NATIVE HAWAIIAN ADOLESCENTS' WEIGHT STATUS, PHYSICAL ACTIVITY AND DIETARY BEHAVIORS

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE UNIVERSITY OF HAWAIʻI AT MĀNOA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PUBLIC HEALTH

AUGUST 2014

By

Jacqueline M. L. Ng-Osorio

Dissertation Committee:

Kathryn L. Braun, Chairperson

Jane Chung-Do

J. Keaweaumoku Kaholokula

Valerie Yontz

Earl Hishinuma

Keywords: Native Hawaiian, adolescence, obesity, socio-ecological model, physical activity

Dedication

This dissertation is dedicated to my family here today, my ancestors of long ago, and the future generations. For without the past, we would have no future.

To my parents, Doris and Peter Ng, who without their belief, support, encouragement and love throughout my journey of life would this milestone, have been completed.

To Kane and Petra thank you for being in my life and supporting me through the past four years and in all that I do.

Acknowledgements

I would like to thank all who have been with me on this journey. I have appreciated all of your love and support through this time. I would first like to acknowledge my committee members who have provided me great mentorship and guidance. Special thanks to my chair Kathryn Braun who stood with me and supported me along the way enduring the ups and downs of the past four years, to Earl Hishinuma who walked through my quantitative methods patiently with me to ensure that the studies were sound, and to the remaining members of my committee--Jane Chung-Do, Keawe Kaholokula, and Valerie Yontz--thank you for the support throughout this process. Mahalo nui loa!

Additionally, thank you to my peers and administrators at Kamehameha Schools who supported me through my studies and allowed me to collaborate with the Physical Education department. A warm mahalo to the late Mrs. Theone Chock, who allowed me to enter her classroom, introduce my study, spend time with her students, and learn from them. Thank you also to the State of Hawai‘i Department of Health, which provided me the HYRBS data. Many thanks as well to my cohort members, Jeanelle and Jen, who have been rocks in this journey, helping me get to this finish line by providing writing sessions and the extra push needed.

Finally, thank you to my family – my mom and dad who have taught me the importance of education and to always have a dream to strive for in life, and that it is okay if dreams change. I am forever grateful for all they have taught me and for the love they continue to give. I thank my siblings for being there and helping Kane and me, and providing me support throughout this time. Many thanks to my husband Kane for allowing me this opportunity to get my degree, for the love that you give me each day and the support that you provided when the studying and writing took more time then I had. To Petra, thank you for understanding that mom had to write and study, but for staying up late for me to come home so you could still share your day with me. I love you all.

Abstract

Increased prevalence of childhood obesity is a public health problem. From 1976 to 2010, the national prevalence has increased from 5% to approximately 17%, and Native Hawaiians youth are more likely to be obese than White and Asian youth. Obese children and adolescents are more likely than healthy-weight youth to maintain excess weight into adulthood and experience earlier onset of chronic disease.

Based on the socio-ecological model, this dissertation examined three questions. The first question was: "Is there an association between weight status (healthy, overweight or obese) and dietary behaviors, physical activity, sedentary behaviors, smoking, and bullying victimization among Hawai'i 's public school adolescents, and are there differences in association by ethnic-sex groups?" A secondary data analysis of the 2011 HYRBS was conducted.

The second question was: "Is there a difference in engagement of healthy behaviors and weight status for 9th grade Native Hawaiian students by school type (public vs. private)?" Data were collected from Native Hawaiian 9th graders in private school (N=252) and compared to HYRBS data for Native Hawaiian 9th graders in public school (N=335). Multinomial logistic regression was used to determine if school type was a significant predictor of weight status.

The third question was: "How do obese Native Hawaiian adolescents perceive supports and challenges to healthy eating and physical activity in their school and neighborhood environments?" Photovoice was used, through which students took photographs and wrote captions to illustrate their perceptions.

Five key findings emerged. First, Native Hawaiian adolescents have a higher prevalence of obesity than White, Japanese, and Filipino adolescents, but a lower prevalence than Other Pacific Islanders. Second, females were less likely than males to have an obese weight status regardless of school type. Third, Native Hawaiian 9th graders in private school had a lower prevalence of obesity than Native Hawaiian 9th graders in public school. Fourth, students who

engaged in physical activity at least 5 days a week had a greater healthy weight-to-obese ratio. Fifth, limitations in resources (financial, community, or school) contribute to increased weight status. These findings can help inform the tailoring of interventions to prevent and reduce obesity among Native Hawaiians adolescents.

Table of Contents

Abstract iv

List of Tables xi

List of Figures xiii

List of Appendices xiv

Chapter 1 1

Issue of Overweight and Obese for Adolescents and Minority Adolescents 2

Socio-Ecological Model 6

Behavioral and Psychological Factors Contributing to Obesity 10

Dietary Behaviors 11

Physical Activity 11

Sedentary Behaviors 12

Smoking 13

Bullying victimization 13

Social and Environmental Factors Contributing to Obesity 14

Purpose of Dissertation and Research Questions 15

Chapter 2 19

Abstract 19

Introduction 21

Adolescent Overweight and Obesity Prevalence, National and State Level 21

Socio-Ecological Model 22

Behavioral and Psychological Factors Contributing to Overweight and Obesity 23

Dietary Behaviors 23
Physical Activity 24
Sedentary Behaviors 25
Smoking 26
Bullying Victimization 26
Youth Risk Behavioral Surveillance System 28
Purposes 28
Measures 29
Data Analyses 40
Sample Description 43
Discussion 69
Sex, Weight Status, and Risk-Protective Behaviors 69
Ethnicity, Weight Status, and Risk-Protective Behaviors 70
Risk-Protective Behaviors and Healthy-to-Overweight and Healthy-to-Obese Ratios 70
Conclusion 76
Chapter 3 77
Abstract 77
Introduction 80
Socio-Ecological Model 80
Schools 81
School Type: Hawai‘i Public Schools 83

School Type: Private Schools 84
The Selected Private School of this Study 85
Behaviors 86
Dietary Behaviors 86
Physical Activity 86
Sedentary Behaviors 87
Youth Risk Behavioral Surveillance System 88
Purpose 89
Method 90
Data Analyses 100
Results 102
Discussion 118
Limitations and Strengths 120
Future Research 123
Conclusion 125
Chapter 4 126
Abstract 126
Native Hawaiian Land and Health 128
Purpose 130
Methods 131
Study Design: Photovoice 131

Study Setting 132
Participants 132
Measures 132
Procedures 133
Data analyses 135
Results 136
Barriers 136
Theme 1: Sucked into Electronics 137
Theme 2: Junk Food, Snack Food, All this Food at Home 138
Theme 3: Rather be sleeping 139
Theme 4: Cheap and Convenient Food in Fast-Food Restaurants 139
Theme 5: Too Busy to Exercise… 140
Theme 6: Being Lazy 141
Theme 7: Don't go past the garage 141
Supports 142
Theme 8: Stairs, gyms, and activities 143
Theme 9: My Home 144
Theme 10: Long roads to walk 144
Theme 11: I'm going to fit a smaller size 145
Theme 12: Surprise…healthy and good tasting 146
Theme 13: Working out with electronics 147

Focus group discussion 147

Discussion 149

Limitations 151

Implications 152

Chapter 5 154

Application of the Socio-Ecological Model 154

Key Findings 154

Directions for Future Research 155

Directions for Future Policy 156

Conclusion 157

References 158

Appendix 174

List of Tables

Table 1.1 Levels of the Socio-Ecological model and examples of public health interventions..... 10

Table 2.1 Description and Coding of the Demographic, Independent, and Dependent Variables 30

Table 2.2 Example of how dietary behavior responses were converted for coding..... 39

Table 2.3 Model 1: Demographic variables..... 42

Table 2.4 Model 2: Demographic variables followed by health-related risk-protective independent variables (i.e., dietary behaviors, physical activity, sedentary behaviors)..... 42

Table 2.5 Model 3: Demographic and all risk-protective variables..... 43

Table 2.6 Description of the sample (unweighted) and population (weighted) based on demographic variables..... 44

Table 2.7 Descriptive statistics of individual items and composites for overall weighted sample and sex..... 46

Table 2.8 Descriptive statistics of individual items and composites for Filipino and Japanese by overall and sex..... 49

Table 2.9 Descriptive statistics of individual items and composites for Multi-ethnic non-Native Hawaiian and Native Hawaiian by overall and sex..... 52

Table 2.10 Descriptive statistics of individual items and composites for Other and Other Asian by overall and sex..... 55

Table 2.11 Descriptive statistics of individual items and composites for Other Pacific Islander and White by overall and sex..... 58

Table 2.12 Means, standard error of means, and *n* sizes of BMI *z*-scores by ethnicity and sex... 64

Table 2.13 Hierarchical multinomial logistic regression..... 66

Table 3.1 Description and coding of the demographic, independent, and dependent variables.... 91

