and the average was used to create the health indicator/behavior score for each classroom.

Data Analysis

Descriptive statistics showed the frequencies of child and classroom demographics and intervention activities. T-tests or chi-square tests were conducted to compare child level baseline demographic characteristics between the intervention and control groups. Since there were significant differences in child's race distribution, race was included in subsequent mixed linear models and multiple regression models as potential confounders. Pre-intervention classroom-level nutrition and physical activity policies, practices and observations (i.e., modified EPAO, BMI, fruit and vegetable consumption, etc.) were compared between the intervention and control classrooms using independent samples t-tests or chi-square tests.

Mixed linear regression models were conducted to assess child-level zBMI change outcomes and fruit and vegetable consumption in order to account for clustering, controlling for child's race and other covariates. Multiple regression models were used to assess center-level outcomes in nutrition and physical activity practices between the intervention and control classrooms, controlling for baseline scores. The paired t-test was used to assess center-level changes.

To test the mediating effect of teacher CCPHEA scores (efficacy, priority, knowledge, misconceptions) on the intervention effect of class-level or child-level outcomes, Baron and Kenny's[43] criteria for the establishment of mediation were followed. A series of linear regression models (or mixed linear regression models for child-level outcomes) were conducted to test whether detected effects of the intervention on class-level or child-level outcomes were mediated by teacher CCPHEA. For mediation to be inferred, the association originally found between the intervention and the outcome variables had to be decreased or eliminated after the mediators were added into the model[45].

To test the moderating effect of intervention fidelity or teacher health indicator and behavior scores on the intervention effect of class-level or child-level outcomes, both intervention fidelity and teacher health indicator and behavior scores were treated as a binary variables: 1=scores at mean or above; 0= scores lower than mean. An interaction term was then created between the intervention variable (coded as 1=treatment group and 0=control group) and the fidelity or health indicator variables. The two variables were multiplied together and added to the regression models. Statistical significance for all tests were set at $p < 0.05$ for 2-tailed tests. All statistical tests were conducted using SAS© version 9.4 (Chapel Hill, North Carolina).

Results

Sample characteristics

The child sample included 355 children from the 23 classes from 18 HS centers. Ages ranged from two to five years of age, with the majority of the sample made up of three and four year olds, 44% and 47% respectively. Fifty four percent of the participating children were boys and 46% were girls. A total of 349 children had information on race: 9% were Asian, 62% were more than one racial group, 23% were Native Hawaiian or Other Pacific Islander (NHPI), and

6% were White. No significant difference was found between the intervention and control group in child's sex and age distribution. However, the two groups differed significantly by child's race (chi-square (df) = 14.04(3), p = 0.003), with the intervention group having a higher percentage of NHPI (27.2%) and a lower percentage of Whites (1.7%) compared to the control group (18.2% for NHPI and 10.2% for White).

Classroom Results

The teacher sample included 46 teachers from 23 HS classrooms, 2 teachers per HS classroom. EPAOs were completed at baseline and follow up for all 23 classrooms, and CCPHEA surveys were completed by one or both HS teachers in each classroom at baseline and follow up. In cases where both teachers completed CCPHEA surveys, the mean of the two teachers was used for analysis. At baseline, no significant difference was observed between intervention HS classes and control HS classes in nutrition and PA environment, as assessed by the EPAO-total score (intervention mean=14.72, SD=1.25; control mean =14.32, SD=0.59), EPAO-nutrition score (intervention mean =14.91, SD=1.47; control mean =14.30, SD=0.96), and EPAO-PA score (intervention mean=14.52, SD=1.46; control mean=14.33, SD=1.33) or teacher CCPHEA scores on misconception, knowledge, or priority related to child nutrition. The only significant difference between the two groups was baseline mean teacher CCPHEA efficacy score, which was significantly higher in the intervention classes (mean=7.0, SD=1.0) than that in the control groups (mean=6.1, SD=0.8).

Monthly implementation score ranged from 0.6 to 2.5 out of a possible 0 to 5, with the minimum meaning that on a monthly basis the average number of intervention activities that took place was 0.6 and the maximum was 2.5 intervention activities. Average monthly implementation scores among the 11 HS classrooms was 1.38 (SD=0.57). Monthly

implementation variety scores ranged from 1.13 to 2.5 out of a possible 0 to 4 with the minimum meaning that the average number of different intervention activities was 1.13 and the maximum meaning that there was an average of 2.5 different intervention activities implemented each month. Average intervention implementation variety score among the 11 intervention centers was 1.64 (SD=0.42).

Teacher health behavior and indicator scores ranged from 3 to 10.8 out of a possible 0 to 11, with the minimum meaning that on average teachers reported improvements to three of the health behaviors and indicators during the intervention and the maximum meaning that on average teachers reported improvements to 10.8 health behaviors and indicators throughout the intervention. There was no significant difference in the mean average monthly teacher health behavior and indicator scores between intervention and control classrooms, 7.67±2.00 and 7.27±2.11, p=0.883.

Controlling for baseline scores, post-intervention EPAO-PA score was two points higher (p=0.002) in the intervention classrooms (mean=16.5, SE=0.45) than in the control classrooms (mean=14.3, SE=0.43). Mean EPAO-PA scores in the intervention group increased 2.0 points, from 14.5 at baseline to 16.5 at follow up (p=0.01); in contrast, there was no change in the control group (p=0.88). Post-intervention EPAO-total scores were 1.03 points higher in the intervention classrooms than the control classrooms (p=0.04), controlling for baseline EPAO-total scores. Mean EPAO-total scores in the intervention group increased by 1.05 points (p=0.03), from 14.72 at baseline to 15.77 at follow up; in contrast, there was no significant change in the control group, e.g., 14.32 at baseline to 14.53 at follow up (p=0.47). No significant difference was observed in EPAO-nutrition scores, or any of the 4 teacher CCPHEA scores between the intervention and control classes (Table 4.2).

Child Results

All child level results controlled for race, as the race distribution was significantly different between the two study groups. Mean zBMI at baseline was significantly higher in the intervention group (mean=0.51, SD=1.14, n=154) than the control group (mean=0.25, SD=1.14, n=166) (t statistic (df) = -2.02(318), p=0.04). Difference in BMI distribution of the four groups at baseline (healthy weight, overweight, obese and underweight) was not significant, with the intervention group having a higher percentage of obese children (15.6%) than the control group (7.2%) (Chi-square=6.899, p=0.07). Mean zBMI increased at post-intervention for both intervention (mean=0.60, SD 1.16, n=114) and control group (mean=0.35, SD 1.17, n=132); however change in zBMI was not significantly different between the groups (p=0.50, p=0.48). No significant differences were observed on mean zBMI between children measured only at the pre-intervention period (n = 87) and those measured at both pre- and post-intervention periods (n = 233). Average consumption of vegetables at baseline was 17.8% higher in the intervention group than the control group (t statistic (df) = 5.05(277), p <.001). As a result, average consumption of fruits and vegetables combined was also 13.3% significantly higher in the intervention group than the control group (t statistic (df) = 2.27(302), p=0.02). No significant difference was found in mean consumption of fruit between the intervention and control classrooms (Table 4.3). The effect of the intervention on fruit consumption, controlling for baseline fruit consumption was not significant (t=1.71, p=0.09) (table 4.4).

Mediation analysis was conducted for classroom variables of which there was a significant change in EPAO-total and EPAO- PA. The intervention showed no significant effect on EPAO-nutrition, so it was omitted from analysis. No mediation effect was found for any of the CCPHEA survey scores on the intervention effect on EPAO-PA except for some evidence of

a mediating effect for CCPHEA-priority on EPAO-PA. Although post-intervention mean EPAO-PA scores in the intervention classrooms were still significantly higher than the control classrooms, the difference was reduced by 0.32 points, controlling for baseline EPAO-PA scores (Table 4). CCPHEA-priority scores were positively associated with EPAO-PA (beta=0.58, p=0.03).

Evidence of a mediating effect was observed for CCPHEA- priority on the intervention effect on EPAO-total. The difference at post intervention between groups was reduced by 0.16 points and the difference between groups was no longer significant at p=0.05 (original EPAO-total model: estimate (SE) = 1.03 (0.47), t-value=2.21 and p=0.039 vs CCPHEA-priority EPAO-total model: estimate (SE) = 0.87 (0.47), t-value=1.87 and p=0.077) (Table 4.5). No mediation was observed in CCPHEA-efficacy, CCPHEA-knowledge, or CCPHEA-misconceptions.

Mediation analysis was conducted for child fruit consumption, as no other child outcomes were significantly affected by the intervention. No mediation effect was found for three of the four CCPHEA survey scores efficacy, knowledge or misconceptions on the intervention effect on fruit consumption. A small mediating effect of CCPHEA- priority was observed where the mean difference of fruit consumption between the intervention classrooms and control classrooms decreased from 19. 8 to 16.5 and the difference no longer approach significance (estimate (SE) = 16.49 (11.78), p=0.16 of the mediation model vs. estimate (SE) = 19.77 (11.57), p=0.08 of the original model) (Table 4.5).

Moderation analysis was completed for classroom variables that were significantly improved by the intervention, EPAO- PA and EPAO- total. The general linear model results demonstrated a significant relationship between intervention effect on both EPAO-PA and EPAO-total scores at follow-up and teacher reported health behaviors and indicators, controlling

for baseline EPAO-PA and EPAO-total scores (Table 4.6). Teacher-reported health behaviors and indicator scores were classified as either above or below the mean and classrooms where teachers reported improvements in health behaviors and indicators above the mean showed greater intervention effect on EPAO-PA and EPAO-total scores (Figure 4.2).

Child-level fruit consumption at follow-up, controlling for race, was analyzed. The mixed model showed no significant relationship between implementation fidelity (frequency or variety) or teacher health behavior and indicator scores and child fruit consumption.

Discussion

This randomized cluster trial showed positive effects of a policy intervention on the HS physical activity environment, also demonstrating the significant role that HS teachers' personal health behaviors and indicators, as well as priority relating to child nutrition, play on the effect of the intervention on both classroom and child level outcomes. The policy intervention that included changes to meal-service style and types of foods and beverages served, did not however, have a significant impact on the HS nutrition environment.

Other interventions have shown similar effects of policy interventions on child care center environments using the EPAO tool, where greater changes were observed in the PA components of the classroom environment than the nutrition components. In the DECAL study, significant effects of policy intervention on both the nutrition and PA components of the EPAO scores showed a smaller proportion of improvement in the nutrition sub-areas (2 out of 8) compared with the PA sub-areas (5 out of 8)[31].

It is plausible that some changes made to the nutrition policies, such as changes to meal-service style and the removal of 100% fruit juice from the meals, were not significant enough to create large changes in the EPAO-nutrition scores. For example, a classroom serving of 100%

fruit juice up to once a week received the same score on the EPAO tool as a classroom serving no 100% fruit juice. At baseline and in many of the control classrooms 100% juice may have already been limited in frequency of offering; therefore, the change policy change of removing 100% fruit juice was not reflected in the nutrition environment score.

Of all the child-level outcomes assessed, the intervention had a positive effect on fruit consumption that only approached significance, despite no measured improvement in the nutrition environment. The intervention did include a policy which removed 100% fruit juice from classroom menus, thus increasing the frequency of offering fruit at meals and snacks. It is possible that this improvement in availability and the increase in offering contributed to the observed effect on fruit consumption. Previous studies have shown that repeated exposure to novel food items in this age group can improve dietary intake and can increase fruit intake[46].

No significant changes in child BMI were detected. Other studies in similar time frames, seven to ten months, were able to detect these changes. However one study consisted of a substantially larger sample size (intervention group n=1,230, comparison group n=19,050 vs n=357 in the current study)[35]. The other had a similar sample size (n=209); however, the intervention was delivered on a larger scale, included family education components, and had more resources available to participating preschool centers than in the current study[32].

Both at the classroom and child level, there was a mediating relationship between CCPHEA-priority scores and the intervention effect. Teachers answered questions related to how they prioritize child nutrition in the classroom environment, which included the priority they placed on childhood obesity prevention, their desire to spend more time teaching about healthy eating, and the frequency that they communicated with parents about their child's food consumption. In classrooms where higher priority was given to child nutrition, there was an

observed increase in intervention effect. Lanigan's ENHANCE intervention program found positive correlations between other CCPHEA variables, but not priority, and intervention effect on the classroom environmental factors, but no child outcomes were assessed[25]. In a qualitative study, beliefs held by HS program teachers, such as low priority placed on childhood obesity, were identified as barriers to obesity prevention efforts [23.] The current study's finding that teacher priority about child nutrition influence the intervention effect quantitatively supports past qualitative evidence that the lack of priority placed on childhood obesity by HS teachers can be a barrier to prevention efforts.

A moderating effect of teachers' own health behaviors and status was found on the intervention effect on the classroom environment. Teachers who reported improvements in their own physical activity levels, weight control, eating habits, skills and knowledge on nutrition above the mean saw greater intervention effect on the PA classroom environment. The EPAO-PA tool assesses number of minutes of structured and unstructured PA per day, teachers' encouragement of PA, teachers participating in PA with children and levels of sedentary behaviors. Other child care provider employee wellness interventions were able to demonstrate similar effects of intervention activities on classroom outcomes, primarily related to foods offered in the classroom.[33] Both of these findings support the influential role teachers play in facilitating a nutrition and PA promoting environment in preschool settings. It is likely that teachers who are moving towards improvements in their own health behaviors and status will have classrooms where PA is better supported.

Implementation fidelity and variety in the intervention classrooms did not significantly impact the relationship between the intervention and classroom or child outcomes. Implementation fidelity and variety scores of one or greater signify compliance with the

intervention activities. With the mean implementation fidelity and variety scores both greater than one, the data demonstrates good compliance with the intervention activities. This compliance shows potential for future possibilities of increasing the intervention dose and activities for a greater effect on child and classroom outcomes.

The findings from this study demonstrate the feasibility and effects of a policy intervention for childhood obesity prevention on both classroom and child-level outcomes, the first of its kind in Hawai‘i. While no significant impacts on child-level outcomes were detected a significant improvement was seen in the PA aspects of the classroom environments. The study's findings demonstrate the significant role that HS teachers play in mediating and moderating the changes observed in their classrooms and thus the effect of policy implementation. Factors related to both HS teachers' personal health behaviors and status and their prioritization of child nutrition can influence intervention and policy effect. This study supports the theory that HS teachers remain a key leverage point and gatekeeper for childhood obesity prevention in preschool settings.

This study has some limitations. The reliance on single assessments of both classroom observations and child fruit and vegetable intake is limiting. Repeated assessments were not within the resources allotted for the current study, but should be included in future investigations. Since fruit and vegetable consumption were the only diet outcomes assessed, controlling for total intake of other meal components was not conducted. These data may have been able to demonstrate differences in consumption rates, controlling for total intake. In addition, the omission of family-level intervention and outcomes may have limited the intervention effects and conclusions. While all families receiving HS benefits must meet certain income-eligibility

criteria, other family-level characteristics, such as parent education and weight status, could explain levels of childhood obesity and diet found in this study.

This study supports the inclusion of teacher employee wellness activities into policy interventions as well as activities targeted at increasing teachers' priorities related to child nutrition to ensure policy compliance and increase the effect.

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Table 4.1 Monthly teacher health indicator and behavior survey items, "yes" responses were scored 1 and "no" responses were scored 0[37].
Have you seen an improvement in your knowledge and skills of physical activities?
Have you seen an improvement in your knowledge and skills of nutrition and healthy eating?
Have you seen an increase in physical activity?
Have you been choosing water over soda and sugary drinks?
Have you been eating more vegetables and fruits?
Have you been reducing your portion size?
Have you seen an improvement in your overall physical health?
Have you seen any loss of body weight?
Have you seen any improvement in your cholesterol?
Have you seen any improvement in your blood pressure?
Have you seen any improvement in your mental health?
Questionnaire adapted from Yin et al[37].

Table 4.2 Covariate adjusted means of class-level Environment and Policy Assessment and Observation (EPAO) nutrition, physical activity (PA) and total scores and Child Care Provider Healthy Eating and Activity (CCPHEA) misconception, priority, knowledge and efficacy related to child-nutrition at post-intervention, comparing the intervention and control classrooms*

Variables	Intervention Group Mean (SE)	Control Group Mean (SE)	*P* value**
EPAO-Nutrition	14.9 (0.40)	14.9 (0.39)	0.98
EPAO- PA	16.5 (0.45)	14.3 (0.43)	0.002
EPAO- Total	15.7 (0.33)	14.6 (0.32)	0.039
CCPHEA-Misconceptions	6.5 (0.20)	6.4 (0.21)	0.847
CCPHEA- Priority	9.8 (0.37)	9.5 (0.40)	0.641
CCPHEAS-Knowledge	9.7 (0.41)	10.0 (0.43)	0.534
CCPHEA- Efficacy	6.1 (0.35)	5.6 (0.38)	0.321

* General linear regression model adjusted for baseline values;
** Global F test that at post-intervention, the difference in means between the two groups is zero.