Table 3.2 Example of how dietary behaviors were converted for coding..... 99

Table 3.3 Model 1: Demographic variables..... 102

Table 3.4 Model 2: Demographic variables and health related risk-protective behaviors 102
Table 3.5 Model 1: Demographic variables 102
Table 3.6 Sample description by weight status, school type and sex 103
Table 3.7 Descriptive statistics for aggregated sample of public and private school students – Overall and by Sex 105
Table 3.8 Descriptive statistics for public school sample - Overall and by Sex 107
Table 3.9 Descriptive statistics for private school sample - Overall and by Sex 109
Table 3.10 Descriptive statistics of dependent variable weight status (%ile, BMI categories) by 111
Table 3.11 Means, standard deviation, and *N* sizes of BMI *z*-scores by school type and sex. 113
Table 3.12 Multinomial logistic regression analyses of weight status – demographics and risk and protective behaviors 115
Table 3.13 Weight status of private school students by entry grade and sex (%) 117
Table 3.14 Multinomial logistic regression analyses of weight status based on entry grade level 118
Table 4.1 Outline of the six Photovoice sessions 134
Table 4.2 Study Themes from Storyboards - Barriers 137
Table 4.3 Study Themes from Storyboards – Supports 142

List of Figures

Figure 1.1 Illustrates the level of influence and the appropriate research question. 17

Figure 4.1 Participant photo describing Theme 1: Sucked into Electronics 138

Figure 4.2 Participant photo describing Theme 2: Junk Food, Snack Food all this Food – at Home 138

Figure 4.3 Participant photo describing Theme 5: Rather be Sleeping..... 139

Figure 4.4 Participant photo describing Theme 4: Cheap and Convenient Food in Fast-Food Restaurants..... 140

Figure 4.5 Participant photo describing Theme 5: Too busy to exercise..... 140

Figure 4.6 Photo participant describing Theme 6: Being Lazy 141

Figure 4.7 Participant photo describing Theme 7: Don't go past the garage..... 142

Figure 4.8 Participant photo describing Theme 8: Stairs, Gyms and Activities 143

Figure 4.9 Participant photo describing Theme 9 My Home..... 144

Figure 4.10 Participant photo describing Theme 10: Fields/Environment Resources..... 145

Figure 4.11 Participant photo describing Theme 11 I'm going to fit a smaller size..... 146

Figure 4.12 Participant photo describing- Theme 12: Surprise…healthy and good tasting 146

Figure 4.13 Participant Photo Describing Theme 13: Working out with Electronics..... 147

List of Appendices

Appendix A Youth Risk Behavior Survey - Study 1and Study 2 184

Appendix B Parent Consent Form – Study 2 185

Appendix C Student Assent Form – Study 2 188

Appendix D Student Survey – Study 2 191

Appendix E Demographic Survey – Study 3 198

Appendix F Student Assent – Study 3 201

Appendix G Parental Consent – Study 3 206

Appendix H Timeline - Study 3 211

Appendix I SHOWED Method Worksheet – Study 3 212

Appendix J Session 5 group discussion questions – Study 3 214

Chapter 1

The continued increase in prevalence of overweight and obese children and adolescents is a public health problem. This increasing prevalence has been demonstrated through several longitudinal studies, including the Framingham Children's study (Hood et al., 2000), the Bogalusa Children's Study (Broyles et al., 2010), and the Young Finn's Study (Raitakari et al., 2008), as well as through comparisons of cross-sectional samples in the United States (U.S.) participating in the National Health and Nutrition Examination Survey (NHANES). In the 2009-2010 NHANES, for example, approximately 17% of U.S. children and adolescents aged 2 to 19 were obese, which represents a dramatic increase over the 1976 estimate of 5% (Ogden, Carroll, Kit & Flegal, 2012).

Overweight and obesity in children are problematic for a number of reasons. For example, obese adolescents are more likely than healthy-weight adolescents (5^{th} to less than 85^{th} percentile for age and sex) to maintain the excess weight problem into adulthood (Broyles, 2008; Daniels et al., 2005; Dietz, 1998; Goo, Wu, Chum lea, & Roche, 2002). The earlier the onset of obesity, the earlier one sees signs of diseases typically found in older adults, including cardiovascular disease, diabetes, and metabolic syndrome, all of which are now being seen at younger ages (Daniels et al., 2005; Goran, Ball, & Cruz, 2003; Raitakari et al., 2008; Spiotta & Luma, 2008). Thus, childhood obesity will "increase the duration of comorbidities in an individual by one or two decades" (Deckelbaum and Williams, 2001, p. 239S). This may impact their life expectancy as well as their quality of life, and it is likely that this generation of adolescents may be the first to not outlive their parents (Oshlansky et al., 2005). Excess weight in childhood also can lead to psychological and social consequences for adolescents, which may

include distorted weight perceptions, engagement in high-risk behaviors, impaired peer relationships, and victimization through various forms of bullying (Griffiths et al., 2006; Janssen, Craig, Boyce, & Pickett, 2004; Leatherdale, Wong, Manske, & Colditz, 2008; Plotnikoff et al., 2007; Robinson, 2006) .

Body mass index (BMI) is a ratio of height and weight, and it is frequently used to determine weight status. For adults, a BMI of 19-24.9 is considered normal weight, 25-29.9 is considered overweight, and 30 and above is considered obese (Centers for Disease Control and Prevention [CDC], 2012, http://www.cdc.gov/obesity/adult/defining.html). Classification is different for children than for adults. According to CDC, a child or adolescent is considered overweight if he or she has a body mass index (BMI) equal to or greater than the 85th percentile, but less than the 95th percentile for their sex and age group. A child or adolescent is considered obese if he or she has a BMI equal to or greater than the 95th percentile for age and sex (CDC, 2012). The growth charts currently used were developed based on norms in the 1970s.

Issue of Overweight and Obese for Adolescents and Minority Adolescents

Although adolescent obesity is an increasing problem for all ethnic groups, minority and indigenous adolescents are faring worse than their non-minority peers in overall health status, excess weight, and engagement in healthy behaviors and high-risk behaviors (Colon-Ramos et al., 2009; Daniels et al., 2005; Gordon-Larsen, Adair, Popkin, 2003; Kumanyika, 2008; Lee, 2005; Neuhouser, Thompson, Coronado, & Solomon, 2004; Wilson, Lawman, Segal, & Chappell, 2011). For example, in 2009-2010, approximately 42.4% of Hispanic adolescents (age 12-19) and 42.9% of Black adolescents were overweight (BMI at the 85th percentile or above), compared to 30% of non-Hispanic White adolescents (Ogden, Carroll, Kit, & Flegal, 2012). Similarly, 23.2% of Hispanic adolescents and 23.7% of Black adolescents were obese (BMI at

the 95th percentile or above), compared to 16.1% of non-Hispanic White adolescents (Ogden, Carroll, Kit, & Flegal, 2012).

Foltz et al. (2011) found that racial and ethnic minority adolescents were less likely than White adolescents to be achieving the recommended guidelines for physical activity and healthy eating. As well, minority and indigenous adolescents have a greater likelihood than White adolescents to come from low socio-economic families and/or neighborhoods. For example, according to the National Poverty Center in 2010, 15.1% of all people in the United States lived in poverty. Yet, when examined by subgroups, 27.4% of Blacks and 26.6% percent of Hispanics live in poverty, compared to 9.9% of non-Hispanic Whites and 12.1% of Asians. When further examined by age group, more than a third of Black and Hispanic children live in poverty (38.2% and 35.0% respectively).

This factor contributes to obesity, as poorer families have fewer opportunities to consume healthier foods and engage in physical activity because of limited family and neighborhood resources (Goodwin et al., 2006). According to Laska, Borradaile, Tester, Foster, and Gittelsohn (2010), lower-income neighborhoods have smaller food stores with less availability of healthy food items compared to wealthier neighborhoods. For example, only 50% of stores in lower-economic neighborhoods visited by Laska and colleagues carried one or more fresh fruits or vegetables.

In the state of Hawai‘i, the problem of adolescent obesity is similar. According to the 2011 Hawai‘i Youth Risk Behavior Survey (HYRBS), 31.3% of Native Hawaiian and 47.7% of Other Pacific Islander high school adolescents were either overweight or obese, compared to the state prevalence of 26.6% for adolescents (Hawai‘i Health Data Warehouse, 2012). About 20.1% of Native Hawaiian and Other Pacific Islander (NHOPI) adolescents are considered

obese, compared to 10.3% of non-Hispanic White (10.3%) and 7.2% of Asian adolescents (CDC, 2009). Looking at the HYRBS data slightly differently, Lai and Saka (2010) categorized 41% of Native Hawaiian adolescents as either "at risk for becoming obese" or "obese," compared to 23% of non-Native Hawaiian students.

This trend continues into adulthood where 31.8% of Native Hawaiian adults 18 years and older are overweight (BMI of 25-29.9), and 43.7% are obese (BMI of 30 or greater). The vast majority (90.9%) of Other Pacific Islander adults are overweight or obese as well, compared to the state prevalence of 57.2% (Hawaii Health Data Warehouse, 2012).

Examining poverty in Hawai‘i , 11.2% of all people live in poverty, whereas 14.4% of all Native Hawaiian people live in poverty (American Community Survey, U.S. Census, 2010). Similarly to findings on the U.S. continent, some neighborhoods have limited availability of healthy foods. For example, Mau, Wong, Efird, Saito and Maddock (2008) found that a neighborhood on Oahu with the highest percentage of Native Hawaiians had the most limited healthy food options and the greatest percentage of fast food options compared to another neighborhood with a relatively low percentage of Native Hawaiians.

Native Hawaiians, the indigenous peoples of Hawai‘i, currently comprise 22.3% of the state's population of 1.3 million people (Census, 2010). They were not always overweight. Prior to Captain James Cook's arrival in the islands 1778, records from the time suggest that Native Hawaiians were a healthy and vibrant people who, like similar agrarian peoples, were self-sustaining with foods they grew or caught. The first visitors to the islands described Native Hawaiians as tall, lean, and muscular (Bushnell, 1993). This was especially the case of the *maka‘āinana* (commoners), whose livelihood depended on fishing and/or farming. The diet was filled with mostly raw or steamed foods and complex carbohydrates, which included large

amounts of poi (mashed taro), kalo (taro), ʻuala (sweet potato), and ʻulu (breadfruit). For protein, Native Hawaiians ate primarily iʻa (fish), moa (chicken), and puaʻa (pork) (Blaisdell, 1998). The Native Hawaiians valued their relationship between the land and the food that sustained them for their physical health and overall well-being (McMullin, 2005). Unfortunately, Westernization did not favor the Native Hawaiians. By 1893, when the Hawaiian kingdom led by Queen Liliʻuokalani was overthrown, the population had dramatically declined to fewer than 40,000. The causes of death for Native Hawaiians were venereal and other infectious diseases brought by Westerners. Due to their previous isolation, Native Hawaiians had no immunity to these diseases (Bushnell, 1993).

Today, there is a "disconnect" between what McMullin would identify as a healthy Native Hawaiian and the current state of Native Hawaiian well-being. Native Hawaiians today are no longer lean, and they experience the highest prevalence of excess weight (including overweight and obesity). The excess weight contributes to other health problems, and Native Hawaiians also have the highest prevalence of cardiovascular disease, the second highest prevalence of diabetes, and the shortest life expectancy among the state's five largest ethnic groups (Aluli, 1991; Hawaii Health Data Warehouse, 2012; Park et al., 2009). As mentioned previously, these health issues are not only seen in Native Hawaiian adults, but also in adolescents (Chai et al., 2003; Nigg et al., 2011; Teranishi et al., 2011). Native Hawaiian adolescents also are more likely than other ethnic groups to engage in risky behavior (Glanz, Mau, Steffen, Maskarinec, & Arriola, 2007; Hishinuma, Umemoto, Nguyen, Chang, Bautista, 2012) than Whites.

To help curb the increased prevalence of adolescent obesity in the U.S., the Department of Health and Human Services (DHHS) Healthy People 2020 created objectives that call for the

maintenance of ideal body weight, improved dietary behaviors, and increased physical activity (PA) for young people. A conservative target was set to reduce obesity in adolescents from 17.9% currently to 16.1% by 2020 (CDC, 2010). However, for this to happen, a greater understanding of what influences adolescent behaviors is needed. The examination of risk behaviors and weight status should be done across subgroups, such as sex and ethnicity, to best be able to create appropriate targeted interventions.

Socio-Ecological Model

The Socio-Ecological Model of Health Behavior is based on the premise that health-related behaviors are determined by multiple levels of intrapersonal, interpersonal, organizational, community, and public policy factors (McElroy, Bibeau, Steckler, & Glanz, 1998). The four main principles of the ecological model in relationship to behavior change are: 1) there are multiple levels of influence on the individual; 2) there is interaction between levels; 3) to be most effective in creating behavior change, multiple levels should be targeted; and 4) to be effective, the use of the ecological model should be behavior-specific (Sallis, Owen, & Fisher, 2008).

The first level of influence is the intrapersonal level. Individual characteristics, such as demographics (e.g., ethnicity, age, and sex), engagement in risky or protective behaviors (e.g. physical activity, healthy eating, sedentary behaviors, smoking, and bullying), and psychosocial factors (e.g. self-efficacy and depression), influence the development of obesity. Cultural connectedness and the relationship an individual has with his/her culture may also influence behaviors. Cultural identity and ethnicity both influence the individual in deciding to engage in behaviors (Kumanyika, 2008). Self-efficacy, which is the belief in personal capabilities to plan

and execute the courses of action required to attain a behavioral goal, may vary by culture (Bandura, 2006).

The second level of influence is interpersonal relationships (e.g., peers and parents) and social networks. During childhood, the individual's behaviors are primarily formed by his/her parents. During adolescence, parents and peers are both very influential to the adolescent's behavior (De Goede, Branje, Delsing & Meeus, 2009; Duncan, Duncan & Strycker, 2005; Prochaska, Rodgers, & Sallis, 2002). Research has found that parents influence their adolescents through five main methods: parental encouragement and support, parental modeling, parental attitudes and knowledge, parental control, and parenting style (Berge et al., 2010; Boutelle et al., 2007; Heitzler et al., 2010; Trost et al., 2003; Young, Fors, & Hayes, 2004). Peers have been found to influence the adolescent in engagement in physical activity (Salvy, Roemmich, Bowker, Romero, Stadler, & Epstein, 2009) and healthy eating (Salvy et al., 2009; 2011) through modeling of behaviors. Beyond the practice of the behaviors, other aspects of the parents' role, such as socio-economic status or parents' education levels have been linked to influencing the development of adolescent health behaviors. The socio-economic status of parents plays a role in the foods that they have available in the homes and those they are willing to purchase (van der Horst, Oenema, Ferreira, Wendel-Vos, Giskes, van Lenthe, & Brug, 2007).

The third level of influence includes organizations such as school or work. Adolescents spend the majority of their day at school, making it a place of great influence on adolescents' eating and physical activity behaviors (Story, 1999). Schools influence the adolescent by the food that is provided as well as the physical education requirements. Schools that receive federal funding from the USDA need to meet a minimum set of volume and nutritional requirements in terms of food served. Research has yielded inconsistent findings on the extent to which school-

based interventions can decrease adolescent obesity. For example, Brown and Summerbell (2009) found that schools have an ability to increase adolescent physical activity, but that their influence on diet was inconsistent. However, interventions that combine physical activity and diet appear to have the best chance of preventing a child from becoming overweight.

Unfortunately, the *Shape of the Nation Report 2012* from the National Association for Sport and Physical Education and the American Heart Association found that there is no standard regarding requirements for physical education at the federal level. Instead, each state defines its own goals and guidelines to be achieved, with implementation left to the school districts. James and Lock's (2009) literature review focusing on improving school policies related to diet and nutrition found inconclusive results in terms of their impact on youth health, in part because of limited studies evaluating policy change in schools. While states set policy for public schools, private schools are able to determine their own policies regarding nutrition and physical education (with the exception of private schools whose nutrition program receive FDA funding). In Hawai‘i, about 16% of Native Hawaiian school-aged children attend private schools, while overall 18% of all school-aged children attend private schools. (American Community Survey, 2010)

The fourth level of influence includes the broader social and environmental context of the adolescent's community. Researchers have examined resources available in the community to engage in physical activity and healthy eating, such as parks and basketball courts and the number of places that offer fresh food (Ding, Sallis, Kerr, Lee, & Rosenberg, 2011; Rahman, Cushing, & Jackson, 2011; Yousefian, Ziller, Swartz, & Hartley, 2009). Findings from research indicate that minorities are more likely to live in communities that have fewer options for fresh food or physical activity (Rahman, Cushing, & Jackson, 2011). Adolescents' perception of the

community and therefore their engagement in physical activity are influenced by the adult/parents' perceptions of the community (e.g., its safety) (Dwyer, Allison, Goldenberg, Fein, Yoshida, & Boutilier, 2006; Santos, Page, Cooper, Ribeiro, & Mota, 2008). Although Native Hawaiians live throughout the state, there are areas that are more densely populated with Native Hawaiians. These areas include the leeward coast of Oʻahu and Hilo on Hawaiʻi Island. These regions also experience high rates of poverty, and a lower median socioeconomic status, and they have fewer resources for healthy eating and physical activity (Mau et al., 2008).

The fifth level of influence encompasses policies (local, national and global), cultural norms, and societal norms. The government has become more involved in trying to change behaviors with legislation at the state and national levels. In a review of the literature, Sallis and Glanz (2009) described the roles of policies as the mechanism to directly influence larger numbers of people and behaviors. Across the nation, policy makers have started to address child and adolescent obesity by: 1) creating task forces; 2) implementing new legislation to increase farm-to-school programs or to improve current school menus; and 3) supporting policies to strengthen physical education or physical activity classes at school (Larson & Story, 2008). Hawaiʻi has attempted to pass legislation to increase taxes on sugar-sweetened beverages and unhealthy foods. It is hoped that increasing taxes on these unhealthy foods would reduce their consumption. This was the case with laws increasing taxes on tobacco, which have led to a 54% decrease in tobacco use among high school students in the state (Fuddy, 2012). Another tactic is to assure that all public high schools receive the encouragement and administrative support to fully implementing the State of Hawaiʻi Board of Education Wellness Guidelines.