Table 4.3 Frequency distribution of child BMI category, zBMI, fruit and vegetable consumption by intervention and control groups, pre- and post- intervention.

	Intervention			Control		
BMI Category[1]	**Pre-Intervention n (%)**	**Post-Intervention n (%)**		**Pre-Intervention n (%)**	**Post-Intervention n (%)**	**P**
Underweight	3 (2.0)	3 (2.6)	0.708	7 (4.2)	7 (5.3)	0.660
Healthy weight	105 (68.2)	78 (68.4)	0.967	125 (75.3)	93 (70.5)	0.348
Overweight	22 (14.3)	14 (12.3)	0.634	22 (13.3)	17 (12.9)	0.924
Obese	24 (15.6)	19 (16.7)	0.812	12 (7.2)	15 (11.4)	0.217
Total	154 (100)	114 (100)		166 (100)	132 (100)	
	Mean (SD), n	**Mean (SD), n**	**P**	**Mean (SD), n**	**Mean (SD), n**	**P**
zBMI	0.51[2] (1.14) 154	0.60 (1.16) 114	0.50	0.25[2] (1.14) 166	0.35 (1.17) 132	0.48
Fruit consumption (% of serving)	48.4 (42.3) 143	72.4 (38.8) 104	<0.001	48.1 (43) 161	56.2 (42) 129	0.11
Veg. consumption (% of serving)	27.8[3] (33) 118	31.5 (38) 104	0.43	9.9[3] (22) 161	13 (26) 129	0.28

[1=] CDC BMI Categories 0-4th%^{tile}= underweight, 5-84th%^{tile}= Healthy weight, 85-94th %^{tile}=overweight, >95th%^{tile}= obese
[2=] -2.02, p=0.04
[3]-5.05, p<0.0001

Table 4.4 Mixed model* testing intervention effect on child fruit consumption controlling for baseline fruit consumption and race.

Parameter	**Estimate (SE)**	**t Value**	**Pr > |t|**
Intercept	46.97 (11.49)	4.09	0.0005
Group intervention (reference: control)	19.77 (11.57)	1.71	0.0892
Baseline fruit consumption	0.26 (0.06)	4.49	<0.0001
Asian (reference: White)	-13.12 (11.61)	-1.13	0.26
More than one race (reference: White)	-10.12 (8.64)	-1.17	0.24
NHPI (reference: White)	-7.59 (9.90)	-0.77	0.44

*Hierarchical linear model controlling for group, baseline fruit intake, and race.

Table 4.5 Model testing teacher priority mediation on the intervention effects for class-level Physical Activity Environment and Policy Assessment and Observation (EPAO), Total EPAO and child-level fruit consumption.

Variables	Intervention Group Mean (SE) Post-intervention	Control Group Mean (SE) Post-intervention	Difference	*p* value [g]
Class-Level Variables				
EPAO- PA				
Original model [a]	16.5 (0.45)	14.3 (0.43)	2.2	0.002
CCPHEA-priority model [b]	16.3 (0.42)	14.4 (0.42)	1.9	0.005
EPAO- Total				
Original model [c]	15.7 (0.33)	14.6 (0.32)	1.1	0.039
CCPHEA-priority model [d]	15.6 (0.32)	14.7 (0.32)	0.9	0.077
Child Level Variable- Fruit Consumption				
Original model [e]	72.21 (8.8)	52.44 (8.11)	19.77	0.089
CCPHEA-priority model [f]	71.64 (8.8)	55.15 (8.46)	16.49	0.16

[a] adjusted for pre-intervention EPAO-PA score
[b] adjusted for pre-intervention EPAO-PA and CCPHEA- priority
[c] adjusted for pre-intervention EPAO-Total score
[d] adjusted for pre-intervention EPAO-Total and CCPHEA- priority
[e] adjusted for pre-intervention fruit consumption and race
[f] adjusted for pre-intervention fruit consumption, race and CCPHEA-priority
[g] global F test that at post-intervention, the difference in the means between the two groups is zero

Table 4.6 Moderating effect of teacher health behavior and indicators status (above or below the mean) on total and Environment and Policy Assessment and Observation (EPAO) Physical Activity (PA) classroom scores, general linear model (Global F test).

Parameter	**Estimate (SE)**	**t Value**	**Pr > |t|**
Intercept	7.05 (3.12)	2.26	0.0366
Group control (reference: control)	2.17 (0.53)	4.10	0.0007
EPAO- Total	0.63 (0.22)	2.91	0.0094
Health behavior/ indicator <mean (reference: >mean)	-1.07 (0.57)	-1.87	0.0786
group*Health behavior/ indicator intervention	-2.47 (0.78)	-3.15	0.0055
Intercept	14.65 (3.16)	4.63	0.0002
Group control (reference: control)	3.46 (0.79)	4.36	0.0004
EPAO- PA	0.16 (0.22)	0.76	0.4574
Health behavior/ indicator <mean (reference: >mean)	-1.22 (0.83)	-1.46	0.1615
group*Health behavior/ indicator intervention	-2.65 (1.15)	-2.30	0.0338

Figure 4.2: Child BMI category distribution by intervention and control groups, pre- and post- intervention (n=355)

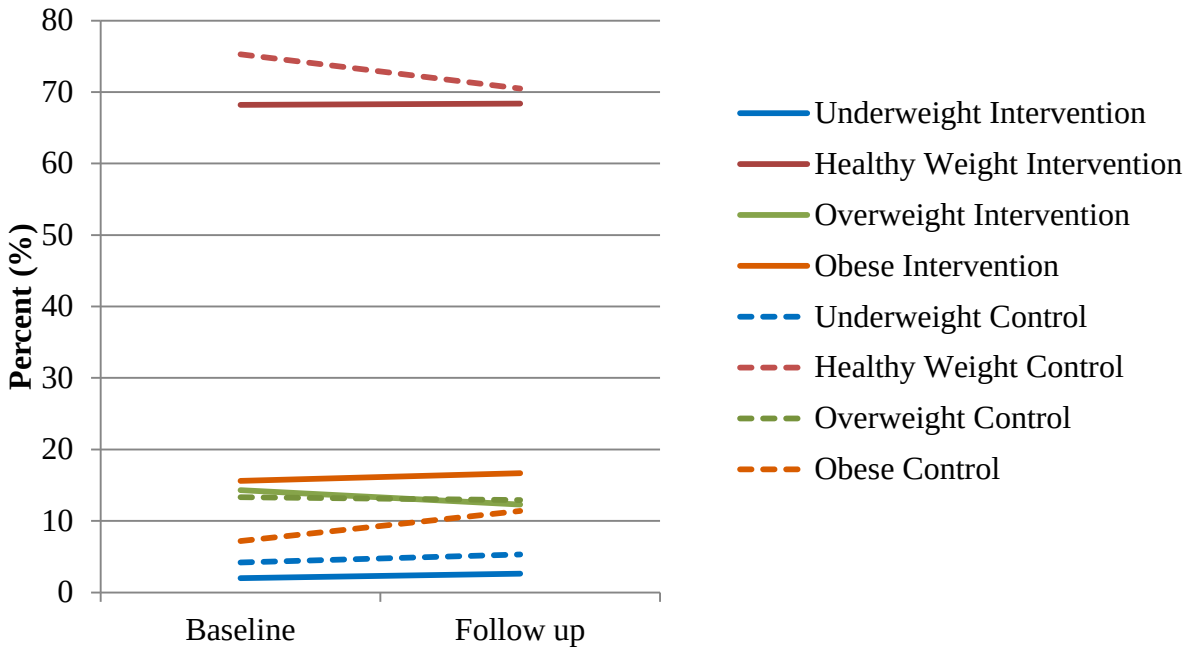


Figure 4.3: Mean child BMI z-score intervention and control groups, pre- and post- intervention (n=355)

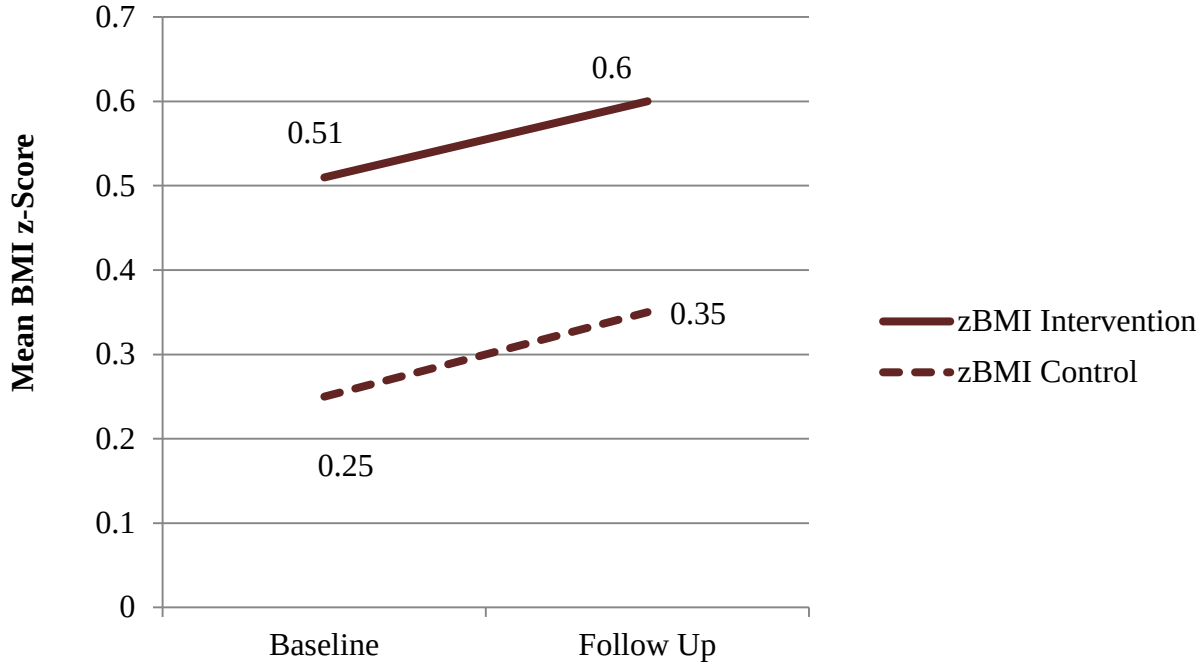


Figure 4.4: Mean percent of child fruit and vegetable consumption by study group, pre- and post- intervention (n=355)

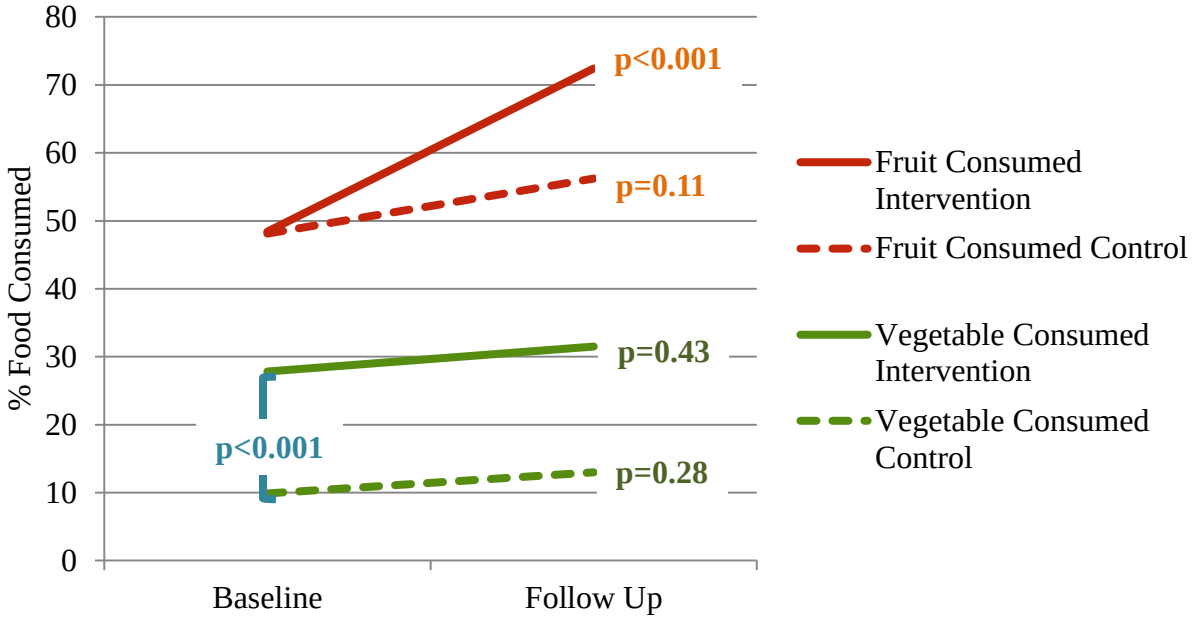
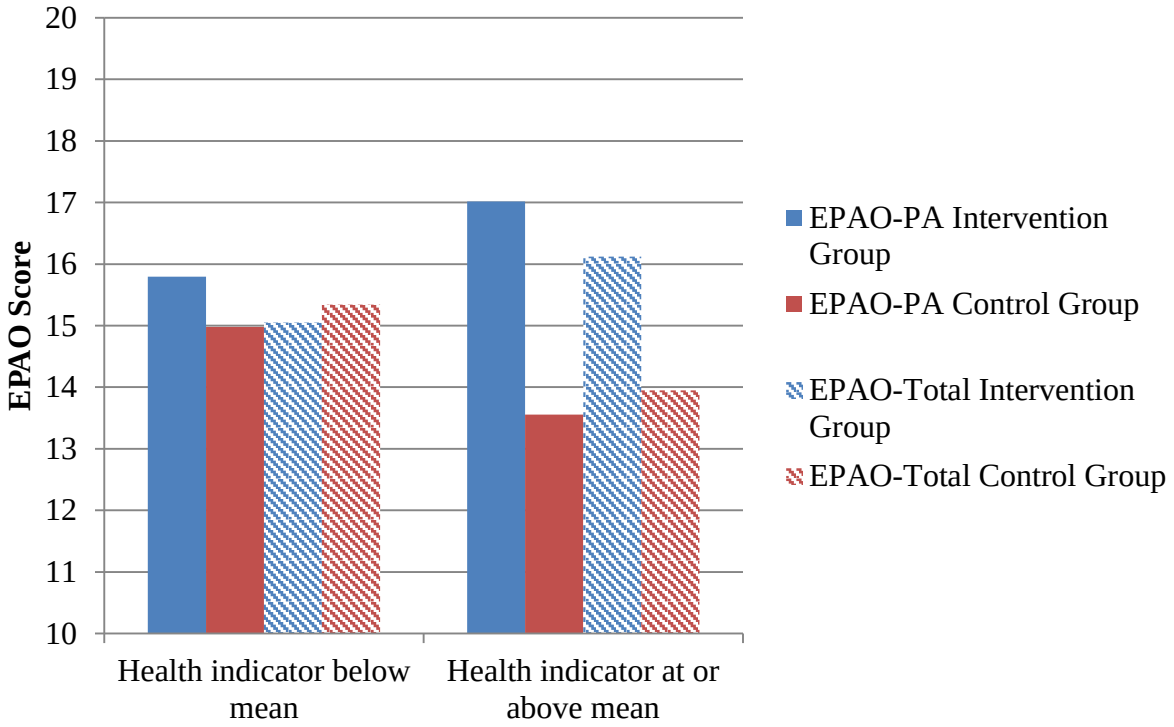


Figure 4.5 Moderating effect of teacher health behavior/indicator level on Environment and Policy Assessment and Observation- Physical Activity (EPAO PA) scores by intervention and control group.



CHAPTER 5: Validity of Head Start teacher child anthropometry and growth assessment.