Shown in Table 1.1 is a summary of the levels of the Social Ecological Model and examples of public health interventions at each level to reduce obesity.

Table 1.1 Levels of the Socio-Ecological model and examples of public health interventions

Level	Target	Public health interventions
Individual	Individual	Public health education that involves changing people's awareness, knowledge, values, beliefs, attitudes, and preferences (e.g., media campaigns)
Interpersonal	Small groups, such as families, friends, jogging groups, etc.	Public health education that involves changing people's awareness, knowledge, values, beliefs, attitudes, and preferences; health education that emphasizes behavior change through social support (e.g., walking with a friend)
Organizational	Schools, places of employment, places of worship, sports teams, volunteer groups	Public health education; creation of organizational policies and environmental change that encourage physical activity and healthy eating (e.g., healthy school lunch policy, stairwell campaign at work)
Community	Neighborhoods, counties, cities	Advocacy, policy and legislation that create sidewalks, bike lanes
Society	All levels working together for large-scale change	Advocacy, policy and legislation that create statewide school policies, statewide building codes, changes to regulations, etc.

The Social Behavioral Model is used in this dissertation to frame the three research questions that are being addressed. The next section of the literature review summarizes research about behavioral and psychological factors contributing to obesity (those at the first two levels of the Social Behavioral Model) and research about organizational, community, and policy factors contributing to obesity (those at the higher three levels of the Social Behavioral Model).

Behavioral and Psychological Factors Contributing to Obesity

Research has demonstrated that the primary ways of managing weight are through increased healthy dietary behaviors, increased physical activity, decreased sedentary behavior, and reduced caloric

intake (Atlantis, Barnes, Singh, 2006; CDC, 2011; Daniels et al., 2005; Peart, Mondragon, Rohm-Young, Bronner, & Hossain, 2011).

Dietary Behaviors. According to the U.S. Department of Agriculture (USDA) and U.S. Department of Health and Human Services (USDHHS), in 2010 only 9% of adolescents consumed the recommended daily five servings of fruits and vegetables. According to the 2010 National Youth Physical Activity and Nutrition Study (NYPANS), less than a third of high school students (28.5%) consumed fruits less than one time per day and, a third (33.2%) consumed vegetables less than one time per day. Produce-consumption patterns, however, differ significantly by ethnicity/race, with non-Hispanic White students consuming 1.4 vegetables per day, compared to 1.0 among non-Hispanic Black students and 1.1 among Hispanic students. According to the 2011 Hawai‘i High School Youth Risk Behavior Survey, 15.1% of Native Hawaiian respondents consumed fruits/vegetables five or more times per day within the past seven days compared to 23.5% of all Other Pacific Islanders and 17.5% of all respondents (Hawai‘i Health Data Warehouse, 2012).

In their review of the literature, Pearson and Biddle (2011) found evidence of a direct relationship between dietary intake, physical activity, and excess weight in teens. Adolescents who were less likely to engage in physical activity were less likely to eat fruits and vegetables and had a higher intake of fast food and energy-dense foods, resulting in increased excess weight. When examining correlates of fruit and vegetable consumption, Neumark-Sztainer, et al., (2003) found that the strongest correlates of consumption of these foods were home availability and taste preference. Campbell (2009) also found that factors such as family and culture influenced the dietary choices of adolescents.

Physical Activity. Two aspects of engagement of physical activity that have been linked to excess weight are: 1) the amount of time the adolescent spends engaging in physical activity; and 2) sports team participation. Research consistently has shown an inverse relationship between physical activity and obesity, with increased engagement in physical activity decreasing the likelihood of an adolescent being or becoming obese (Must & Tybor, 2005; Patrick et al., 2004). Adolescents' engagement

in physical activity is important to examine because, during this development phase, lifelong physical activity patterns are established. According to Patrick et al. (2004), of the variables (e.g., physical activity engagement, sedentary behaviors, dietary intake, and highest household educational level) associated with overweight adolescents, the only risk factor that demonstrated a significant influence on overweight status was the lack of vigorous physical activity. Drake et al. (2012) found that students who played on three sports teams were 27% less likely to be overweight or obese (when these weight statuses were combined) and 39% less likely to be obese (when the overweight group was separated from the obese group).

However, only 18% of high school students nationally achieved a physical activity level of 60 minutes of moderate-to-vigorous physical activity (MVPA) daily for 7 days as recommended (CDC, 2011; World Health Organization [WHO], 2012). According to the 2011 HYRBS, 42.7% of Native Hawaiian teens report engaging in 60 minutes or more of physical activity 5 or more days (compared to 48.6% of Whites), and 23.6% report engaging in 60 minutes or more of physical activity for 7 of the past 7 days (compared to 31.3% of Whites) (Hawai‘i Health Data Warehouse, 2012).

Sedentary Behaviors. In the review by Sallis, Prochaska and Taylor (2000), time in sedentary behaviors may not be a valid predictor of obesity. Sedentary behavior is not simply the inverse of physical activity. However, findings suggest that weight increases significantly with increasing hours of "screen time," defined as time spent watching television or playing computer or video games (Peart et al., 2011, Perez, et al., 2011). The American Academy of Pediatrics (2001) suggests adolescents engage in no more than 2 hours of total screen time per day, and Peart et al. (2011) found that youth who watched at least 2 hours of television or video each day were almost twice as likely to be categorized as obese compared to those who watched less than 2 hours per day.

To determine how both the lack of physical activity and the amount of screen time may influence weight status, both behaviors need to be examined together. For example, Eisenmann et al. (2008) examined data from the 2001 national YRBS and found that high levels of screen time (greater than 3 hours daily) and low physical activity increased risk of being overweight or obese among 14 to 18 year

olds. In a comparable study of Australian adolescents, Maher et al. (2012) found that screen time and physical activity levels were both independent predictors of weight status. According to the HYRBS in 2011, 60.8% of all high school respondents (and 52.8% of Native Hawaiian adolescents) engaged in 3 or more hours per day of screen time not related to school work.

Smoking. Findings from research on adolescents' smoking use and its relationship to weight status has been inconclusive (Dupuy et al., 2011; Larson et al., 2007). Ratcliff et al. (2011) found that adolescents who were extremely obese (with a BMI-*for age* greater than or equal to the 99th percentile) had a higher prevalence of having tried smoking than normal-weight peers. Hussaini, Nicholson, Shera, Stettler, and Kinsman (2011) found that twice as many obese adolescent females compared to non-obese adolescent females had high levels of nicotine intake. In Hawai'i, according to Nigg et al. (2011), high school students who were overweight or obese had a higher prevalence (33%) of having "used tobacco in the previous 30 days" than those who were normal weight (25%).

Bullying victimization. A victim of bullying is defined as someone who is frequently exposed to negative actions of others with the intention of harm (Griffiths et al., 2006). Bullying takes on many forms, including verbal (e.g., teasing), physical (e.g., hitting), and relational (e.g., social exclusion). Students who are overweight or obese are bullied and teased more often than their healthy-weight counterparts (Fox & Farrow, 2009; Gray, Kahhan & Janicke, 2009; Griffiths et al., 2006; Janssen, Craig, Boyce & Pickett 2004; Puhl, Luedicke, & Heuer, 2011; Wang, Iannotti, & Luk, 2010). When examining the difference of victimization by types of bullying endured due to weight status, Guo et al. (2010) and Wang, Iannotti, and Luk (2010) found overweight boys and girls were more likely to be verbally bullied compared to healthy-weight peers, while underweight adolescents were more likely to be physically bullied by their peers. Janssen et al. (2004) found a direct and significant relationship between BMI category and victimization in girls, with the amount of victimization increasing with BMI. Consequences of victimization may include poor social, emotional, and physical health, which further hinders social development of youth. Additionally, victims may engage in behaviors and strategies to deal with the

bullying that increase weight, such as increased food consumption or avoidance of gym class (Puhl & Luedicke, 2011).

Social and Environmental Factors Contributing to Obesity

School. Schools influence the health of students with policies related to nutrition and physical education. Four ways in which schools can engage in the reduction of obesity are: 1) school food environments and policies; 2) school physical activity environments and policies; 3) school body mass index measurements; and 4) school wellness policies (Story, Nanney, & Schwartz, 2009). According to the School Health Policies and Programs Study (2006), 77% of schools nationally offered a choice between two or more different fruits or types of 100% fruit juice each day for lunch, and 81% offered lettuce, vegetable, or bean salads a la carte to students during a typical week. Findings focused on physical education (PE) suggest that, of the 95% of schools that require students to take PE, only 2% required daily PE or its equivalent for students in all grades in the school for the entire year.