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Abstract

A state of emergency was declared in the US Affiliated Pacific due to alarmingly high rates of obesity and associated diseases, but no system for monitoring young child obesity in the region is available. Head Start (HS) preschools complete bi-annual growth assessments to assess childhood obesity, but the validity of this data is unknown. Anthropometric measurements by HS teachers were assessed for relative validity against standardized researcher measurements for height in weight in 19 of the 23 HS classrooms participating in a randomized control trial. Independent t-tests showed no significant difference in mean height, weight, BMI, or age (months) at measurement between the standardized researcher and HS teachers (n=135). General linear models controlling for age (months) showed no significant difference between the two measurement methods (researcher and teacher) for height, weight, and BMI. Chi-square analysis showed no significant difference in CDC BMI category classification by measurement method (chi-square=1.24, p=0.74), and kappa statistics for agreement based on CDC BMI categories showed good agreement between the two methods (weighted kappa=0.50). Percent agreement was 94% for healthy, 87% for overweight, 75% for obese and 50% for underweight. HS teacher anthropometric measurements demonstrate adequate validity for assessing child BMI and growth status, however less agreement is found between growth assessment in children who fall in the extreme categories (underweight and obese). Anthropometric data from HS centers may contribute to a system for monitoring childhood overweight and obesity in the US Affiliated Pacific as measures taken by teachers do not significantly differ from measures taken by a standardized researcher

Introduction

In recent decades, the increased prevalence of childhood overweight and obesity across both the United States (US) and the Pacific has become a serious public health concern.[1-3] Especially high rates of childhood obesity have been observed among Native Hawaiian and Pacific Islander (NHPI) children, where up to 39% of children entering kindergarten in Hawai‘i were overweight or obese.[4-6] While Hawai‘i is one of the 50 United States, it is not included in the country-wide nutrition surveillance program, the National Health and Nutrition Examination Survey (NHANES), and the last population-wide anthropometric measurement was conducted in Hawaii in 1984.[5-7] Other Pacific Islands, such as the US territories of Guam and American Samoa, also lack a regular surveillance program that includes children three to five years of age.

Head Start (HS) is a federally funded preschool program, serving low-income children three to five years of age across the US and its jurisdictions.[8] HS programs complete bi-annual growth assessments to assess childhood obesity as recommended by the Institute of Medicine (IOM) and to meet regulations set by their Federal funding agency.[9, 10] Resource-limited programs and organizations such as HS, county or state health departments, The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) often obtain height and weight measurements of clients to assess growth, offer early intervention, and conduct program evaluation, but are often not likely to offer standardization trainings to staff on collecting measurements. The objective of this study is to validate HS anthropometric measurements for their potential use as data for monitoring young child growth and nutritional status in the US Affiliated Pacific.

Methods

Anthropometric measurements by HS teachers were assessed for relative validity against standardized researcher measurements. Height and weight were measured on separate occasions by both HS staff and the student researcher (ME) in 19 of the 23 HS classrooms participating in a randomized controlled trial.

Height and weight were measured by ME using a calibrated portable scale (SECA) and portable stadiometer (Perspective Enterprises model PE-AIM 101). One measurer participated in training on collecting standardized measurements, including proper calibration of equipment. Procedures were followed by this trainee, with exception of having two standardized measurers collect anthropometric data. Three measurements of each height and weight were taken and recorded, until at least two were within 0.2 units of each other. The Lohman et al. Anthropometric Standardization Reference manual informed protocol development.[11] The protocol for reading anthropometry was adapted from the CDC's training module: Accurately Weighing and Measuring Infants, Children and Adolescents as well as The University of California Berkley's guidelines for collecting heights and weights on children and adolescents in school settings.[12] The HS agency provided teachers' measurements of child height, weight, BMI (calculated by HS data management system), as well as child date of birth, sex, race, and date of measurement by HS classroom. Measurement equipment and training varied by classroom. Regular calibration of stadiometers and/or scales was not reported.

Data were matched by HS classroom, child date of birth, and sex. Child age in months at on the date of measurement was calculated for the HS and researcher data to later account for differences in age at measurement. Paired t-tests, ANOVA, linear regression and inter-rater intra-

class coefficients (ICC) were performed to examine the differences and comparability of HS and ME measures, controlling for the difference in time between the two measurement points and HS classroom. Kappa statistics were used to test for significance of agreement by BMI category using Centers for Disease Control and Prevention (CDC) 2000 growth reference data and cut points.[13] The research study was approved by the University of Hawai‘i Institutional Review Board.

Results

Nineteen HS teachers conducted height and weight assessments of the 135 children included in the study. Difference in age (months) between HS and researcher measurements ranged in direction (before or after) and length (0 to 9 months). Independent t-tests showed no significant difference in mean height, weight, BMI, or age (months) at measurement between the standardized researcher and HS teachers (Table 5.1). General linear models, controlling for age (months) also showed no significant difference between the two measurement methods (researcher and teacher) for height, weight, and BMI (Table 5.2). From a practical standpoint, chi-square analysis showed no significant difference between CDC BMI category classification by measurement method (chi-square=1.24, p=0.74), and kappa statistics for agreement based on CDC BMI categories showed good agreement between the two methods (weighted kappa=0.50).

Table 5.3 shows the agreement between methods by category. Percent agreement was 94% for healthy weight category, 87% for overweight and 75% for obese. Both HS and the researcher assessed 4 children as being underweight. However, only 2 of the 4 children were classified the same by both. Two children were classified as underweight by the researcher and

healthy weight by HS, and another two children were classified as underweight by HS but healthy weight by the researcher.

Discussion

Anthropometric measures of height and weight taken by HS teachers and the standardized researcher were not significantly different in the sample of 135 HS children. While mean height was slightly lower in HS teachers, the difference was not large enough to significantly affect BMI, zBMI or BMI category.

Standardization of anthropometrists is considered a gold-standard practice for large surveillance studies, such as the National Health and Nutrition Examination Survey. This ensures that high quality and reliable measures are taken to give the most accurate picture of the US population's weight status. Due to limited resources only one standardized measurer was able to conduct data collection. It is possible that the absence of the second standardized measurer may have decreased the accuracy of the measures of the researcher. However, it could also be plausible that HS teachers' experience in conducting measurements, bi-annually, over the course of employment, has improved the accuracy of their assessments. However, HS teachers' measurements had a tendency to measure shorter heights, even after controlling for child age differences, resulting in classification of children in the heavier BMI category in comparison to the researcher (i.e.: obese vs overweight, overweight vs healthy weight), but this observation was not significant. The primary cause of the slight variation observed could be related to differences in measurement equipment and lack of training.

Limitations of the study include the relatively small number of children, the large number of HS teachers conducting the measurements and the varying differences in time (and the

consequent differences in age of the child) between when the measures were taken. Nineteen HS teachers conducted height and weight assessments of the 135 children included in the study. The sample of children measured by each teacher was too small to make any formal analysis of differences between measurements by teacher. In addition, teachers measured children anywhere from five months before the standardized researcher to nine months after. This difference in time was controlled for by including age in months in the general linear model but a more ideal evaluation of validity would involve both the teacher and researcher assessing height and weight on the same day.

This study raises awareness on the need for further assessment of the validity of HS teacher measurements in order to assess the potential for HS data to contribute to a system for monitoring childhood growth. Future research should ensure that standardized procedures for collecting anthropometric data are followed. In addition, anthropometric measures should be taken by both the standardized researcher and lay anthropometrist (teacher) on the same day for the most optimal assessment of validity. HS programs conduct bi-annual child growth assessment of children enrolled in their program throughout the US Affiliated Pacific Region. Future training for HS staff and teachers who conduct these measurements will strengthen interpretation of the potential for this data to be a source of childhood overweight and obesity monitoring throughout the region.

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Table 5.1 Mean height, weight, BMI, age (months), and differences in height, weight, BMI by researcher and HS teacher, independent t-test (n=1							
Variable	Researcher		HS Teacher		Mean±SD Difference	T-value	Significance
	Mean±SD	Range	Mean±SD	Range			
Height (cm)	105.80±5.77	90.33-122.53	105.14±5.77	88.90-120.02	0.66±5.77	-0.94	0.35
Weight (kg)	18.67±4.13	12.2-38.4	18.58±3.92	12.87-36.93	-0.09±4.03	-0.19	0.85
BMI (kg/m^2)	16.55±2.37	12.74-26.32	16.69±2.32	12.43-26.25	0.15±2.34	0.52	0.61
Age (months)	54.76±6.3	39-64	53.82±6.17	33-62	-0.93±6.24	-1.23	0.22

Table 5.2 Difference in measurement method (researcher or Head Start teacher) of height, weight, and BMI, controlling for child age in months, general linear model (F test) (n=135).			
	Estimate (SE)	T-value	P-value
Variable: Height			
Intercept	105.80 (0.41)	258.91	<0.0001
Method (reference=researcher)	-0.66 (0.58)	-1.15	0.25
Age (months)	0.53 (0.05)	11.37	<0.0001
Variable: Weight			
Intercept	18.67 (0.34)	55.24	<0.0001
Method (reference=researcher)	-0.09 (0.48)	-0.19	0.85
Age (months)	0.15 (0.04)	3.83	0.0002
Variable: BMI			
Intercept	16.55 (0.20)	82.38	<0.0001
Method (reference=researcher)	0.15 (0.28)	0.52	0.61
Age (months)	-0.04 (0.23)	-1.75	0.08

Table 5.3 Categorical agreement between researcher and HS teacher measurements on CDC 2000 BMI categories[1], underweight, healthy weight, overweight, and obese. (n=1

		HS Teacher Assessment				
		Underweight	Healthy weight	Overweight	Obese	Total
Researcher Assessment	Underweight	2	2	0	0	4
	Healthy weight	2	81	7	4	94
	Overweight	0	6	4	5	15
	Obese	0	0	2	20	22
	Total	4	89	13	29	135

[1]CDC BMI categories defined as: 0-4th%^{tile}= Underweight, 5-84th%^{tile}= Healthy weight, 85-94th %^{tile}=Overweight, >95th%^{tile}= Obese

CHAPTER 6: Growth and BMI z-scores using CDC and WHO Reference Data in Native Hawaiian and Pacific Islander Children

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Abstract

Background: In the diverse US Affiliated Pacific Region, Centers for Disease Control (CDC) 2000 and World Health Organization (WHO) 2007 reference data are available to assess child growth. WHO reference data are composed of children who met specific recommended health and breastfeeding guidelines, while CDC reference data describe growth of US children where few met those infant feeding guidelines. It was the purpose of this study to compare results and interpretation of growth assessments among USAP children who are predominantly of Native Hawaiian and Pacific Islander ancestry, u the two reference data sets.

Objective: We assessed the differences between child growth assessments between the two references among children in the US Affiliated Pacific Region, where there are unique child race and ethnic groups compared to the US mainland or Europe or even the multicenter growth study population. We hypothesized that CDC would underestimate childhood overweight and obesity relative to WHO, and that differences would be related to breastfeeding history.

Methods: We compared BMI z-scores (zBMI) calculated from the two data references, using baseline data from the Children's Healthy Living Program for Remote Underserved Minority Populations in the Pacific Region in Hawai'i (n=944). We further examined the role of breastfeeding history, age, sex, and race on BMI.

Results: Mean BMI z-scores calculated with CDC reference data were significantly lower than those calculated with WHO (zBMI difference=-0.28, $p<0.001$). A general linear model on zBMI differences showed the difference by reference was greater in CDC for boys than girls (zBMI difference = -0.10, $p<0.001$) and in the eight year old age group compared with age three, four, and five years (zBMI difference=0.16, 0.22, and 0.30, respectively, $p<0.005$). The difference was

not related to breastfeeding history or race. Significant differences in child's growth status by BMI category were also observed ($p<0.0001$). The percent agreement between the two references was 97% for healthy weight, 65% for overweight, 73% for obese, and 35% in underweight.

Conclusions: BMI percentiles and z scores, and the resultant categorization, were lower when CDC reference data were used, as compared to WHO, and differences were not related to breastfeeding history or race. Agreement between the two references was lowest in the obese category, deserving further study.

Introduction

Estimates of childhood overweight and obesity (OWOB) in the US Affiliated Pacific region range from 21% to 39% in children ages two and eight years, with rates increasing with age.[1] Policy and intervention aimed at reducing the burden of obesity necessitate accurate assessment of child growth in order to track effectiveness of efforts and leverage resources.

Child growth assessment requires demographic information (e.g., sex and age), anthropometric measures of height and weight to calculate body mass index (BMI), and child growth reference data to calculate zBMI and BMI percentiles. Two sets of child growth reference data are available for calculating BMI z score and percentile for child growth assessment at an individual and population level: the Centers for Disease Control and Prevention (CDC) 2000 growth reference data for children and adolescents 2 to 20 years and the World Health Organization (WHO) 2007 for 5 to 19 years and Child Growth Standards (CGS) for 0 to 5 years.

The CDC 2000 growth reference data are based on five US-based nationally representative surveys conducted between 1963 and 1994.[2] Studies suggest that this dataset represents the growth of children in the US during that specific time period, reflecting the lifestyle pattern of that time.[3] The WHO CGS reference data was created from the WHO Multicenter Growth Reference Study (MGRS). The MGRS collected primary growth data and related information from approximately 8,500 children from different ethnic backgrounds and cultural settings (Brazil, Ghana, India, Norway, Oman and the US). Children were selected for this study to represent optimal growth; inclusion criteria included meeting specific early infant feeding recommendations (i.e.: exclusive breastfeeding for 6 months).[4, 5] In comparison, the CDC

dataset rates of reported infant breastfeeding history were 50% of children were ever been breastfed, and 33% were breastfed for at least 3 months.[3, 6]

Previous studies have found significant differences in child's growth status between these two references.[6-9] Specifically, the CDC reference dataset has been found to represent a shorter heavier sample population than WHO datasets. A US study that included 143,787 preschool aged children, primarily White, Black or Hispanic, two-to-five years, found that WHO growth reference data estimated significantly higher prevalence of OWOB compared with CDC (42.2% vs 33.8% $p<0.0001$) and that the difference was greater in children at age two to three years of age compared to age four to five years.[7]

Adult obesity in Pacific Islanders has been found to be overestimated when standard BMI cut points are used for classification, leading to the creation of ethnic specific BMI cut points for adult Pacific Islanders [10], but none have been created for children, and Native Hawaiian and Pacific Islander children have not been studied in large US surveys. The US Affiliated Pacific Region includes Alaska, American Samoa (AS), Commonwealth of the Northern Marianas Islands (CNMI), Federated States of Micronesia, Guam, Hawai‘i, Republic of Marshall Islands (RMI), and the Republic of Palau. In this region, child race is predominantly Native Hawaiian and Pacific Islander, differing from that of the mainland US and Europe, where Whites predominate.[11]

The purpose of this study was to examine differences in child zBMI and OWOB classification between the CDC and WHO reference data in a sample of primarily Native Hawaiian and Pacific Islander children from Hawai‘i. We further examined the influence of child's age, sex, race, and breastfeeding history on these differences. We hypothesized that CDC

assessments would underestimate childhood overweight and obesity and that differences would be related to breastfeeding history.

Methods

Data from the Children's Healthy Living Program for Remote Underserved Minority Populations in the Pacific (CHL) in Hawai'i were used for this study. Child's height, weight, age (in months), sex, and parent reported race and infant feeding history for 941 children were available for analysis. Methods for study sampling and data collection procedures of CHL are described elsewhere.[12] Body mass index (BMI), calculated using height and weight, age at measurement and birth date, and sex were analyzed using Epi Info software[13], version 7.1.4 to calculate zBMI and BMI percentiles for each child using both the CDC and WHO reference data sets. BMI categories were also assigned according to CDC 2000 criteria: underweight <5th BMI percentile, healthy weight 5th-84th BMI percentile, overweight 85th-94th BMI percentile and obese >95th BMI percentile.[14]

Infant feeding history was used to determine breastfeeding status. Parents/caregivers of children answered two questions related to breastfeeding initiation and duration, "Was your child ever breastfed or fed breast milk?" and "If yes, how old [months] was your child when he/she completely stopped breastfeeding or being fed breast milk?" Children were classified as not breastfed, breastfed <6 months, breastfed ≥6 months or unknown. Race data were also parent/guardian reported. Parents were asked which race/ethnic category best described their child and were able to check as many boxes as applied.

Paired t-tests were used to examine differences between mean zBMI between the CDC and WHO reference data sets. A general linear model was conducted on zBMI differences

against child age (in single age groups and separately in two age groups: 2-5y vs 6-8y), sex, race and breastfeeding history. Chi-square test and Kappa statistics were used to determine differences and agreement in BMI categories between the two references. Statistical significance for all tests were set at $p < 0.05$ for 2-tailed tests. All statistical tests were conducted with SAS©, version 9.4. Consent and assent were obtained of participants, and Institutional Review Board approval was granted by the University of Hawai‘i.