Community. In addition to the home environment, the surrounding neighborhood community environment plays a role in adolescent engagement in healthy behaviors (Ding et al., 2011; Forsyth et al., 2009; Mota, Ribeiro, & Santos, 2009; Richardson, Boone-Heinonen, Popkin, & Gordon-Larsen, 2011). Sallis & Glanz (2009) provided a review of the literature to determine how both food and physical activity environments affect a populations' obesity level. They defined three levels of environment that influence the resources available: 1) community environment; 2) microenvironments; and 3) consumer environments. The result of the review confirmed the relationship between availability of resources in one's environment and engagement in healthy eating and physical activity. When there is greater availability of supermarkets and fresh food, there is increased consumption of nutritious foods. Increased availability of fast food restaurants is associated with greater consumption of fat in diets. The availability and proximity of physical activity resources increased physical activity engagement (Grow et al., 2008; Santos et al., 2008). As noted earlier, availability of resources varies by ethnic and economic composition of the neighborhoods (Rahman, Cushing, & Jackson, 2011).

Purpose of Dissertation and Research Questions

Based upon the findings of the literature review and the socio-ecological model related to understanding the weight status of overweight and obese, this dissertation research examined three questions, focusing on three levels of the model--intrapersonal, organization and community. Other studies have used the socio-ecological model to explore the ecological risk of obesity in adolescents (Cutler, Flood, Hannan, & Neumark-Sztainer, 2011; Kim, Lee, Kim, Ko, Park & Kim, 2011). However, none has focused on an indigenous adolescent population. This study focuses on Native Hawaiian adolescents, aiming to support a broad understanding of obesity-related influences on Native Hawaiian adolescents within the studied domains of the ecological model. Findings will help to inform comprehensive and culturally appropriate approaches to obesity prevention and control in Native Hawaiian adolescents.

Within the levels of the model, the current research examined individual traits (e.g., ethnicity and sex), risk-protective behaviors (e.g., dietary behaviors, physical activity, sedentary behaviors, smoking and bullying victimization), organizational traits (school type), and the community environment (e.g., school and neighborhood). The first research question asked, "Is there an association between weight status (healthy, overweight or obese) and dietary behaviors, physical activity, sedentary behaviors, smoking, and bullying victimization among Hawai'i's public school adolescents, and are there differences in association by ethnic-sex groups?" A community partner in this study was the State of Hawai'i Department of Health, which provided access to the HYRBS data used to answer this research question. A secondary data analysis of the 2011 HYRBS was conducted. The findings from this study could potentially help to reduce the prevalence of obesity for adolescents by increasing our understanding of differences between

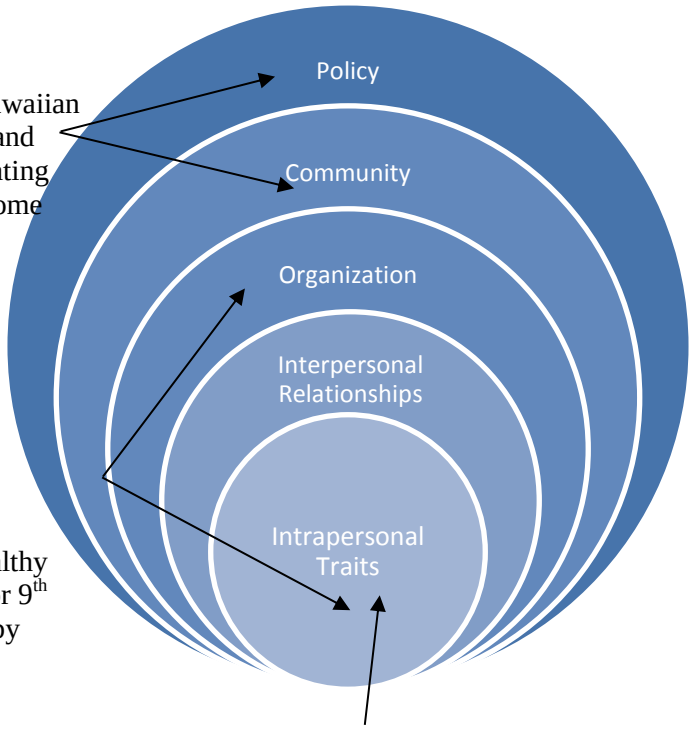
ethnic-sex groups, their likelihood to be either overweight or obese, their engagement in risk-protective behaviors associated with excess weight, and relationships among these variables.

The second research question asked, "Is there a difference in engagement of risk-protective behaviors (dietary behaviors, physical activity and sedentary behaviors) and weight status for 9th grade Native Hawaiian students by school type (public vs. private)?" For this study, I collaborated with a private institution in Hawai'i that has a high percentage of Native Hawaiian students. Currently, the HYRBS is not administered to private school students in the state, therefore missing the portion of adolescents who attend private schools. Utilizing the 2011 HYRBS questions that measured dietary behaviors, physical activity, and sedentary behaviors (i.e. screen time), a survey was developed and administered to 9th grade Native Hawaiian students attending a private institution in Hawai'i. Data from the private school sample was then compared to the data for 9th graders participating in the 2011 HYRBS who self-selected as Native Hawaiian. Data analysis examined responses to the selected identical questions asked of all students in the sample. As a second step, the BMI z-score variable was analyzed to determine differences by school type. In the third step, multinomial logistic regression was performed on the aggregated data set (all 9th grade Native Hawaiian students from both datasets) to determine if school type (public vs. private) was a significant predictor of weight status (healthy vs. overweight and healthy vs. obese) among Native Hawaiian 9th graders, controlling for other variables. Finally in the fourth step of analysis, the private school dataset was analyzed independently using multinomial logistic regression to determine if the grade that the student entered the private school affected their weight status.

In the third and final study of this dissertation research, I collaborated with the same Hawai'i private institution as in the previous study to answer the research question "How do

obese Native Hawaiian adolescents perceive supports and challenges to engage in healthy eating and physical activity in their school and neighborhood community environments?" The qualitative methodology of Photovoice was used, which allowed students to be active participants as they took photographs and wrote captions to illustrate their perception of the supports and challenges to healthy eating and physical activity. As previously discussed, there was an important connection between Native Hawaiians and the land in the past. Today, the community environment in which one lives and attends school may play the same important role in the health and well-being of an individual.

Figure 1.1 Illustrates the level of influence and the appropriate research question.



RQ3: How do obese Native Hawaiian adolescents perceive supports and barriers to engage in healthy eating and physical activity in their home and school communities?

RQ2: Is there a difference in engagement of risk-protective behaviors (i.e., dietary behaviors, physical activity and sedentary behaviors) and weight status (healthy weight, overweight and obese) for 9th grade Native Hawaiian students by school type (public vs. private)?

RQ1: Is there an association between weight status, dietary behaviors, physical activity, sedentary behaviors, smoking, and bullying victimization among Hawaii's public school adolescents and are there differences by ethnic-sex groups?

The findings from these three studies will provide a clearer understanding of factors that contribute to excess weight and the differences between healthy weight and overweight adolescents. Additionally, the results will increase the literature on Native Hawaiian adolescents and a public health problem that plagues this ethnic group. These findings can be used to help develop interventions that we would hope could help to prevent and control obesity in adolescents.

Chapter 2

Ethnic-sex group differences in weight status and engagement in risk-protective behaviors based on the 2011 Hawai‘i State Youth Risk Behavior Survey

Abstract

Background

Adolescent obesity remains a significant public health problem in the United States. Nationally and in Hawai‘i, ethnic minority teens have a higher prevalence of obesity than Whites. There are many factors that contribute to this public health problem. These factors link to the various levels of the Socio-Ecological Health Behavior Model. This study focused on the first level of the model, the intrapersonal level, which includes individual characteristics such as demographics and engagement in risk-protective behaviors. Focusing on variables at this level allows for an increased understanding of the relationships between weight status and personal characteristics, like ethnicity and sex, in the diverse population of Hawai‘i.

Methods

This study analyzed self-reported data from 4,028 (41,155 weighted) public school students in 9^{th}-12^{th} grades, who participated in the 2011 Hawai‘i Youth Risk Behavior Survey. Descriptive statistics were calculated for weight-status (healthy, overweight and obese) and risk-protective behaviors by ethnic-sex groups. The risk-protective behaviors were dietary behaviors, physical activity, sedentary behaviors (as defined by number of screen hours), smoking, and bullying victimization. Sample weights were included in the analysis, which allowed for generalization of the sample responses to Hawai‘i’s public high school population. Univariate linear and logistic regressions were conducted to determine differences by ethnicity, sex, and ethnic-sex group for each weight-status (i.e., healthy, overweight and obese) and each risk-

protective behavior. Univariate and multiple linear regressions were performed to determine differences in BMI *z*-scores for ethnicity, sex, and ethnic-sex groups. Finally, multinomial logistic regressions were performed to determine the associations between the independent variables (demographics, risk-protective behaviors) with the relative weight-status ratios (i.e., healthy vs. overweight, healthy vs. obese).