Results

The sample included 944 children from the state of Hawai‘i. Approximately half of the sample were males. Fifty-five percent of the children were more than one race, 28% were NHPI, 10% were Asian, 7% were White and less than one percent were Black or American Indian, or Native Alaskan. Fifty-seven percent were breastfed for at least six months, 25% breastfed for less than six months, and 18% were not breastfed (Table 6.1).

Mean zBMI was significantly lower when CDC growth reference data (mean= 0.5, SD= 1.3) were used compared to WHO (mean= 0.77, SD=1.3) (mean difference =-0.28, t statistic=-15.78, $p<0.001$). Overall, the general linear model showed that the difference in mean zBMI by age (years) (Table 6.2); differences in mean zBMI between CDC and WHO data were significantly greater in the eight-year old age group and in the three-year, four-year, and five-year old age groups.

Chi-square analysis showed significant differences in BMI category classification between the two reference datasets ($p<0.0001$). The WHO criteria classified more children in the obese category and fewer in the healthy weight category than the CDC criteria (OW 15.3% and Healthy Weight 64.3% WHO vs 14.1% and Healthy Weight 68% CDC).

Nevertheless, the Kappa statistic indicated strong agreement in BMI category classification between the two criteria (Kappa=0.72, $p<0.0001$). Percentages of agreement between the two criteria were higher in healthy weight (97%) and lower in obese (73%), overweight (65%) and underweight (35%) categories.

Discussion

Similarly to previous studies' findings in other populations, the CDC growth reference significantly underestimated zBMI and differences in BMI classification (underweight, healthy weight, overweight, or obese) were observed between the two growth reference datasets.[3] The greatest disparities were noted in the youngest compared with oldest age group (two years vs. eight years) as well as in the underweight and obesity classifications (Figure 6.1). The findings are similar to those of Maalouf-Manasseh et al[7] where OWOB prevalence was significantly higher when the WHO growth reference data was used to assess growth than when CDC was used in a sample of143, 787 children in Massachusetts. That study also demonstrated similar differences between the two reference datasets in younger ages in a study from Massachusetts, where CDC underestimated OWOB to a greater degree in children two-to-three years old when compared with older children.[7]

While the samples comprising the CDC and WHO growth reference datasets differed based on race and breastfeeding history, exploration of the influence of those variables on the differences in zBMI between the two reference datasets showed that neither factor explained the differences observed. However, no data on exclusivity of breastfeeding was assessed. It is possible that the children breastfed in the current sample were introduced to complementary foods or fed in combination with infant formula, which could have an impact on the

interpretation of these results. Sex and age were, however, related to the differences observed, where zBMI of males in the sample was larger than that of females, indicating that CDC underestimated the zBMI of males to a larger degree in this study. Previous studies have not reported differences in reference data estimates of zBMI related to sex, however other studies have indicated biologic vulnerability of male infants such as higher mortality rates.[15]

Previous findings support that WHO zBMI reference values are significantly and consistently lower than CDC values; thus, WHO reference data will identify a greater proportion of OWOB children, especially in younger age groups.[3, 8, 9] One hypothesis is that this is related to the higher prevalence of childhood OWOB in older children in the Pacific region.[1] At younger ages, Pacific Islander children experience lower prevalence of obesity (21% in two year olds vs. 39% in 8 year olds) .[1] It is plausible that the larger difference between the CDC and WHO reference data estimations of zBMI is related to the observation that the younger children have lower rates of OWOB in the Pacific, and thus when compared with the CDC reference sample they are relatively smaller.

Limitations of this study include the methods for identifying breastfeeding history. Information on the introduction of complimentary foods (i.e. infant cereal or infant formula) was not used to determine if breastfeeding was exclusive for at least six months. This is the first study to examine differences in CDC and WHO growth assessments in a NHPI and mixed-race sample. Previous studies have studied Hispanic, non-Hispanic White, Black and Asian/Pacific Islander ethnic groups, but have 1) not included a mixed race category, 2) included relatively low numbers of Asian and NHPI children. The unique sample in the present study is not represented in either the CDC or WHO growth reference samples, as neither included children from Hawai‘i or the US Affiliated Pacific Region in their sampling frames. In addition breastfeeding history in

the present study was self-reported and limited to two questions that did not account for exclusivity or when complementary foods were introduced. Future studies using the CHL wide data where a greater diversity of child race groups can be included could reexamine the differences between the two references and the role of race and infant feeding history.

Strengths of the study are the relatively large sample size and that it was the first of its kind to examine differences in CDC and WHO growth reference data applied to a NHPI sample. As the US Affiliated Pacific Region often receives funding from both US-based and international organizations, researchers may be required to report zBMI and OWOB rates using either growth reference dataset and thus should be aware of the differences that will result from the use of each. In addition, practicing clinicians should also be aware that CDC growth charts may lead to misclassification of child BMI category on an individual basis, with WHO charts being a better choice for clinical use up to age five, and reinforcing the notion that BMI in children should be used as a screening tool and that follow-up assessments of growth and adiposity are necessary for a true diagnosis of growth status (underweight, healthy weight, overweight or obese).

BMI is an indicator of excess body fat or obesity. In NHPI adults, BMI has been found to overestimate excess body fat, as this population has higher proportions of lean body mass, leading to the creation of ethnic-specific BMI cut points.[10] Future studies should examine the ability of each reference dataset to predict excess body fat and health outcomes in these NHPI children to determine if child-level ethnic-specific cut points are needed. Further research could also support the creation or revision of current growth reference data to include NHPI children. From a research stand point, significant differences in zBMI and weight classification will be observed when changing from one reference dataset to the other. From a practical standpoint the choice of reference data may influence programmatic decisions regarding obesity intervention.

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Table 6.1 Mean and distribution of sample's age, sex, race, breastfeeding history, CDC BMI z score and WHO BMI z score (n=944).

	Statistics
	Mean (SD)
CDC BMI z	0.50 (1.3)
WHO BMI z	0.77 (1.3)
Difference in BMI z (CDC-WHO)	-0.28
	n (%)
Male	451 (48)
Female	493 (52)
>1 Race	510 (55)
NHPI	267 (28)
Asian	92 (10)
White	68 (7)
AIAN	2 (0.2)
Black	1 (0.1)
Breastfed ≥6 months	513 (57)
Breastfed <6 months	225 (25)
Not Breastfed	161 (18)
Unknown breastfeeding history	75 (8)
2 years	70 (7)
3 years	146 (15)
4 years	222 (24)
5 years	223 (24)
6 years	86 (9)
7 years	80 (8)
8 years	84 (9)

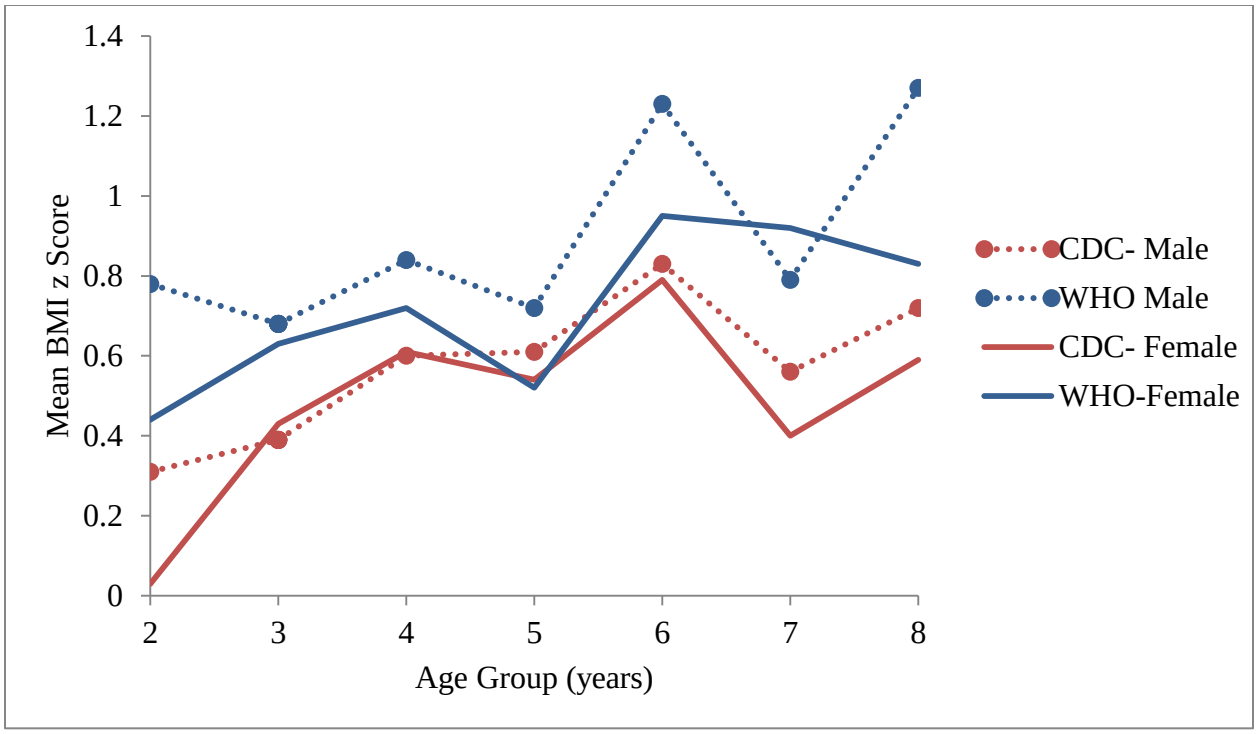


Figure 6.1 Mean zBMIs by child age (years) calculated from CDC and WHO reference data sets for the total sample (n=944) and by sex.

Table 6.2 General linear model including race, breastfeeding history, age group, and sex on difference in BMIz score CDC vs WHO.

Parameter	Estimate	t-value	Pr>|t|
Intercept	-0.31	-3.42	0.0006
AIAN (reference: white)	0.24	0.46	0.65
Asian (reference: white)	-0.02	-0.23	0.82
>1 Race(reference: white)	-0.005	-0.07	0.95
NHPI (reference: white)	-0.05	-0.64	0.52
Not Breastfed (reference: Breastfed >6 Months)	-0.05	-1.00	0.32
Breastfed <6 months (reference: Breastfed >6 Months)	-0.05	-1.13	0.26
Age 2 (reference:8 years)	-0.5	-0.64	0.52
Age 3 (reference:8 years)	0.16	2.25	0.02
Age 4 (reference:8 years)	0.22	3.13	0.002
Age 5 (reference:8 years)	0.30	3.53	<0.0001
Age 6 (reference:8 years)	0.11	1.33	0.18
Age 7 (reference:8 years)	-0.04	-0.43	0.66
Sex Male (reference: female)	-0.10	-2.89	0.004

CHAPTER 7: CONCLUSION

Childhood obesity across both the United States (US) and the Pacific has become a serious public health concern, although there is no system for monitoring obesity prevalence in this high-risk population.[1-4] Overweight and obesity in childhood contributes to an increased risk for cardiovascular disease, diabetes, and cancer, and for being overweight or obese as an adult, however, few interventions have demonstrated significant and long-term success in treating and reducing childhood obesity in preschool aged children.[5-10] HS preschools are present throughout the US and the US Affiliated Pacific region. Policies at these centers can potentially reduce childhood obesity as well as contribute to a data system for monitoring child growth. Strong, health-related preschool policies have shown to reduce childhood obesity, and HS teachers play a key role in intervention effectiveness. The objectives of this dissertation were to: 1) work with HS teachers to develop a child care center (CCC) policy intervention for childhood obesity; 2) test this intervention; 3) explore the potential for CCCs to contribute to childhood obesity monitoring; and 4) measure the effect of growth reference data source used on child growth assessments.

Research Summary

Four research studies were conducted to meet those objectives. The first study, "Engaging Head Start Teachers on Wellness Policy Implementation to Improve the Nutrition and Physical Activity Environment in Head Start Classrooms: A Qualitative Study of the Children's Healthy Living Program (CHL) in Hawai‘i," included two focus groups with 17 HS teachers in Hawai‘i (Chapter 3) to identify potential policy changes and activities to increase the childhood obesity prevention efforts in HS classrooms. HS teachers were found to value their ability to role

model healthy eating to children in their classrooms. Need for training and technical assistance from a Registered Dietitian to improve obesity prevention efforts and discomfort in having to address child BMI with parents of obese children were expressed.

The second study, "Head Start Wellness Policy Intervention in Hawaiʻi: A project of the Children's Healthy Living Program (CHL)," tested the effects of the intervention developed with input from the HS teacher focus groups on the HS classroom environment and child growth and dietary intake (Chapter 4). This study found that teachers' child nutrition priorities and improvements in personal health behaviors and status played mediating and moderating roles on the intervention effect.

The third study, "Validity of Head Start teacher child anthropometry and growth assessment," (Chapter 5) quantitatively assessed differences in anthropometric data measured by HS teachers and a standardized researcher in 135 children. Findings demonstrated that HS teacher measurements of height and weight did not vary significantly from measures taken following a standardized procedure, supporting the notion that HS data can be used to support young child obesity monitoring in the US Affiliated Pacific.

The fourth study, "Growth and BMI z-scores using CDC and WHO Reference Data in Native Hawaiian and Pacific Islander Children," (Chapter 6) utilized socio-demographic, anthropometric, and infant feeding history information from 944 children to assess differences in zBMI and BMI weight category between CDC and WHO reference data. While CDC significantly underestimated zBMI, and BMI weight category classifications were significantly different, the differences were unrelated to race and breastfeeding history but were related to

child sex and age. The implications of these for childhood obesity prevention and future research are further addressed below.

Approach to Intervention Planning and Development

This research included an intervention planning and development process that was both participatory and evidenced-based. The wellness policy intervention that was created stemmed from qualitative research that included HS teacher focus groups and the literature. HS teacher participation in the process is supported by previous research, where involvement in community members resulted in more impactful interventions.[11-13] This participatory process allowed for the development of an intervention plan that built upon the strengths of both the researcher and the HS teacher. In addition, the bottom up approach to intervention development supported buy-in from the same teachers who would later be delivering the intervention. While the intervention was found to only have a positive impact on some aspects of the HS classroom environment (PA) and had limited effects on child outcomes, implementation of the intervention was in compliance with policy changes and activities. Past research studies have found disparities between written policy and compliance, as well as compliance with intervention activities.[14] The data demonstrating that monthly implementation fidelity and variety met the intended intervention is promising. This compliance with intervention implementation demonstrates HS teachers' motivation for implementing policy which can be fostered through their inclusion in the intervention development process and likely has long term positive effects.

The intervention developed was supported by the teacher focus groups and was also supported by literature on the obesogenic environment and social ecologic model. Figures 7.1 and 7.2 demonstrate how the intervention activities address all levels of the obesogenic

environment as well as social ecologic model. In figure 7.1, the policy intervention acts on the political environment, the monthly employee wellness or worksite wellness activities support teachers as role models and the social environment in HS classrooms. The physical environment was addressed through the changes to foods served; improving the accessibility and availability of fruits, and lastly the economic environment was affected as HS participation improved fruit and vegetable accessibility to children of low income households. This can lessen the financial burden on families to purchase these foods. Figure 7.2 demonstrates how the policy intervention activities work on all levels of the social ecologic model; policy, community, organizational, interpersonal and individual. For example, organizational changes were made by changing the meal vendor contract, leading to increased fruit offering and decreasing juice in the classrooms and with training and technical assistance to HS teachers, and worksite wellness activities.

Figure 7.1 Policy Intervention Activities & Obesogenic Environment

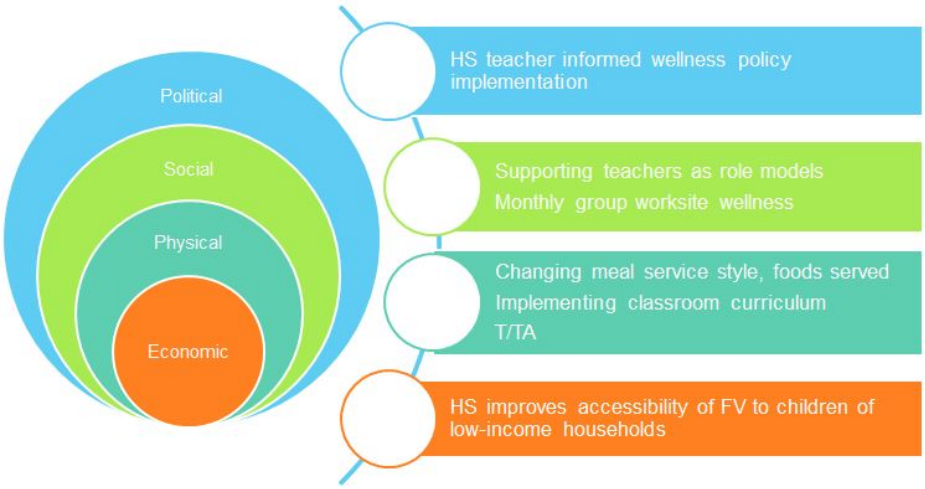
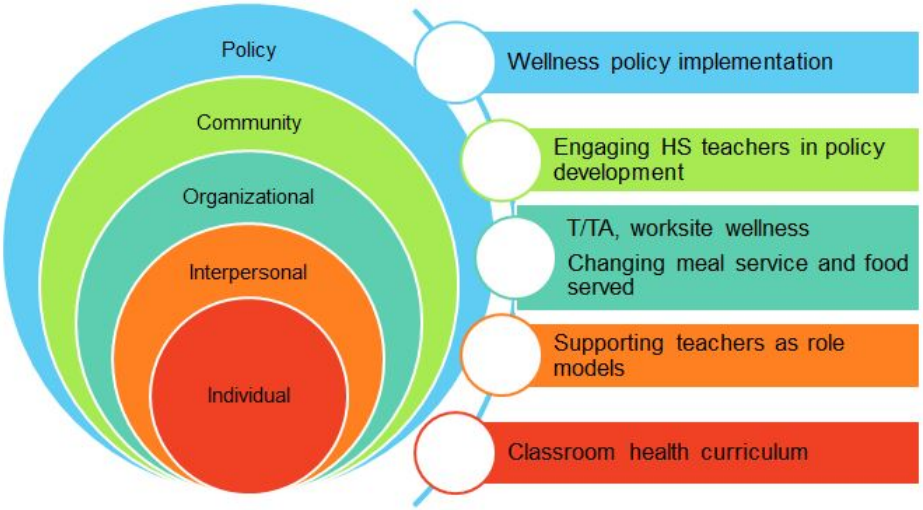


Figure 7.2 Policy intervention within social ecologic model.



Teacher Role in Intervention Effect

The findings from both manuscripts one and two underscore the vital role that HS teachers play in planning and implementing policy changes and in effectively implementing policies to create classroom environments that promote PA. Teacher priorities on child nutrition were assessed with questions such as, "In your role working with children, what priority do you put on health promotion and childhood obesity prevention?," "In your role working with children, how much time are you willing to spend encouraging healthful activity and eating in order to prevent childhood obesity?," and "How often do you communicate with parents about their child's food consumption while in your care?[11]" While the creators of this particular assessment found no correlation between teacher priority and observed obesity prevention practices in their setting [11], in this group of teachers who value their ability to role model healthy behaviors, there was a relationship. In addition to teacher priorities related to child nutrition, this study also found a significant moderating relationship between teachers' own health behaviors and status on the intervention effect. Monthly intervention activities were targeted at increasing

nutrition activities to be delivered to children in HS classrooms, and to nutrition and health education that supported teachers' improvements in eating, PA, and stress management behaviors. The intervention effect on the PA classroom environment was significantly greater when the HS teacher in that classroom reported improvements to their own health behaviors and status. This finding is in line with the qualitative finding that teachers value their ability to role model healthy behaviors and is significant for future intervention planning and development.

Potential Program-Wide Policy Implementation/Sustainability

The findings from this study support the future program-wide implementation of the intervention, with further evaluation and adjustment. Further evaluations could include follow-up focus groups with HS teachers who participated in the research study. Their feedback will continue to build the participatory nature of the project and may help to identify areas for potential improvements and strengths of the study. Further evaluation of other HS efforts for nutrition promotion and childhood obesity prevention could also be assessed. Independently of the dissertation research activities, HS has other nutrition education classes and activities that may affect childhood obesity. These activities can be incorporated into policy and added to the intervention if found effective. Findings warrant continued inclusion of employee wellness and nutrition promotion targeted at improving teacher health behaviors and child nutrition priority, which are supported by previous studies.[15] The current and previous studies all demonstrate the varying ways that HS and other preschool teachers are leverage points for creating healthy change in their classrooms. The HS teachers themselves expressed the value they place in being healthy role models to the children and families they serve, and the findings show that teachers making health improvements themselves also improve the PA environment of their classrooms.

Continued efforts to support teachers' health and wellness are needed to further strengthen their effect on childhood obesity.

Potential for BMI Monitoring System Partnership with HS

Evidence for effective childhood obesity prevention in Hawai‘i is still needed, but even more so, a system for long-term monitoring of child growth is needed for the state and US Affiliated Pacific Region. Monitoring of childhood obesity prevalence in the region and state will provide system-level evaluation of policy and program effect. As HS and other early-learning education programs are present throughout Hawai‘i and the US Affiliated Pacific region, they serve as a potential source of much needed data. While HS is already conducting bi-annual anthropometric measurements, they can programmatically serve as role models for other school settings.[16] Even though HS has not conducted any regular training or standardization for collecting height and weight measurements, the teacher assessments were not significantly different than those taken from a standardized researcher. Future assessment on the feasibility of creating a database for storing anthropometric and other nutrition-related data is needed at this time.

Further consideration of the growth reference dataset used for assessing child BMI data is also warranted. Both WHO and CDC reference data are used throughout the US Affiliated Pacific Region, depending on the reporting purposes and individual program needs. Manuscript four in this dissertation demonstrates the differences seen when one reference dataset is used over the other, with the CDC 2000 growth charts significantly underestimating child zBMI and overestimating childhood underweight when compared to WHO reference data. Further, disparities between sex and age were identified in these differences, with the difference between

CDC and WHO mean zBMI of males almost double that of the difference seen in females. Caution is necessary when choosing one reference data set over the other, as they could provide different assessments of child growth status. Most importantly, from a systems point of view a database for monitoring and surveillance of childhood obesity prevalence should contain growth assessments made with both reference data sets, as both could potentially be used in the region.

This dissertation research focused on HS center childhood obesity prevention policy development and effect, as well as the potential role of HS as a source for ongoing data monitoring in Hawai‘i and the US Affiliated Pacific Region. This research supports that HS policy interventions targeted at childhood obesity prevention should not underestimate the value of their teaching staff in the process of policy development and in implementation. Teachers are resources for planning interventions, are leverage points for effective implementation, and can contribute to program evaluation and potentially surveillance of childhood obesity through the measurements they conduct in their classrooms. HS agencies and other organizations looking to creating wellness policies to prevent childhood obesity can involve staff through focus groups, interviews, and can increase program effect by supporting HS teachers to make improvements to their own health behaviors and status. Longitudinally, HS teachers can also contribute to programmatic evaluation and ongoing monitoring and surveillance through the routine anthropometric measurements they conduct. Resources to support current and potential HS and other preschool teachers’ skills in conducting measurements, efficacy to address child BMI, and priority regarding child nutrition should be offered via training and technical assistance or made available through continuing education courses.

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APPENDIX

LIST OF APPENDICES

Appendix A. Child Care Center Policy Interventions Literature Review Table

Appendix B. Teacher Focus Group Informed Consent

Appendix C. Teacher Monthly Implementation/Child Care Provider Healthy Eating and Activity Survey Informed Consent

Appendix D. Child Informed Consent

Appendix E. Information About Your Child Form

Appendix F. Environment and Policy Assessment and Observation tool

Appendix G. Childcare Provider Healthy Eating and Activity Survey

Appendix H. Monthly Implementation Survey

Appendix I. Institutional Review Board Approval Forms for Research

APPENDIX A: Literature reviewed for Head Start Wellness Policy Intervention in Hawai‘i: A project of the Children’s Healthy Living Program (CHL)								
Program Name/ Reference	Sample Size, Age, Target Population	Study Design Intervention Duration	Intervention And Setting	Methods for Outcomes:				Results
				Diet Intake	Growth	CCC Environment	Teacher Behaviors or Beliefs	
Miranos! [79]	423 children in Head Start (HS) 21 classrooms, 3-5 y, Mexicans in Texas	Quasi Experimental; pre-post test Intervention:14 classrooms Control: 6 7 months HS	Multi-component: staff wellness, PA, curriculum (Healthy Habits for Life), Parent engagement	Weighed Plate waste (average 3 days, per classroom)	BMI z-score		Changes in teacher PA/eating behavior, health status, attitude towards implementation	- lower gain in weight z-score -0.06 ($p<0.04$) - Increase in fruit & veg consumption 0.19 svgs ($p<0.05$) * Analysis controlled for age, sex, pre-test score
Healthy-Start [104]	1, 296 children in 9 HS centers, 2-5 y, African Americans, Hispanics, Caucasian in rural New York	Quasi-experimental I1: 3 centers I2:3 centers C: 3 centers 3 y HS	Food service training and support to decrease total and saturated fat in HS meals Classroom nutrition curriculum, parent newsletters and meetings	Weighed and observed plate waste to assess intake				- Decrease in child intake of calories from saturated fat at school at 1 and 2 years in intervention vs. control (11%baseline, 10.4%, 8% vs 10.2% baseline, 13%, 11.4%), $p<0.001$

Literature review inclusion criteria: Childhood obesity interventions focused on improving nutrition, PA, sedentary behaviors, or policies that promote healthy behaviors at classroom, school, community or multi-level; targeted at children 0-5 y, delivered in child care centers, preschools or Head Start centers (n=17). Studies that were excluded did not assess child dietary intake, child anthropometry, CCC environment, or caregiver/teacher characteristics related to nutrition, PA, and/or wellness. Bolded outcomes and methods represent methods and outcomes used in current Head Start Wellness Policy Intervention project

			(3-4x/y)					
Hip-Hop to Health Jr. [80]	362 children in 12 HS centers , 2-5 y, African Americans in Chicago	RCT Intervention (I): 12 classrooms Control (C) : 12 classrooms 14 weeks	3 activities/wk: 20 minutes PA, 20 minutes Healthy eating, Weekly homework and newsletters	Parent reported diet intake	BMI z-score			Intervention saw smaller increases in BMI z-score at 1-y (-0.06 vs 0.13 p=0.024) and 2-y follow up (0.16 vs 0.021 p=0.021), fewer calories from saturated fat consumed at 1-y (11.6 v 12.8)*
Hip-Hop to Health Jr. Obesity Prevention [82]	618 children from 18 HS centers , 2-5 y, African Americans in Chicago	RCT I: 9 classrooms C: 9 classrooms 14 weeks	Teacher delivered intervention to promote PA and healthy eating	Parent reported food record and class observed intake	BMI			Change in moderate-vigorous PA was 7.46 minutes greater in intervention (p=0.02) and decreased screen time No impact on BMI or diet intake
Contra Costa County [70]	82 staff at 13 licensed child-care centers in Contra Costa	Quasi Experimental I: 6 centers C: 7 centers 10 month	Training on health and nutrition and policies for CCCs;			Frequency of serving foods & beverages to children (Researcher	Staff health behaviors & self-efficacy	Intervention: Decreased frequency of SSB consumption (-0.10 vs 0.33/d p=0.04),

Literature review inclusion criteria: Childhood obesity interventions focused on improving nutrition, PA, sedentary behaviors, or policies that promote healthy behaviors at classroom, school, community or multi-level; targeted at children 0-5 y, delivered in child care centers, preschools or Head Start centers (n=17). Studies that were excluded did not assess child dietary intake, child anthropometry, CCC environment, or caregiver/teacher characteristics related to nutrition, PA, and/or wellness. Bolded outcomes and methods represent methods and outcomes used in current Head Start Wellness Policy Intervention project

	County, CA	Intervention	Intervention also received worksite wellness			observed)	Staff perceived workplace support for healthy behaviors	Ease in engaging parents to discuss child eating improved (0.22 vs -0.31 p=0.04) and comfort in talking to parents about PA (0.20 vs -0.22 p=0.02). Improved frequency in providing fresh fruit in past y (74% vs 41% p=0.004) and fresh vegetables (64% vs 38% p=0.03) Increased likelihood to have fresh fruit at celebrations (39% vs 24% p=0.05) and decreased in SSB (7% vs 27% p=0.05) and desserts (15% vs 34% p=0.025)
Alkon NAP SACC [66]	137 staff, 552 families, 209 preschoolers	Randomized Control Trial; I: 9 centers	NAP SACC intervention protocol; policy	DOCC	BMI	EPAO	Teacher knowledge re: healthy	No change in EPAO, PA or diet

Literature review inclusion criteria: Childhood obesity interventions focused on improving nutrition, PA, sedentary behaviors, or policies that promote healthy behaviors at classroom, school, community or multi-level; targeted at children 0-5 y, delivered in child care centers, preschools or Head Start centers (n=17). Studies that were excluded did not assess child dietary intake, child anthropometry, CCC environment, or caregiver/teacher characteristics related to nutrition, PA, and/or wellness. Bolded outcomes and methods represent methods and outcomes used in current Head Start Wellness Policy Intervention project

	in 17 preschool centers in CT, CA, NC from Low-income families	C: 8 centers 7 months in licensed CCC Includes only centers with on-site kitchen	intervention, parent and teacher education, training/technical assistance, $500 for purchasing supplies/equipment				PA, nutrition	Difference in changes in BMI z-score by treatment group coefficient estimate (SE)= -0.14(0.06); 95% C.I.= (-0.26, -.0.02); p-value= 0.02
NAP SACC [65]	30 licensed CCC in 6 communities in Southern AZ	Pre-post assessment 9 month follow-up	5 step intervention: self-assessment with directors; action planning; workshops; technical assistance, grant for PA equipment; reassessment			NAP SACC (self-report by CCC director)		Median nutrition best practices increased from 25 to 30 out of 38 (p=0.0003) n=17 Median PA best practices increased from 10 to 14 out of 17 (p=0.0014) n=17 Median Total best practices increased 36 to 44 out of 54 (p=0.0003) n=17 (Bonferroni adjusted alpha=0.0167)
NAP SACC [64]	82 licensed CCC in North	RCT I: 56 centers	5 step intervention:			NAP SACC (self-report by		-11% improvement in intervention

Literature review inclusion criteria: Childhood obesity interventions focused on improving nutrition, PA, sedentary behaviors, or policies that promote healthy behaviors at classroom, school, community or multi-level; targeted at children 0-5 y, delivered in child care centers, preschools or Head Start centers (n=17). Studies that were excluded did not assess child dietary intake, child anthropometry, CCC environment, or caregiver/teacher characteristics related to nutrition, PA, and/or wellness. Bolded outcomes and methods represent methods and outcomes used in current Head Start Wellness Policy Intervention project

	Carolina	C: 26 centers 9 month follow-up	self-assessment with directors; action planning; workshops; technical assistance, grant for PA equipment; reassessment			CCC director)		classrooms (p=0.06); As Per Protocol Centers: nutrition score 8.3 to 9.6 (p=0.01)
ENHANCE [62]	72 child care providers at 45 preschool centers	Longitudinal Pilot study 12 month	Collaboration and support for providers to identify and make policy changes that promote healthful child weight & staff wellness retreat Resources and assistance were provided for support			Protocol for Mapping Policies and Practices (observation)	Child Care Provider Healthy Eating Activity (CCPHEA) survey	Improved feeding practice (+2.3 p<0.01) and teacher feeding knowledge (+1.8 P<0.01) Changes in teacher efficacy and feeding knowledge contributed to variation in nutrition education (R^2=0.59) and family communication (R^2=0.29) improvements, decrease in teacher misconceptions accounted for improved feeding practices (β=0.71;

Literature review inclusion criteria: Childhood obesity interventions focused on improving nutrition, PA, sedentary behaviors, or policies that promote healthy behaviors at classroom, school, community or multi-level; targeted at children 0-5 y, delivered in child care centers, preschools or Head Start centers (n=17). Studies that were excluded did not assess child dietary intake, child anthropometry, CCC environment, or caregiver/teacher characteristics related to nutrition, PA, and/or wellness. Bolded outcomes and methods represent methods and outcomes used in current Head Start Wellness Policy Intervention project