Results

Overall, the findings from this study indicate that there are different associations in weight status by sex, ethnicity, and engagement in risk-protective behaviors. Based on self-reported height and weight, males had a greater tendency than females to have overweight or obese weight status, and males had a higher BMI *z*-score than females, even though they had higher levels of consuming fruits/vegetables and being physically active. In general, when examining across the three hierarchical models, Native Hawaiians had a lower healthy-to-obese ratio compared to all other ethnic groups except Other Pacific Islanders. In examining risk-protective behaviors, the only behavior studied that contributed to a higher healthy weigh status-to-obese ratio was engagement in physical activity for five or more days per week.

Conclusion

The findings of this study provide insight into differences across ethnicity, sex, and ethnic-sex groups in the association between weight statuses and risk-protective behaviors. Increasing physical activity should help reduce the prevalence of adolescent overweight and obesity, but interventions may need to be both ethnic- and gender-appropriate. Because this study is based on data from Hawai‘i’s public high schools, more research is needed on students in private schools.

Introduction

Adolescent Overweight and Obesity Prevalence, National and State Level

Adolescent obesity remains a significant public health problem in the United States (U.S.). According to the 2011 High School Youth Risk Behavior Survey (YRBS), nationally 15.2% of high school students are categorized as being overweight and 13.0% are categorized as being obese, representing almost no change from the 2009 survey (Centers for Disease Control & Prevention [CDC], 2011). For children and adolescents 18 years old and younger, body mass index (BMI) for age and sex are grouped into four categories of weight status based on the CDC 2000 Growth Charts (CDC, 2000). The four categories are: (1) obese = BMI for age and sex equal to or greater than the 95th percentile; (2) overweight = BMI equal to or greater than the 85th and less than the 95th percentile; (3) healthy = BMI from the 5th to less than the 85th percentile; and (4) underweight = BMI of less than the 5th percentile.

Sweeting (2008) examined the international literature on weight status from 1997-2007 and found no statistical differences in excess weight between males and females. However, Sweeting found weight differences by ethnicity. For example, British studies found a higher prevalence of obesity among black females and a lower prevalence among South Asian females compared to White females. Similarly, Cali and Caprio (2012) found that African-Americans, Mexican-Americans, and Native Americans in the U.S. had higher prevalence of obesity compared to Whites and Asians.

Although most previous studies discussed obesity differences by ethnicity and sex as separate main effects, one investigation found a significant ethnic-by-sex group interaction effect. Basing their study on multivariate models, when controlling for SES, Patrick et al. (2004) found that Hispanic and other minority girls had a higher risk of becoming overweight or obese

compared to non-Hispanic White girls (OR = 1.65 95% CI 1.09-2.49). However, the researchers did not find similar results for boys.

In Hawai‘i, according to the 2011 High School Hawai‘i Youth Risk Behavior Survey (HYRBS), 13.4% of all high school students were overweight while another 13.2% were obese (Hawai‘i Health Data Warehouse, 2012). Among the major ethnic groups in Hawai‘i, two minority groups, Native Hawaiians and Other Pacific Islanders, have the highest prevalence of excess weight among public high school adolescents. Approximately a third (31.3%; 15.5% overweight and 15.8% obese) of all Native Hawaiian adolescents and almost half (47.7%; 20.4% overweight and 27.3% obese) of Other Pacific Islander adolescents in high school were either overweight or obese (Hawai‘i Health Data Warehouse, 2012).

Socio-Ecological Model

The Socio-Ecological Model of Health Behavior is based on the premise that health-related behaviors are determined by multiple levels of intrapersonal, interpersonal, organizational, community, and public policy factors (McElroy, Bibeau, Steckler, & Glanz, 1998). Research has found that there are many factors that contribute to the public health problem of adolescents being overweight and obese. These factors originate from the different dimensions of the Socio-Ecological Model, and at times, interact with one another (e.g., ethnic group, peer relationships, and community that the adolescent lives in). The first level of influence is the intrapersonal level. This level includes individual characteristics, such as demographics (e.g., ethnicity, age, and sex) and engagement in risk-protective behaviors (e.g., physical activity, dietary behaviors, sedentary behavior, cigarette use, and bullying victimization). The present study focuses on associations between weight status and variables at this intrapersonal level.

Behavioral and Psychological Factors Contributing to Overweight and Obesity

Research has linked behaviors like healthy eating, physical activity, sports team participation, and sedentary behaviors to the management of adolescent obesity (Atlantis, Barnes, & Singh, 2006; CDC, 2011; Daniels et al., 2005; Drake et al., 2012; Peart et al., 2011). More recently, research has begun to examine the association of other behaviors with weight status, including smoking and bullying victimization. However, this literature has been inconclusive in determining these risk behaviors' contribution to adolescent weight status (Farhat et al., 2010; Guo et al., 2010; Janssen, Craig, Boyce, & Pickett, 2004; Puhl & Luedicke, 2011; Wang, Iannotti, & Luk, 2010).

The following brief review provides a representation of scientific literature regarding the association between the abovementioned behaviors of healthy eating, physical activity, sports team participation, sedentary behaviors, smoking, and bullying victimization with weight status (i.e. healthy, overweight and obese). The majority of these studies were based on cross-sectional methodologies, which limited the ability to make causal statements.

Dietary Behaviors. Appropriate nutrition for adolescents is important because of the physical growth that occurs during that time, as well as the long-term effects of diet. According to the U.S. Department of Agriculture (USDA) and U.S. Department of Health and Human Services (USDHHS) in 2010, only 9% of adolescents consumed the recommended daily five servings of fruits, vegetables, and whole grains. According to the 2010 National Youth Physical Activity and Nutrition Study (NYPANS), a third of high school students (28.5%) consumed fruits less than one time per day, and a third (33.2%) consumed vegetables less than one time per day. The results of the data were found to be significantly different by ethnicity/race for

consumption of vegetables, with non-Hispanic white students consuming 1.4 vegetables per day, compared to non-Hispanic black (1.0) and Hispanic students (1.1).

In their literature review, Pearson and Biddle (2011) found evidence of a direct relationship between dietary intake, physical activity, and excess weight in teens. Adolescents who were less likely to engage in physical activity were less likely to eat fruits and vegetables and had a higher intake of fast foods and energy-dense foods, resulting in increased excess weight. When examining fruit and vegetable consumption, Neumark-Sztainer et al., (2003) found that its strongest correlates were home availability and taste preference. Campbell (2009) found that factors such as family and culture also influenced the dietary choices of adolescents.

Physical Activity. Two aspects of physical activity engagement that have been linked to excess weight are 1) the amount of time the adolescent spends in engaging in physical activity and 2) sports team participation. Research has consistently shown an inverse relationship between physical activity and obesity, as increased engagement in physical activity decreases the likelihood of an adolescent being or becoming obese (Must & Tybor, 2006; Patrick et al., 2004). Adolescents' engagement in physical activity is important to examine because, during this development phase, lifelong physical activity patterns are established. According to Patrick et al. (2004), of all the variables studied (e.g., physical activity engagement, sedentary behaviors, dietary intake, and highest household educational level), the only risk factor significantly associated with overweight status in adolescents was lack of vigorous physical activity. Similarly, Peart et al. (2011) found that the more time students spent in moderate-to-vigorous physical activity (MVPA), the less likely they would be classified as obese (OR = 0.75, 95% CI = 0.59-0.95). However, in 2011 only 18% of high school students nationally achieved a physical

activity level of 60 minutes of moderate-to-vigorous physical activity (MVPA) daily for seven days a week as recommended (CDC, 2011; World Health Organization [WHO], 2012).

Research has suggested that sports' team participation also has a direct association with weight status. Drake et al. (2012) found that students who played on three teams, as compared with those who did not particulate on any sports team, were 27% less likely to be overweight or obese (when these weight statuses were combined) and 39% less likely to be obese (when the overweight group was separated from the obese group).

Sedentary Behaviors. When examining "screen time," which is defined as time spent watching television or playing computer or video games, findings indicated that as students spend more time engaged in these behaviors, there was an increase in BMI (Peart et al., 2011; Perez et al., 2011). Perez found that, on average, girls engaged in screen-time for 4.1 hours per day compared with boys at 5.9 hours per day. Peart et al. (2011) found that youth who watched at least two hours of television or video each day compared to those who watched less than two hours (American Pediatric Association [APA] guidelines) were almost twice as likely to be categorized as obese compared to those who were normal weight (OR = 1.84, 95% CI 1.24-2.69). Perez et al. (2011) found boys who watched more television, or played computer/video games regardless of effort spent in physical activity, had an increased likelihood of being obese.