								$p<0.01$; $R^2=0.4$)
DECAL [69]	22 licensed CCC Southwest Georgia	Intervention trial 15 months	Training & technical assistance, resources for caregivers on adoption and implementation wellness practices Centers applied for mini-grants to participate			EPAO (Observed)		Improvement in nutrition environment scores (+3.6/20, $p<0.001$), nutrition training & education (+8.5/20, $p<0.001$), active play (+2.1/20, $p<0.02$),
Romp n Chomp [67]	Children, n=11,898 baseline; n=15, 451 follow=up, 0-5 y, in 33 preschools in Australia	Repeated Cross-sectional,	Community-based intervention trial Promoted environmental changes to support healthy eating, health promotion and PA Preschool and long day care centers	Parent reported diet	BMI %tile BMI category	Nutrition & PA (self-report)		Intervention communities had increased frequency of centers having a policy & number of policy items addressing nutrition/PA. 2.5 percentage point decrease in ow/ob prevalence in 2 y. olds, 3.4 in 3.5 y. olds 3.5 y olds decrease in ow/ob. ($p<0.05$) Behaviors: increased veg and

Literature review inclusion criteria: Childhood obesity interventions focused on improving nutrition, PA, sedentary behaviors, or policies that promote healthy behaviors at classroom, school, community or multi-level; targeted at children 0-5 y, delivered in child care centers, preschools or Head Start centers (n=17). Studies that were excluded did not assess child dietary intake, child anthropometry, CCC environment, or caregiver/teacher characteristics related to nutrition, PA, and/or wellness. Bolded outcomes and methods represent methods and outcomes used in current Head Start Wellness Policy Intervention project

								fruit baseline to follow up r=0.41 and 0.52 (p<0.001)
Be Active Eat Well [105]	Australia 4-12 y olds in preschool and elementary.	Quasi-Experimental; non-randomized longitudinal data with comparison community I: 835 C: 977	Community based participatory project: multi-strategy/settings: including affecting school PA/food environment, curriculum training for teachers, social marketing, etc	Parent reported eating and PA behaviors	BMI z-score	School Environment assessed (observed)		Intervention greater decrease in BMI z-score 0.085 (p=0.03) over 2 y No effect between F and V intake and BMI z-score.
Fisher, et al, 2012 [78]	153 children, in HS classrooms, 2-5 y, Hispanics	Quasi-experimental Randomized cross-over 7 weeks	Children categorized as sensitive to bitter taste or not; Broccoli given to HS children in four conditions: plain, with regular salad dressing, with light dressing for dip or mixed with regular	Mean weight of broccoli consumption; plate waste Child reported "liking" of broccoli				Child reported liking of broccoli increased following exposure but did not vary by dip condition or bitter sensitivity Bitter sensitive children (70% of sample) ate 80% more broccoli with any type of dressing vs plain (p<0.001)

Literature review inclusion criteria: Childhood obesity interventions focused on improving nutrition, PA, sedentary behaviors, or policies that promote healthy behaviors at classroom, school, community or multi-level; targeted at children 0-5 y, delivered in child care centers, preschools or Head Start centers (n=17). Studies that were excluded did not assess child dietary intake, child anthropometry, CCC environment, or caregiver/teacher characteristics related to nutrition, PA, and/or wellness. Bolded outcomes and methods represent methods and outcomes used in current Head Start Wellness Policy Intervention project

			dressing as a sauce					
Herman, 2012[81]	Staff n=496 Parents n=438 Children n=112 from 6 HS agencies in 5 states, Caucasians	6 month intervention Pre-post within group comparison	Pilot study "Eat Health, Stay Active" coordinated child/parent/teacher curriculum based program to promote healthy nutrition and PA; theoretical basis- CBPR, social learning theory	Diet and PA questionnaire for parents and staff on knowledge and behavior	BMI adult and child, measured by trained HS staff			BMI reduction adults: mean=30.1 to 29.2, p<0.001, child: mean 17 to 16.6, p<0.001) Decreased proportion of obesity adults: 45 to 40% P<0.001, child: 30 to 21% p<0.001
Namenek, 2013[77]	4 licensed CCC in North Carolina	RCT 4 month pilot intervention	Garden-based CCC curriculum "watch me grow" including installing garden at centers and providing supplies and plants Monthly activities, Training/	DOCC Mean servings of fruit and vegetables served and consumed				Fewer vegetables were served at control and intervention centers post-intervention (-0.37 and -0.18), children at intervention centers consumed more of vegetables offered 0.25 vs -0.18) at post-intervention but fruit consumption

Literature review inclusion criteria: Childhood obesity interventions focused on improving nutrition, PA, sedentary behaviors, or policies that promote healthy behaviors at classroom, school, community or multi-level; targeted at children 0-5 y, delivered in child care centers, preschools or Head Start centers (n=17). Studies that were excluded did not assess child dietary intake, child anthropometry, CCC environment, or caregiver/teacher characteristics related to nutrition, PA, and/or wellness. Bolded outcomes and methods represent methods and outcomes used in current Head Start Wellness Policy Intervention project

			technical assistance from health educator Gardener consultation					was higher in control centers following the intervention (0.15 vs -0.32) Crude analysis only
Witt, 2012 [106]	263 children 17 preschool classrooms in Texas	RCT 6 week intervention pre-post assessment at 1 week and 3 weeks post-intervention	Color Me Health curriculum; weekly lessons focused on fruits and vegetables Assessed intervention effect, process evaluation for fidelity	Weighed plate waste to assess fruit and vegetable consumption at snack				20.8% increase in fruit consumption and 33.1% in vegetable consumption for children who participated in intervention. Hierarchical linear modeling sound that group assignment was only predictor of fruit/veg consumption
Zask, 2012[71]	560 children from 31 preschools in Australia	RCT 10 month intervention C: 13 preschools I: 18 preschools	PA intervention- structured bi-weekly; playground environment with grants; parent workshops	Lunchbox audit	BMI			Intervention children had more fruit and veg servings (0.63, P=0.001); less likely to have unhealthy food items; decreased BMIz- -0.15,

Literature review inclusion criteria: Childhood obesity interventions focused on improving nutrition, PA, sedentary behaviors, or policies that promote healthy behaviors at classroom, school, community or multi-level; targeted at children 0-5 y, delivered in child care centers, preschools or Head Start centers (n=17). Studies that were excluded did not assess child dietary intake, child anthropometry, CCC environment, or caregiver/teacher characteristics related to nutrition, PA, and/or wellness. Bolded outcomes and methods represent methods and outcomes used in current Head Start Wellness Policy Intervention project

			Nutrition: review and adjust food and nutrition policies on appropriate lunchbox foods; policy communication with parents, parent workshops and education, staff role modeling					p=0.022

Literature review inclusion criteria: Childhood obesity interventions focused on improving nutrition, PA, sedentary behaviors, or policies that promote healthy behaviors at classroom, school, community or multi-level; targeted at children 0-5 y, delivered in child care centers, preschools or Head Start centers (n=17). Studies that were excluded did not assess child dietary intake, child anthropometry, CCC environment, or caregiver/teacher characteristics related to nutrition, PA, and/or wellness. Bolded outcomes and methods represent methods and outcomes used in current Head Start Wellness Policy Intervention project

APPENDIX B. TEACHER FOCUS GROUP CONSENT FORM

CONSENT FORM

AGREEMENT TO PARTICIPATE IN A FOCUS GROUP

Description

The purpose of the Focus Group is to hear your thoughts and opinions about how to best implement new child care center wellness policies with the goal to improve overall health and dietary habits of preschool children. This Focus Group is a component of the Hawai'i Childcare Center Wellness Policy Implementation Project a student research project funded by the Children's Healthy Living Program for Remote Underserved Minority Populations in the Pacific Region (CHL). The goal of the CHL program is to promote environments that promote active play and intake of healthy food to prevent young child obesity across the Pacific Region. More information on CHL can be found at www.chl-pacific.org. Themes identified from these groups will be used in planning new childcare center policies. All information that will identify you will be strictly confidential. All tapes and written records from this Focus Group will be kept in a locked box during transportation and stored in a locked cabinet.

Procedure

You will be asked to meet with a group of 6 to 10 other childcare providers, preschool teachers and/or teacher's assistants at a time and location convenient to the group. Two to three researchers will be present during the focus group. One researcher will be the primary facilitator, asking a series of questions regarding wellness policies and healthy eating, the other two researchers will be responsible for recording the conversation in writing as well as on flip chart paper. The focus group is expected to last 2 hours.

Compensation

For your time and attendance you will receive a $15 gift card to Long's Drugs.

Risks

While your participation poses minimal safety risk, discussions on topics regarding health and healthy eating can sometimes cause emotional discomfort. If at anytime the focus group questions cause discomfort, you may cease participation.

Consent

I understand that I will be asked to share some personal information on a short questionnaire prior to the Focus Group. I also understand that as a participant in this Focus Group, I will be asked for my thoughts

and opinions about how to best implement new childcare center wellness policies with the goal to improve overall health and dietary habits of preschool children.

I understand that the Focus Group will be recorded, but my name will not appear in any written or oral report. All information that would identify me would be strictly confidential. All tapes and written records from this Focus Group will be kept in a locked file and destroyed on December 2014, the end of the project.

I understand that I have the right to refuse to respond to any part of the discussion or questionnaire and that I may at any time withdraw from the Focus Group.

Certification

I consent to participate in this Focus Group.

Signature

_____ _____ _____

Print Name Signature Date

A copy of this consent form will be given to you.

If you have any questions following this Focus group, please call Monica K. Esquivel at this phone number (808) 989-2459, Dr. Rachel Novotny at (808) 956-3848 or the University of Hawaii Human Studies Program at (808) 956-5007.

APPENDIX C. TEACHER SURVEY INFORMED CONSENT

CONSENT FORM

AGREEMENT TO COMPLETE TEACHER SURVEY

Description

The purpose of the Child Care Provider Healthy Eating and Activity Survey is to understand your beliefs, attitudes, priority, and knowledge as it relates to child nutrition and your role as a childcare provider or preschool teacher. This survey is a component of the Hawai'i Childcare Center Wellness Policy Implementation Project a student research project funded by the Children's Healthy Living Program for Remote Underserved Minority Populations in the Pacific Region (CHL). The goal of the CHL program is to promote environments that promote active play and intake of healthy food to prevent young child obesity across the Pacific Region. More information on CHL can be found at www.chl-pacific.org. Knowledge gained from this survey will help us to understand the role that preschool teachers play in child nutrition and wellness. All information that will identify you will be strictly confidential. The surveys will be kept in a locked box during transportation and stored in a locked cabinet.

Procedure

You will be asked to complete the survey on two occasions, Spring-Fall 2013 and Spring 2014. The survey should take no more than 20 to 30 minutes to complete.

Compensation

For your time and attendance you will receive a $5 gift card to Long's Drugs.

Risks

While your participation poses minimal safety risk, questions on topics regarding health and healthy eating can sometimes cause emotional discomfort. If at anytime the survey questions cause discomfort, you may stop participating.

Consent

I understand that I will be asked to share some personal information on a short questionnaire prior to the survey. I also understand that by completing the survey, I will be asked to rate my beliefs, attitudes, priority, and knowledge related to child nutrition.

I understand that all information that will identify me will be strictly confidential. All surveys from this project will be kept in a locked file.

I understand that I have the right to refuse to respond to any questions and that I may at any time cease completing the survey..

Certification

I consent to complete the survey.

Signature

_____ _____ _____

Print Name Signature Date

A copy of this consent form will be given to you.

If you have any questions following this survey, please call Monica K. Esquivel at this phone number (808) 989-2459, Dr. Rachel Novotny at (808) 956-3848 or the University of Hawaii Human Studies Program at (808) 956-5007.

APPENDIX D. CHILD PARTICIPATION CONSENT FORM

Consent Form

Study Title: Hawaii Childcare Center Wellness Policy Implementation Project

Principal Investigator: Monica Esquivel MS RD

Funded by: United States Department of Agriculture (USDA), National Institute of Food and Agriculture (NIFA).

Your child is being asked to be in a health research study about preschool wellness policies, nutrition and physical activity. This form tells you about the study. Please read the information below. Ask questions about anything you don't understand before you decide whether or not to be in the study. A member of the research team will explain the study to you and answer your questions.

Why is this study being done?

The goal of this study is to evaluate how preschool wellness policies effect what children eat, how much physical activity they do and how they grow. This study will measure the amount of food your child eats at a Head Start meal and collect information on the weight and height of your child and their classmates at Head Start.

How many people are in this study?

We plan to study about 360 children enrolled in 24 Head Start classrooms for the 2013-2014 program year.

What happens if your child joins this study?

If your child joins the study, your child will be asked if he or she is willing to be measured for weight and height on two occasions, August-September 2013 and April-May 2014.

You (parent/caregiver) will be asked to complete several forms about you and your child. The forms ask questions about your child's age, ethnicity, and the amount of time they spend watching TV or playing video games. You will be given directions on how to complete the forms. The first meeting will take about 30 minutes. You will be contacted in the future, Spring 2014, to complete the form on about your child's TV and video game habits. This will take 5-10 minutes to complete.

Lastly, a researcher will observe how much food and beverage your child consumes at one Head Start meal on two occasions. A researcher will also weigh your child's lunch plate before and after they eat to measure how much food they consume on the same day.

What are the possible discomforts or risks?

The risks to you for taking part in this study are small. As a result of being part of this study, you may feel a loss of privacy about your child's measurements and other questions asked. You could feel a bit of embarrassment about the measures or questions.

What are the possible benefits of the study?

This study is to learn more about how preschool policies affect young children's eating, drinking and screen time habits. The information you and your child give will help us to learn how to better promote health to young people. Some children feel good about helping with something important. By understanding the effect of these policies they can be promoted in other Head Start classrooms and childcare centers to improve the health of other young children. In addition by being a part of the study you will be provided information on your child's growth status, as well as their future health risks.

This study will not treat any illness.

Compensation

For your time and attendance you will receive a $5 gift card to Long's Drugs.

Who is paying for this study?

This research is being paid for by a grant from the United States Department of Agriculture (USDA), National Institute of Food and Agriculture (NIFA).

Do I have to pay for anything?

There is no cost for you or your child to be in the study.

Who will see my research information?

The Principal Investigator and the other researchers who work on this project may have access to the information you give. By law we are required to keep your information confidential. Most of your information will only have an ID number without a name. Your records may also be reviewed for an audit by the University of Hawai‘i (UH) Committee on Human Studies employees, USDA or other agents, who must follow the same rules of confidentiality.

The forms you complete and the forms where we note your child's weight, height and food intake will be kept by ID (identification) number only and will not have any names or other identifying information. You and your child's name and contact information and consent form will be stored and transported separately from the rest of the information we collect. All data will be kept in a password-protected file and any paper forms like the consent forms will be kept in a locked file cabinet in a room which will be locked when not in use. We will look at your information to contact you again to fill out forms in the Spring 2014 and we will check to see how your child's information changed over time.

A researcher will bring your information to the University of Hawaii at Manoa and it will be stored privately and safely there.

We plan to talk about the results of this study at community and scientific meetings and to print the results of this research study. The results will be printed as group data without identifying any of your individual information.

Is my participation voluntary?

Taking part in this study is voluntary. You have the right to choose that your child not be in this study. If you allow your child to be in the study, you and your child have the right to stop at any time, not answer a question, or not do some part of the study. If you don't join the study or if you stop being in the study, you or your child will not lose any benefits or rights.

Who do I call if I have questions?

You may ask any questions you have now. If you have questions, concerns, or complaints later, you may call Monica Esquivel, Principal Investigator at (808)989-2459 or Dr. Rachel Novotny, her advisor at (808) 956-3848. You will be given a copy of this form to keep.

You may have questions about your or your child's rights as someone in this study. You can ask the people listed above, or you can also call the University of Hawai‘i Human Studies Program at (808) 956-5007 or Email them at uhirb@hawaii.edu (1960 East-West Road, Biomedical Building, Room B-104, Honolulu, HI).

Agreement to be in this study

I have read this paper about the study, or it was read to me. I understand the possible risks and benefits of this study. I understand that if I am injured in the course of this research, I alone may be responsible for the costs of treating my injuries.

I know that being in this study is voluntary. I choose for my child and me to participate in this Hawaii Childcare Center Wellness Policy Implementation Project study.

Signature:_____ Date:_____

Parent / Guardian / Legal representative

Print Name:_____

Child's Name: _____

_____ Date:_____

Signature of person obtaining consent

APPENDIX E. INFORMATION ABOUT YOUR CHILD FORM

INFORMATION ABOUT YOUR CHILD

Parent, Guardian OR Caretaker: Please complete entire form.

SEX (Circle One)	BIRTHDATE			AGE In Years
	Month	Day	Year	
Boy Girl			20_ _	

CHILD INFORMATION

1.	Do you consider your child to be of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish cultural heritage?		
☐	Yes	☐	No

Which category(s) below best describes your child?