Many researchers have interpreted sedentary behavior as the inverse of physical activity for adolescents—that is, the amount of time that the adolescent is not engaging in physical activity. In a review of adolescent physical activity correlates, Sallis, Prochaska, and Taylor (2000) found that engagement in sedentary behaviors after school and on weekends was consistently and inversely related to engagement in physical activity. However, to determine how both the lack of physical activity and the amount of screen time may influence weight status,

both behaviors need to be examined together. For example, Eisenmann et al. (2008), utilized the 2001 national YRBS data and found that high levels of screen time (greater than 3 hours daily) and low physical activity increased risk of being overweight or obese among 14 to 18 year olds. Similar to Eisenmann, Perez et al. (2011) found that boys who participated in organized physical activity and watched two or less hours per day of television, were less likely to become obese than boys who did not participate in organized physical activity and watched three or more hours of television (i.e., screen time). In a comparable study of Australian adolescents, Maher et al. (2012) found that screen time and physical activity levels were both independent predictors of weight status.

Smoking. Research on adolescents' smoking behavior and its relationship to weight status has had inconclusive findings. Ratcliff et al. (2011) found that adolescents who were extremely obese (with a BMI-*for age* greater than or equal to the 99th percentile) had a higher prevalence of having tried smoking than normal-weight peers. Additionally, Hussaini, Nicholson, Shera, Stettler, and Kinsman (2011) found that twice as many obese adolescent females had high levels of nicotine intake compared to non-obese adolescent females. Similarly, Farhat et al. (2010) found that obese girls age 15 and older had a higher relative risk (RR = 2.05, 95% CI 1.25-3.36) of being frequent smokers compared to normal-weight girls. In Hawai‘i, according to Nigg et al. (2011), high school students who were overweight or obese had a higher prevalence (33%) of having "used tobacco in the previous 30 days" than those who had not (25%). However, other studies found no relationship between smoking and being overweight or obese (Dupuy et al., 2011; Larson et al., 2007).

Bullying Victimization. A victim of bullying is defined as someone who is frequently exposed to negative actions of others with the intention of harm (Griffiths et al., 2006). Bullying

takes on many forms, including verbal (e.g., teasing), physical (e.g., hitting), and relational (e.g., social exclusion). Students who were overweight or obese were bullied and teased more often than their healthy-weight counterparts (Fox & Farrow, 2009; Gray, Kahhan & Janicke, 2009; Griffiths et al., 2006; Janssen, Craig, Boyce & Pickett 2004; Puhl, Luedicke, & Heuer, 2011; Wang, Iannotti, & Luk, 2010). When examining the differences in victimization by types of bullying endured due to weight status, Guo et al. (2010) and Wang, Iannotti, and Luk (2010) found that overweight boys and girls were more likely to be verbally bullied compared to healthy-weight peers, while underweight adolescents were more likely to be physically bullied. Research also found sex differences in types of bullying. In general, girls were victims of bullying more than boys (Craig, Harel-Fish, Fogel-Grinvald, Dostaler, et al. 2009; Wang, Iannotti, & Nansel, 2009), with some exceptions (e.g., no differences between genders Williams & Guerra, 2007). Findings become more complex when examining the three variables of bullying, gender, and weight status together. Janssen et al. (2004) found that there was a direct and significant relationship between BMI category and victimization in girls, independent of age. Moving from a healthy normal weight group (which was used as the reference group) to a higher-BMI group increased the girls' odds ratio of being a victim of peer-led bullying. Girls who were obese had significantly greater odds of ever been victimized than healthy-weight girls (Farhat et al., 2010). Only when controlling for age did Janssen find that an increased BMI for boys led to an increased odds ratio of being a bullying victim ($p < 0.05$). Consequences of victimization may include poor social, emotional, and physical health, which further hinders social development of youth. Additionally, victims may engage in behaviors and strategies to deal with the bullying that increase weight, such as increased food consumption or avoidance of gym class (Puhl & Luedicke, 2011).

Youth Risk Behavioral Surveillance System

The Youth Risk Behavior Surveillance System (YRBSS) was developed by the Division of Adolescent and School Health of CDC, DHHS. One part of the YRBSS is the Youth Behavior Risk Survey (YRBS). The YRBS is administered in states and local jurisdictions every other year. It assesses six important risk domains that contribute to the leading causes of mortality, morbidity, and social problems among youth in the U.S. Those six areas are: 1) behaviors contributing to injuries and violence, 2) alcohol or other drug use, 3) tobacco use, 4) general risk behaviors, 5) dietary behaviors, and 6) physical activity.

Students in Hawai‘i are administered the YRBS through a collaboration between the State of Hawai‘i Department of Education and State of Hawai‘i Department of Health. In Hawai‘i, the survey is referred to as the Hawai‘i YRBS (HYRBS) (Saka, 2012). The high school version of the survey began administration in 1991 and has been administered during odd-numbered years. The response rate for the HYRBS exceeds 60%, The HYRBS is comprised of national survey questions and state-specific questions (see Appendix A). In 2011, there were an additional 26 Hawai‘i state-specific questions. The survey is a means for the state to obtain data on certain behaviors that are not collected by other tools. Currently there is a limitation of school-collected information on BMI and risk-protective behaviors external to the HYRBS. Therefore, there is a dependency on the HYRBS for such data.

Purposes

In summary, literature was lacking in areas such as the examination of prevalence and association between obesity and certain risk-protective behaviors in the under-represented ethnic-sex groups of Hawai‘i. Few previous studies built multi-variable models when comparing healthy-weight, overweight, and obese-weight status adolescents. Also, the majority of the

literature examined sex or ethnicity as separate moderators of the outcome of excess weight. The diversity of Hawai‘i’s population warrants greater exploration into the differences between ethnic-sex groups.

Therefore, the purposes of this study were three-fold. The first was to answer the question, “Are there differences in prevalence of healthy weight, overweight, and obese students and risk-protective behaviors by ethnic-sex groups?” The second question was, “Are there differences in weight status by ethnic-sex groups when examining BMI *z*-score?” Finally, the third question was, “Are there associations between the independent variables (demographics and risk-protective factors) with the relative weight status ratios (i.e., healthy vs. overweight, healthy vs. obese)?”

Measures

There were three categories of variables that were utilized in the analyses. Table 2.1 explains the demographic, independent, and dependent variables used in the data

Table 2.1 Description and Coding of the Demographic, Independent, and Dependent Variables

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
Demographics		Age		How old are you?	A. 12 years old or younger B. 13 years old C. 14 years old D. 15 years old E. 16 years old F. 17 years old G. 18 years old or older	• 1 = 12 years old • 2 = 13 years old • 3 = 14 years old • 4 = 15 years old • 5 = 16 years old • 6 = 17 years old • 7 = 18 years old
		Sex		What is your sex?	A. Female B. Male	• 1 = Female • 2 = Male
		Grade Level		In what grade are you?	A. 9th grade B. 10th grade C. 11th grade D. 12th grade E. Ungraded or other grade	• 1 = 9th grade • 2 = 10th grade • 3 = 11th grade • 4 =12th grade • 5 = missing
		Ethnicity		Are you Hispanic?	A. Yes B. No	• 1 = Yes • 0 = No
				What is your race? (Select one or more responses)	A. American Indian or Alaska Native B. Black or African American C. Filipino D. Japanese E. Native Hawaiian/Part Hawaiian F. Other Asian G. Other Pacific Islander H. White	• 3 = Filipino • 4 = Japanese • 5 = Other Asian • 6 = Other Pacific Islander • 7 = White • 9 = Multi-ethnic Non-Native Hawaiian • 10 = Other • 11 = Native Hawaiian

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
Independent Variable	Dietary Behaviors (8 items, 1 composite)	Fruit juice	1	During the past 7 days, how many times did you drink 100% fruit juices?	A. I did not drink 100% fruit juice during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1= drank fruit juice at least 1-3 times during the past 7 days • 0 = did not drink fruit juice during the past 7 days
		Fruit	2	During the past 7 days, how many times did you eat fruit?	A. I did not eat fruit during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1 = ate fruit at least 1-3 times during the past 7 days • 0 = did not eat fruit during the past 7 days
		Green salad	3	During the past 7 days, how many times did you eat green salad?	A. I did not eat green salad during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1 = ate green salad at least 1-3 times during the past 7 days • 0 = did not eat green salad during the past 7 days

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
		Potatoes	4	During the past 7 days, how many times did you eat potatoes? (Do not count French fries, fried potatoes, or potato chips)	A. I did not eat potatoes during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1 = ate potatoes at least 1-3 times during the past 7 days • 0 = did not eat potatoes during the past 7 days
		Carrots	5	During the past 7 days, how many times did you eat carrots?	A. I did not eat carrots during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1 = ate carrots at least 1-3 times during the past 7 days • 0 = did not eat carrots during the past 7 days
		Other vegetables	6	During the past 7 days, how many times did you eat other vegetables?	A. I did not eat other vegetables during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1 = ate other vegetables at least 1-3 times during the past 7 days • 0 = did not eat other vegetables during the past 7 days