2. You may check (✓) <u>more than one box</u>.

☐ **Black or African American-** A person having origins of any of the original peoples of Africa.

☐ **White** - A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

☐ **American Indian or Alaska Native -** A person having origin in any of the original peoples of North or South America (including Central America), and who maintains tribal affiliation or community attachment.

Please specify the one(s) you most identify with (*check all that apply*):

☐ Athabascan ☐ Siberian

☐ Cup'ik ☐ Yup'ik

☐ Inupiaq ☐ Other *(please describe)*_____

☐ **Asian**

Please specify the one(s) you most identify with (*check all that apply*):

☐ Cambodian ☐ Japanese ☐ Pakistani

☐ Chinese ☐ Korean ☐ Thai

☐ Filipino ☐ Malaysian ☐ Vietnamese

☐ Indian ☐ Other *(please describe)* _____

☐ **Native Hawaiian or other Pacific Islander:**

Please specify the one(s) you most identify with: (*check all that apply*):

☐ Chamorro	☐ Kosraean	☐ Pohnpeian	☐ Tokelaun
☐ Carolinian	☐ Marshallese	☐ Samoan	☐ Tahitian
☐ Chuukese	☐ Native Hawaiian	☐ Tongan	☐ Yapese
☐ Kiribati	☐ Palauan	☐ Other *(please describe)* _____	

Thank you!

APPENDIX F. ENVIRONMENT AND POLICY ASSESSMENT AND OBSERVATION TOOL

8818607480

EPAO Observation

Center Name

Date of Observation: ☐☐ / ☐☐ / ☐☐☐☐ (month / day / year)

Observer ID#: ☐☐

Start time: ☐☐ : ☐☐

Number of children in classroom: ☐☐

Ages of children: *[Mark all that apply]*

○ 1 ○ 4
○ 2 ○ 5
○ 3 ○ 6

Eating Occasions Observed: *[Mark all that apply]*

○ Breakfast
○ AM Snack
○ Lunch
○ PM Snack

Total Physical Activity occasions observed: ☐☐

End time: ☐☐ : ☐☐

Initials of Teacher Observed

Weather:

Eating Occasions - Foods

1. How was **breakfast** served? *[Choose one.]*

   ○ family style
   ○ delivered and served in prepared portions
   ○ delivered in bulk and portioned by staff
   ○ N/A

2. How was **a.m. snack** served? *[Choose one.]*

   ○ family style
   ○ delivered and served in prepared portions
   ○ delivered in bulk and portioned by staff
   ○ N/A

3. How was **lunch** served? *[Choose one.]*

   ○ family style
   ○ delivered and served in prepared portions
   ○ delivered in bulk and portioned by staff
   ○ N/A

1 of 21

EPAO Observation

4. How was **p.m. snack** served? *[Choose one.]*

   ○ family style
   ○ delivered and served in prepared portions
   ○ delivered in bulk and portioned by staff
   ○ N/A

5. How many times was **fruit** served the day of observation?

   ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

6. How many times was **fruit** served fresh, frozed or canned in own juice the day of observation?

   ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

7. How many times was **100% fruit juice** served the day of observation?

   ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

8. How many times were **vegetables** (not including French fries or fried vegetables) served the day of observation?

   ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

9. How many times were **dark green, red, orange or yellow vegetables** served the day of observation?

   ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

10. Was **margarine, butter, or meat fat** visible on vegetables?

    ○ yes
    ○ no → 10a. According to staff, during the day of observation were vegetables prepared with added fat? ○ yes ○ no ○ unsure
    ○ no vegetables served

1863607483

EPAO Observation

11. Are vegetables **typically** served with added fat? (ask classroom staff or cook) ○ yes ○ no ○ unsure

12. How many times were **fried or pre-fried vegetables** (e.g., tator tots, french fries, fried okra, fried zucchini and hashbrowns) served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ other → [ ][ ]

13. How many times were **fried or pre-fried meats** (e.g., chicken nuggets, fish sticks) served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ other → [ ][ ]

14. How many times were **high fat meats** (e.g., ground beef, bologna, hotdogs, ham) served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ other → [ ][ ]

15. How many times were **lean meats/fish** (e.g., baked chicken or turkey breasts, baked fish, deli turkey, tuna and salmon) served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ other → [ ][ ]

16. How many times were **beans/lentils** served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ other → [ ][ ]

17. How many times were **high sugar and/or high fat foods(not condiments)** served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

18. How many times were **high sugar and/or high fat condiments** served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

19. How many times were **high fiber grains** served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

EPAO Observation

Eating Occasions - Beverages

20. Was drinking water for children visible in the classroom?

○ yes → 20a. How accessible was drinking water to children in the classroom?

○ available for self-serve (child-level fountain or pitcher/cups on table)

○ available by request only

○ no

↓

↓

20b. If no, is there a water fountain in a nearby hallway?

○ yes → 20b_1. How accessible is this fountain to children?

○ available by request only (must ask permission to leave classroom)

○ during teacher-designated water breaks

○ no

21. Did you witness teachers prompting children throughout the day to drink water?

○ yes, regularly (multiple times throughout the day, not just specific occasions such as coming in from outdoor play)

○ yes, at specific times only (such as coming in from outdoor play)

○ no

22. How many times were **sugar drinks** (Kool-aid, sports drinks, sweet tea, punch, sodas) served the day of observation?

○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

23. How many times was **milk** served the day of observation?

○ 0 ○ 1 ○ 2 ○ 3 ○ other → [ ][ ]

24. What type of **milk** was served **to the majority** of children at a majority of meals? *[Mark only one.]*

○ Whole	○ Skim	○ Rice milk
○ 2%	○ Whole, flavored	○ Soy milk
○ 1%	○ Lower fat, flavored (2%, 1%, skim)	○ Lactaid

EPAO Observation

25. Note other types of **milk** served to **selected** children: *[Mark all that apply.]*

○ Whole	○ Skim	○ Rice milk
○ 2%	○ Whole, flavored	○ Soy milk
○ 1%	○ Lower fat, flavored (2%, 1%, skim)	○ Lactaid

Eating Occasions - Staff Behavior

26. Did staff push children to eat more than they want to (e.g., clean your plate, you won't get dessert until you finish lunch)?

○ yes → 26a. How many eating occasions was the behavior observed?
○ no ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

27. Did staff serve children second helpings without being asked for more by the child (see an empty plate and add food without request by child)?

○ yes → 27a. How many eating occasions was the behavior observed?
○ no ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

28. Did staff positively and gently encourage children to try new or less favorite foods?

○ yes → 28a. How many eating occasions was the behavior observed?
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

○ no (children resisted eating but were not encouraged)

○ no children resisting eating observed

29. Was food used to control behavior?

○ yes → 29a. How many eating occasions was the behavior observed?
○ no ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

EPAO Observation

30. Did staff sit with children during lunch?

O yes → 30a. Did staff consume the same food as children? → O yes O no

O no

31. Did staff eat and/or drink less healthy foods in front of children?

O yes → 31a. How many meals? O 1 O 2 O 3 O 4 O 5 O other → [ ][ ]

O no

O did not observe staff eating

32. Did staff talk with children about healthy foods?

O yes → 32a. How many separate times did you observe staff talking to children about healthy foods? O 1 O 2 O 3 O 4 O 5 O other → [ ][ ]

O no

33. Was any **formal** nutrition education for children observed?

O yes O no

Physical Activity - Child Behaviors

34. How many minutes of total active play time was observed (includes indoor, outdoor, structured and unstructured)?

[ ][ ][ ]
minutes

35. Was structured physical activity observed?

O no

O yes ↓

35a. How many occasions? O 1 O 2 O 3 O 4 O 5 O other ↓ [ ][ ]

35b. Total minutes of structured PA observed: [ ][ ][ ]
minutes

35c. Was the structured PA optional for children? O yes O no

EPAO Observation

36. Did you observe any outdoor active play?

○ yes → 36a. How many times/day? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

○ no → 36b. Was it due to weather (too hot, too cold, rain/snow)?

○ yes ○ no ○ unsure

37. How many total minutes of outdoor active play (structured and unstructured) was observed?

[ ][ ][ ]
minutes

38. Was drinking water for children available outdoors?

○ yes ○ no ○ no outdoor time observed → 38a. Did you see a drinking fountain located in the outdoor play area? ○ yes ○ no

39. While outdoors, did you witness teachers prompting children to drink water?

○ yes ○ no ○ no outdoor time observed

Sedentary Activities - Child

40. Did you observe children seated for more than 30 minutes at a time (excluding nap and meal times)?

○ yes → 40a. How many times/day? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

○ no

40b. How many total minutes of seated activity (majority of the class seated) was observed?

[ ][ ][ ]
minutes

EPAO Observation

41. Was a TV present in the room? ○ yes ○ no

42. Was TV viewing observed?

○ yes → 42a. Total minutes TV was on: [ ][ ][ ] *minutes*

○ no

42b. Was it on during meals? ○ yes → 42b_1. If yes, how many meals? ○ 1 ○ 2 ○ 3 or more

○ no

42c. Was the TV used only for viewing educational programs? ○ yes ○ no

43. Was a VCR/DVD present in the room? ○ yes ○ no

44. Was there a video game system present in the room? ○ yes ○ no

45. Was a computer present in the room for use by children? ○ yes ○ no

46. Was video game or computer game playing observed?

○ yes → 46a. Total number of minutes computer/video game playing was observed: [ ][ ][ ] *minutes*

○ no

46b. Was it being used for educational purposes only? ○ yes ○ no

46c. How many total children participated in computer/video game playing during the entire day? [ ][ ] *# of children*

EPAO Observation

Physical Activity - Staff Behaviors

47. Did you observe restricting active play as punishment?

○ yes → 47a. How many times/day? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

○ no

48. Did staff join in active play?

○ yes → 48a. How many times/day? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

○ no

49. How many positive statements were made about physical activity (e.g., Good throw!, Running is fun!, I like the way you threw that ball!)?

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

50. Did staff provide prompts to **increase** physical activity (e.g., Can you jump higher?, Can you hop on one foot?)?

○ yes → 50a. How many times/day? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

○ no

51. Did staff provide prompts to **decrease** physical activity (e.g., Slow down!, Give it a rest! Don't climb on the slide!)?

○ yes → 51a. How many times/day? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

○ no

52. Were any **formal** physical education lessons for children observed? ○ yes ○ no

53. Were any extra-curricular (special) physical activity programs provided to children on a fee basis (e.g., Tumbling Tots, Tumble Bus)?

○ yes → 53a. Were any active alternatives provided for those children that did not participate? → ○ yes ○ no

○ no

EPAO Observation

Center Environment

54. Where were soda and other vending machines located?

- ○ in entrance or front
- ○ in public areas, but not the entrance →
- ○ out of sight of parents and kids
- ○ no vending machines on site

54a. Did they contain only healthy options (e.g., water, milk, 100% fruit juice, granola bars, pretzels, nuts)? →
- ○ yes
- ○ no

Please indicate where these pieces of physical activity equipment (both fixed and portable) were located:

55. Fixed Play Equipment	***indoors only***	***outdoors only***	***both indoors & outdoors***	***not present***
a. balancing surfaces (balance beams, boards, etc.)	○	○	○	○
b. basketball hoop	○	○	○	○
c. climbing structures (jungle gyms, ladders, etc.)	○	○	○	○
d. merry-go-round	○	○	○	○
e. pool	○	○	○	○
f. sandbox	○	○	○	○
g. see-saw	○	○	○	○
h. slides	○	○	○	○
i. swinging equipment (swings, rope, etc.)	○	○	○	○
j. tricycle track	○	○	○	○
k. tunnels	○	○	○	○

EPAO Observation

56. Portable Play Equipment	indoors only	outdoors only	both indoors & outdoors	not present
a. ball play equipment	○	○	○	○
b. climbing structures (ladders, jumble gyms, etc.)	○	○	○	○
c. floor play equipment (tumbling mats, carpet squares, etc.)	○	○	○	○
d. jumping play equipment (jump ropes, hula hoops)	○	○	○	○
e. parachute	○	○	○	○
f. push/pull toys (wagon, scooters, etc.)	○	○	○	○
g. riding toys (tricycles, cars, etc.)	○	○	○	○
h. rocking & twisting toys (rocking horse, sit-n-spin, etc.)	○	○	○	○
i. sand/water play toys (buckets, scoops, shovels, etc.)	○	○	○	○
j. slides	○	○	○	○
k. twirling play equipment (ribbons, scarves, batons, etc.)	○	○	○	○

57. Was outdoor running space . . .

- ○ unobstructed with plenty of space for groups games (tag, red rover, etc.)
- ○ some obstruction, but space was adequate for individual play (running, skipping, etc.)
- ○ plenty of space for play, but obstructed with play equipment
- ○ little running space or completely obstructed

58. Did staff limit or restrict outdoor play area in a way that substantially affect active play (more than 1/3 of total play space or quipment)?

○ yes → 57a. How many outdoor play occasions? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → [ ][ ]

○ no

EPAO Observation

59. Was indoor play space suitable for . . .

- ○ quiet play (classroom is small and not a lot of room for movement)
- ○ limited movement/some active play (able to translocate by walking, skipping, hopping, jumping, etc.)
- ○ all activities (easily able to perform all gross motor activities)

60. Were any posters, pictures or displayed books about **physical activity** present in the observation room?

○ yes → 60a. How many were present? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other [ ][ ]

○ no

61. Were any posters, pictures or displayed books about **nutrition** present in the observation room?

○ yes → 61a. How many were present? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other [ ][ ]

○ no

EPAO Document Review

2689175402

Date of Assessment: ☐☐ / ☐☐ / ☐☐☐☐
month day year

ID#: ☐☐

Section 1: Menu Review - Observed Foods & Beverages

Fruits and Vegetables

1. Fruit (not juice):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times does fruit appear on the menu ***for the day of observation*** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ ☐☐

b. Is menu consistent with observation for type served?

○ yes ○ no ○ type not specified on menu

c. How many total times does fruit appear on the menu ***for that full week?*** ☐☐

2. Vegetables (not including fried or prefried vegetables):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do vegetables appear on the menu ***for the day of observation*** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ ☐☐

b. Is menu consistent with observation for type served?

○ yes ○ no ○ type of vegetable not specified on menu

c. How many total times do vegetables appear on the menu ***for that full week?*** ☐☐

3. Dark green, red, orange, or yellow vegetables:

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do vegetables (dark green, red, orange or yellow) appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ ☐☐

b. Is menu consistent with observation for type served?

○ yes ○ no ○ type of vegetable not specified on menu

c. How many total times do dark green, red, yellow or orange vegetables appear on the menu ***for that full week?*** ☐☐

4. Added fat for cooked vegetables:

a. Is added meat fat, margarine, or butter specified on the menu for cooked vegetables?

○ yes ○ no → a1. How many total times does it appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ [ ][ ]

b. How many total times do vegetables **with added fat** appear on the menu ***for that full week?*** [ ][ ]

Fried Foods and High Fat Meats

5. Fried or pre-fried meats (chicken nuggets) or fish (fish sticks):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do fried or pre-fried meats appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ [ ][ ]

b. Is menu consistent with observation for type served?

○ yes ○ no

c. How many total times do fried or pre-fried meats appear on the menu ***for that full week?*** [ ][ ]

6. Fried or pre-fried vegetables (French fries, tater tots, hash browns, fried okra):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do fried or pre-fried vegetables appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ [ ][ ]

b. Is menu consistent with observation for type served?

○ yes ○ no

c. How many total times do fried or pre-fried vegetables appear on the menu ***for that full week?*** [ ][ ]

7. High fat meats (sausage, bacon, hot dogs, bologna, ground beef):

a. Is menu consistent with observation for frequency served?

○ yes ○ no → a1. How many total times do high fat meats appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ [ ][ ]

b. Is menu consistent with observation for type served?

○ yes ○ no

c. How many total times do high fat meats appear on the menu for ***that full week?*** [ ][ ]

8. Lean meats (baked or broiled chicken, turkey or fish):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do lean meats appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ [ ][ ]

b. Is menu consistent with observation for type served?

○ yes ○ no

c. How many total times do lean meats appear on the menu ***for that full week?*** [ ][ ]

9. Beans/Lentils:

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do beans/lentils appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ [ ][ ]

b. Is menu consistent with observation for type served?

○ yes ○ no

c. How many total times do beans/lentils appear on the menu ***for that full week?*** [ ][ ]

Beverages

10. 100% fruit juice:

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times does 100% fruit juice appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ [ ][ ]

b. Is menu consistent with observation for type served?

○ yes ○ no

c. How many total times does 100% fruit juice appear on the menu ***for that full week?*** [ ][ ]

11. Sugar drinks (Kool-aid, sports drinks, sweet tea, punches, soda) other than 100% fruit juice:

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do sugar drinks appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ [ ][ ]

b. Is menu consistent with observation for type served?

○ yes ○ no

c. How many total times do sugar drinks appear on the menu ***for that full week?*** [ ][ ]

12. Milk:

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times does milk appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ [ ][ ]

b. Is menu consistent with observation for type served?

○ yes ○ no ○ type not specified on menu

c. How many total times does milk appear on the menu ***for that full week?*** [ ][ ]

d. What type is indicated on the menu as ***"usually"*** served?

○ Whole	○ Skim	○ Rice milk
○ 2%	○ Whole, flavored	○ Soy milk
○ 1%	○ Lower fat, flavored (2%, 1%, skim)	○ Type not specified on menu

Menus and Variety

13. Menus include high fiber grain foods (whole wheat bread, oatmeal, brown rice, Cheerios):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do high fiber grain foods appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ [ ][ ]

b. Is menu consistent with observation for type served?

○ yes ○ no

c. How many total times do high fiber grain foods appear on the menu ***for that full week?*** [ ][ ]

Meals and Snacks

14. High sugar and/or high fat foods (not including condiments):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do high sugar and/or high fat foods appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ [ ][ ]

b. Is menu consistent with observation for type served?

○ yes ○ no

c. How many total times do high sugar and/or high fat foods appear on the menu ***for that full week?*** [ ][ ]

15. High sugar and/or high fat condiments:

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do high sugar and/or high fat condiments appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ [ ][ ]

b. Is menu consistent with observation for type served?

○ yes ○ no

c. How many total times do high sugar and/or high fat condiments appear on the menu ***for that full week?*** [ ][ ]

Section 2: Menu Review - Weekly Menus

Menus and Variety

16. Weekly menus include foods from a variety of cultures:

a. How many times are foods from a different culture present on the menu ***for the observation week*** only?

○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ other → [ ][ ]

Section 3: Guideline Reviews

Foods offered outside of regular meals and snacks

17. Does the center have written guidelines addressing holiday/celebration foods?

○ yes → a. If yes, are healthier items encouraged? ○ yes ○ no

○ no

○ no documents received from center

18. Did you review past/future fundraising projects or guidelines?

○ yes → a. If yes, how many were non-food only?
- ○ all
- ○ more than half
- ○ half
- ○ less than half
- ○ none

○ Center guidelines do not address the type of fundraising, or fundraising at all

○ Center doesn't do fundraising

Nutrition Policy

19. Does the center have a written policy on nutrition and food service?

○ yes → a. If yes, what areas of NAP SACC are covered? *[Mark all that apply.]*
- ○ F&V
- ○ Fried food
- ○ High fat meats
- ○ Beverages
- ○ Menus and variety
- ○ Meals and snacks
- ○ Foods offered outside of reg meals & snacks
- ○ Support for healthy eating
- ○ Nutrition education

○ no

○ no documents received from center

Play Environment

20. Did you review any documentation of safety checks?

- ○ yes → a. If yes, frequency of checks:
  - ○ only when installed
  - ○ once a week
  - ○ once a year
  - ○ other →
  - ○ once a month
- ○ no

Center Physical Activity Policy

21. Does the center have written policy on physical activity?

- ○ yes → a. If yes, what areas of NAP SACC are covered? *[Mark all that apply.]*
  - ○ Active play and inactive time
  - ○ Supporting PA
  - ○ TV use and TV viewing
  - ○ PA education
  - ○ Play environment
- ○ no
- ○ no documents received from center

Section 4: Training & Curriculum Review

Nutrition Education for Children, Parents and Staff

22. Does the center provide nutrition training for staff?

- ○ yes → a. If yes, how often?
  - ○ 2 times/year or more
  - ○ 1 time/year
  - ○ less than 1 time/year
  - b. If yes, what was the content of the trainings?
- ○ no
- ○ no documents received from center

23. Does the center have a documented nutrition curriculum for kids?

○ yes → a. If yes, what was the content of the curriculum?

○ no

24. Does the center have documentation of parent nutrition education/workshop materials?

○ yes → a. If yes, what was the content of the education workshops?

○ no

Physical Activity Education for Children, Parents and Staff

25. Does the center provide physical activity training for staff?

○ yes → a. If yes, how often?

○ 2 times/year or more ○ 1 time/year ○ less than 1 time/year

○ no

○ no documents received from center

b. If yes, what was the content of the trainings?

26. Does the center have a documented physical activity curriculum for kids?

○ yes → a. If yes, what was the content of the curriculum?

○ no

27. Does the center have documentation of physical activity education/workshop materials?

○ yes → a. If yes, what was the content of the workshops?

○ no

Please use the following citation when referencing this instrument:

Ball SC, Benjamin SE, Hales DP, Marks J, McWilliams CP, Ward DS. 2005. The Environment and Policy Assessment and Observation (EPAO) child care nutrition and physical activity instrument. Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill.

Please use the following citation when referencing instrument protocol and interobserver agreement:

Ward DS, Hales D, Haverly K, Marks J, Benjamin SE, Ball SC, Trost S. An instrument to assess the obesogenic environment of child care centers. Am J Health Behavior. 2008 Jul-Aug;32(4):380-6.

APPENDIX G. CHILD CARE PROVIDER HEALTHY EATING AND ACTIVITY SURVEY

Classroom Code:_____

Child Care Provider Healthy Eating Activity Survey

Please answer the following questions regarding your beliefs about healthy eating as a childcare provider.

Healthy eating and activity practices in child care can help to counter less healthful practices in a child's home.

☐	☐	☐	☐
Strongly Agree	Agree	Disagree	Strongly Disagree

How children eat while at child care has little or no effect on food habits and beliefs because those are formed at home.

☐	☐	☐	☐
Strongly Agree	Agree	Disagree	Strongly Disagree

Experiences at child care settings contribute to children's eating habits.

☐	☐	☐	☐
Strongly Agree	Agree	Disagree	Strongly Disagree

When children serve themselves, they are likely to eat more.

☐	☐	☐	☐
Strongly Agree	Agree	Disagree	Strongly Disagree

Giving children a food treat to reward good behavior is an effective way to manage a classroom.

☐	☐	☐	☐
Strongly Agree	Agree	Disagree	Strongly Disagree

Society has gone overboard limiting sweets and other desirable food.

☐	☐	☐	☐
Strongly Agree	Agree	Disagree	Strongly Disagree

In your role working with children, what priority do you put on health promotion and childhood obesity prevention?

☐	☐	☐	☐
Not a Priority	Low Priority	Medium Priority	High Priority

In your role working with children, how much time are you willing to spend encouraging healthful activity and eating in order to prevent childhood obesity?

☐	☐	☐	☐
None	Some	Quite a Bit	A Lot

How often do you communicate with parents about their child's food consumption while in your care?

☐	☐	☐	☐
Never	Occasionally	Fairly Often	Very Often

Child care providers should eat the same food as children in their care.

☐	☐	☐	☐
Strongly Agree	Agree	Disagree	Strongly Disagree

Children should participate in all aspects of mealtime/snack while at child care (preparing, serving, and cleaning up).

☐	☐	☐	☐
Strongly Agree	Agree	Disagree	Strongly Disagree

It is important for child care providers to sit with children while they eat.

☐	☐	☐	☐
Strongly Agree	Agree	Disagree	Strongly Disagree

When a child asks for more food, it is important to check to see if they are still hungry before giving them more.

☐	☐	☐	☐
Strongly Agree	Agree	Disagree	Strongly Disagree

A picky eater should be left alone rather than pressured to try a new food.

☐	☐	☐	☐
Strongly Agree	Agree	Disagree	Strongly Disagree

Mahalo!

Adapted from: Lanigan, J.D. (2012). The relationship between practices and child care providers' beliefs related to child feeding and obesity prevention. *J Nutr Educ Behav, 44*(6), 521-529.

APPENDIX H. MONTHLY IMPLEMENTATION SURVEY

Classroom ID: _____
Date: ___/_____/_____

Dear Teacher/Assistant Teacher,

Please answer these questions about the classroom Wellness Activities from the "Healthy Habits for Life" curriculum.

1. In the past 4 weeks how often have you used a lesson/activity from "Healthy Habits for Life" to promote physical activity or nutrition in your classroom? (circle one)
n/a

2. In the past 4 weeks how many DIFFERENT lessons/activities from "Healthy Habits for Life" did you use to promote physical activity or nutrition in your classroom? (circle one)
n/a

3. In the past 4 weeks have you had any successes in using the "Healthy Habits for Life" curriculum? Describe briefly.
n/a

4. In the past 4 weeks have you run into any problems or challenges in using the "Healthy Habits for Life" curriculum? Describe briefly.
n/a

5. Please answer these questions about your own health and wellness in the past 4 weeks. Circle "yes" or "no."

a. Have you seen an improvement in your knowledge and skills of physical activities?	YES	NO
b Have you seen an improvement in your knowledge and skills of nutrition and healthy eating?	YES	NO
c Have you seen an increase in physical activity?	YES	NO
d. Have you been choosing water over soda and sugary drinks?	YES	NO
e. Have you been eating more vegetables and fruits?	YES	NO
f Have you been reducing your portion size?	YES	NO
g. Have you seen an improvement in your overall physical healthy?	YES	NO
h. Have you seen any loss of body weight?	YES	NO
i. Have you seen any improvement in your cholesterol?	YES	NO
j. Have you seen any improvement in your blood pressure?	YES	NO
k. Have you seen any improvement in your mental health?	YES	NO

Adapted from Yin et al, 2012. *Childhood Obesity, 8(5),* 429-439.

APPENDIX I. UNIVERSITY OF HAWAII HUMAN SUBJECTS APPROVAL LETTERS

Office of Research Compliance
Human Studies Program

UNIVERSITY of HAWAI'I
MĀNOA

MEMORANDUM

March 14, 2013

TO: Monica Esquivel, MS, RD
Principal Investigator
Human Nutrition, Food & Animal Science

FROM: Denise A. Lin-DeShetler, MPH, MA
Director

SUBJECT: CHS #21087- "Childcare Center Wellness Policy Implementation Project (A Project of the Children's Healthy Living Program for Remote Underserved Minority Populations in the Pacific Region"

Under an expedited review procedure, the research project identified above was approved for one year on March 14, 2013 by the University of Hawaii (UH) Human Studies Program. The application qualified for expedited review under CFR 46.110 and 21 CFR 56.110, Category (7).

This memorandum is your record of the Human Studies Program approval of this study. Please maintain it with your study records.

The Human Studies Program approval for this project will expire on March 13, 2014. If you expect your project to continue beyond this date, you must submit an application for renewal of this Human Studies Program approval. The Human Studies Program approval must be maintained for the entire term of your project.

If, during the course of your project, you intend to make changes to this study, you must obtain approval from the Human Studies Program prior to implementing any changes. If an Unanticipated Problem occurs during the course of the study, you must notify the Human Studies Program within 24 hours of knowledge of the problem. A formal report must be submitted to the Human Studies Program within 10 days. The definition of "Unanticipated Problem" may be found at: http://hawaii.edu/irb/download/documents/SOPP_101_UP_Reporting.pdf, and the report form may be downloaded here: http://hawaii.edu/irb/download/forms/App_UP_Report.doc.

You are required to maintain complete records pertaining to the use of humans as participants in your research. This includes all information or materials conveyed to and received from participants as well as signed consent forms, data, analyses, and results. These records must be maintained for at least three years following project completion or termination, and they are subject to inspection and review by the Human Studies Program and other authorized agencies.

1960 East-West Road
Biomedical Sciences Building 8104
Honolulu, Hawai'i 96822
Telephone: (808) 956-5007
Fax: (808) 956-8683
An Equal Opportunity/Affirmative Action Institution

Please notify this office when your project is complete. Upon notification, we will close our files pertaining to your project. Reactivation of the Human Studies Program approval will require a new Human Studies Program application.

Please contact this office if you have any questions or require assistance. We appreciate your cooperation, and wish you success with your research.

Office of Research Compliance
Human Studies Program

UNIVERSITY of HAWAI'I
MĀNOA

MEMORANDUM
CR

January 23, 2014

TO: Monica Esquivel, MS, RD
Principal Investigator
Human Nutrition, Food & Animal Science

FROM: Denise A. Lin-DeShetler, MPH, MA
Director

SUBJECT: CHS #21087- "Hawaii Childcare Center Wellness Policy Implementation Project (A Project of the Children's Healthy Living Program for Remote Underserved Minority Populations in the Pacific Region"

Under an expedited review procedure, the research project identified above was approved for one year on January 22, 2014 by the University of Hawaii (UH) Human Studies Program. The application qualified for expedited review under CFR 46.110 and 21 CFR 56.110, Category (7).

This memorandum is your record of the Human Studies Program approval of this study. Please maintain it with your study records.

The Human Studies Program approval for this project will expire on January 21, 2015. If you expect your project to continue beyond this date, you must submit an application for renewal of this Human Studies Program approval. The Human Studies Program approval must be maintained for the entire term of your project.

If, during the course of your project, you intend to make changes to this study, you must obtain approval from the Human Studies Program prior to implementing any changes. If an Unanticipated Problem occurs during the course of the study, you must notify the Human Studies Program within 24 hours of knowledge of the problem. A formal report must be submitted to the Human Studies Program within 10 days. The definition of "Unanticipated Problem" may be found at: http://hawaii.edu/irb/download/documents/SOPP_101_UP_Reporting.pdf, and the report form may be downloaded here: http://hawaii.edu/irb/download/forms/App_UP_Report.doc.

You are required to maintain complete records pertaining to the use of humans as participants in your research. This includes all information or materials conveyed to and received from participants as well as signed consent forms, data, analyses, and results. These records must be maintained for at least three years following project completion or termination, and they are subject to inspection and review by the Human Studies Program and other authorized agencies.

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Biomedical Sciences Building B104
Honolulu, Hawai'i 96822
Telephone: (808) 956-5007
Fax: (808) 956-4683
An Equal Opportunity/Affirmative Action Institution

Please notify this office when your project is complete. Upon notification, we will close our files pertaining to your project. Reactivation of the Human Studies Program approval will require a new Human Studies Program application.

Please contact this office if you have any questions or require assistance. We appreciate your cooperation, and wish you success with your research.

Office of Research Compliance
Human Studies Program

UNIVERSITY of HAWAI'I
MĀNOA

MEMORANDUM
CR

December 18, 2014

TO: Monica Esquivel, MS, RD
Principal Investigator
Human Nutrition, Food & Animal Science

FROM: Denise A. Lin-DeShetler, MPH, MA
Director

SUBJECT: CHS #21087- "Hawaii Childcare Center Wellness Policy Implementation Project (A Project of the Children's Healthy Living Program for Remote Underserved Minority Populations in the Pacific Region"

Under an expedited review procedure, the research project identified above was approved for one year on December 17, 2014 by the University of Hawaii (UH) Human Studies Program. The application qualified for expedited review under CFR 46.110 and 21 CFR 56.110, Category (7).

This memorandum is your record of the Human Studies Program approval of this study. Please maintain it with your study records.

The Human Studies Program approval for this project will expire on December 16, 2015. If you expect your project to continue beyond this date, you must submit an application for renewal of this Human Studies Program approval. The Human Studies Program approval must be maintained for the entire term of your project.

If, during the course of your project, you intend to make changes to this study, you must obtain approval from the Human Studies Program prior to implementing any changes. If an Unanticipated Problem occurs during the course of the study, you must notify the Human Studies Program within 24 hours of knowledge of the problem. A formal report must be submitted to the Human Studies Program within 10 days. The definition of "Unanticipated Problem" may be found at: http://hawaii.edu/irb/download/documents/SOPP_101_UP_Reporting.pdf, and the report form may be downloaded here: http://hawaii.edu/irb/download/forms/App_UP_Report.doc.

You are required to maintain complete records pertaining to the use of humans as participants in your research. This includes all information or materials conveyed to and received from participants as well as signed consent forms, data, analyses, and results. These records must be maintained for at least three years following project completion or termination, and they are subject to inspection and review by the Human Studies Program and other authorized agencies.

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Please notify this office when your project is complete. Upon notification, we will close our files pertaining to your project. Reactivation of the Human Studies Program approval will require a new Human Studies Program application.

Please contact this office if you have any questions or require assistance. We appreciate your cooperation, and wish you success with your research.