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
		Soda	7	During the past 7 days, how many times did you drink a can, bottle, or glass of soda or pop, such as Coke, Pepsi or Sprite? (Do not count diet soda or diet pop)	A. I did not drink soda or pop during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1 = drank soda at least 1-3 times during the past 7 days • 0 = did not drink soda during the past 7 days
		Milk	8	During the past 7 days, how many glasses of milk did you drink? (Count the milk you drank in a glass or cup, from a carton, or with cereal. Count the half pint of milk served at school as equal to one glass.)	A. I did not drink milk during the past 7 days B. 1 to 3 glasses during the past 7 days C. 4 to 6 glasses during the past 7 days D. 1 glass per day E. 2 glasses per day F. 3 glasses per day G. 4 or more glasses per day	• 1= drank milk at least 1-3 times during the past 7 days • 0 = did not drink milk during the past 7 days

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
		Fruits/ Vegetable	Composite 9	[Consumption of fruits and vegetables based on the following items: fruit juice, fruit, green salad, other vegetables, carrots, and potatoes – Added the amount of each food item to determine the total number eaten per day within the past 7 days.]		• 1 = consumed 5 or more fruits or vegetables per day within the past 7 days (Items 1-6) • 0 = did not consume 5 or more fruits or vegetables per day within the past 7 days (Items 1-6)
	Physical Activity (2 items, no composite)	Physical Activity	10	During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time)	A. 0 days B. 1 day C. 2 days D. 3 days E. 4 days F. 5 days G. 6 days H. 7 days	• 1 = engaged in 5 to 7 days of physical activity for at least 60 minutes during the past 7 days • 0 = engaged in less than 5 days of physical activity for at least 60 minutes during the past 7 days

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
		Sports Team Participation	11	During the past 12 months, on how many sports teams did you play? (Count any team run by your school or community groups.)	A. 0 teams B. 1 team C. 2 teams D. 3 or more teams	• 1 = played on at least 1 sports team during the past 12 months • 0 = did not play on at least 1 sports team during the past 12 months
		Television	12	On an average school day, how many hours do you watch TV?	A. I do not watch television B. Less than 1 hour per day C. 1 hour per day D. 2 hours per day E. 3 hours per day F. 4 hours per day G. 5 or more hours per day	0 = 0 hours 0.5 = less than 1 hour per day 1 = 1 hour 2 = 2 hours 3 = 3 hours 4 = 4 hours 5 = 5 or more hours
	Sedentary Behaviors (2 item, 1 composite)	Computer/ Video Games	13	On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work? (Include activities such as Xbox, Playstation, Nintendo DS, iPod touch, Facebook and the Internet)	A. I do not play video or computer games or use a computer for something that is not school work B. Less than 1 hour per day C. 1 hour per day D. 2 hours per day E. 3 hours per day F. 4 hours per day G. 5 or more hours per day	0 = 0 hours 0.5 = less than 1 hour per day 1 = 1 hour 2 = 2 hours 3 = 3 hours 4 = 4 hours 5 = 5 or more hours

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
		Total Screen Time	Composite 14	[Total screen time based on 2 items.]		• 1 = Spent 3 or more hours engaged in TOTAL screen time based on total number of hours watched television (Item 11) AND played computer/video games (Item 12) • 0 = Spent 2 or less hours engaged in TOTAL screen time
	Smoking (1 item)	Smoking	15	During the past 30 days, on how many days did you smoke cigarettes?	A. 0 days B. 1 or 2 days C. 3 to 5 days D. 6 to 9 days E. 10 to 19 days F. 20 to 29 days G. All 30 days	• 1 = Smoked at least 1 or 2 days during the past 30 days • 0 = Did not smoke during the past 30 days
	Bullying Victimization (2 items, 1 composite)	School Bullying	16	During the past 12 months, have you ever been bullied on school property?	A. Yes B. No	• 1 = Bullied on school property during the past 12 months • 0 = Not bullied on school property during the past 12 months

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
		Electronic Bullying	17	During the past 12 months have you ever been electronically bullied? (Include being bullied through e-mail, chat rooms, instant messaging, Web sites, or texting)	A. Yes B. No	• 1 = Bullied electronically during the past 12 months • 0 = Not bullied electronically during the past 12 months
		Bullying	Composite 18	[Bullied either at school or electronically within the past 12 months.]		• 1 = Bullied on school property (Item 14 coded 1) OR bullied electronically (Item 15 coded 1) • 0 = Both Items 14 and 15 coded 0
Dependent Variable	Weight Status	BMI percentile	19	[Percentile based on age and sex.]		• No coding was necessary
		BMI *z*-score		[*z*-score based on age and sex.]		• No coding was necessary
		Weight status	20-22	[CDC's categories of weight status,]		• 2 = 5^{th} %ile $\leq$ BMI $< 85^{th}$ %ile (Healthy) • 3 = 85^{th} %ile $\leq$ BMI $< 95^{th}$ %ile (Overweight) • 4 = BMI $\geq 95^{th}$ %ile (Obese)

Demographic Variables. These variables focused on students' ethnicity, age, sex, and grade.

Two of the three HYRBS ethnicity questions were used to create the ethnicity categories. The first question asked, "Are you Hispanic or Latino?" The second question asked, "What is your race?" and allowed the student to select one or more responses. In Hawai'i, this second question differed from the national survey in that Native Hawaiian/Part-Hawaiian was retained as its own group. In the national survey, Native Hawaiian/Part-Hawaiian was combined with Other Pacific Islanders. The eight-race response options for the survey were: "American Indian or Alaska Native, Black or African American, Filipino, Japanese, Native Hawaiian/Part Hawaiian, Other Asian, Other Pacific Islander, and White."

In response to the first question, if students selected Hispanic/Latino and did not indicate an additional race, then these students were grouped in the "Other" category. In response to the second question, if students selected the option of "Native Hawaiian/Part Hawaiian" alone or with one or more of the ethnicity options, they were classified as Native Hawaiian. This is traditionally done for Hawai'i data, as most Hawaiians are ethnically mixed, there is the desire to count in the population all people of Native Hawaiians ancestry. If students selected more than one ethnicity, including Latino and excluding Hawaiian, then they were classified as "Multi-ethnic non-Hawaiian." All other students were grouped as Filipino, Japanese, Other Asian, Other Pacific Islander, White, or Other. For the latter, due to the small sample sizes for Hispanic/Latino, Native Alaskan, American Indian, and Black or African American (compared to the number of items included in the analyses), the data for these adolescents were grouped together as "Other."

Independent Variables. These include 18 risk-protective variables. Behaviors were considered protective when individuals were striving to improve overall well-being (e.g., consuming an appropriate number of servings of fruits and vegetables daily). Behaviors like smoking were considered as risky. Two independent variables related to physical activity were time spent in physical activity and sports' team participation Ten of the 18 were used to construct three composite scores (i.e., dietary behaviors, sedentary behaviors, and bullying victimization). For example, the composite score for fruit and vegetable consumption was calculated from six variables asking about frequency of consumption in the past week of fruit juice, fruit, green salad, carrots, potatoes, and other vegetables. Fractions were used for responses that indicated when consumption of the foods was less than one time a day (e.g., Table 2.2 below), and the total score was used to determine if the respondent consumed five or more fruits or vegetables per day within the past 7 days. The focus on fruits and vegetables stems from the trend that adolescents fall short of the daily recommended 1.5 cups of fruits and 2.5 cups of vegetables for girls, and 2 cups of fruits and 3 cups of vegetables for boys. According to the 2010 National Youth Physical Activity and Nutrition Study, adolescents eat fruits and vegetables an average of only 1.2 times a day (CDC, 2011).

Table 2.2 Example of how dietary behavior responses were converted for coding

	Example	Coding
A.	I did not eat other vegetables during the past 7 days	A = 0
B.	1 to 3 times during the past 7 days	B = 2/7
C.	4 to 6 times during the past 7 days	C = 5/7
D.	1 time per day	D = 1
E.	2 times per day	E = 2
F.	3 times per day	F = 3
G.	4 or more times per day	G =4

To determine the composite variable for sedentary behaviors, the numbers of hours the student engaged in watching television and playing video/computer games were added together.

Both of these behaviors and their association with excess weight have been studied in previous research on sedentary behaviors (Eisenmann et al., 2006; Peart et al., 2011; Perez, et al., 2011). The American Academy of Pediatrics recommends that children and adolescents should be limited to no more than one or two hours of daily screen time entertainment (American Academy of Pediatrics, 2012).

Dependent Variables of Weight Status. Weight status was operationally defined using BMI. BMI was calculated from self-reported height and weight, and then transformed to a BMI *z*-score and a BMI percentile based on the CDC specifications based on age and sex. Given that the purposes of the study were to examine adolescents who were overweight or obese versus healthy weight, students who were categorized as having a BMI of less than the 5^{th} percentile were excluded from the study. The three remaining weight statuses were included throughout the study:

- Healthy Weight: 5^{th} percentile or greater but less than 85^{th} percentile
- Overweight: 85^{th} percentile or greater but less than 95^{th} percentile
- Obese: 95^{th} percentile or greater

The next section on Data Analyses describes how the different BMI measures were used.

Data Analyses

Because the HYBRS response rate exceeds 60%, CDC returns the dataset to Hawai‘i with sample weights, allowing the findings to be generalized to the greater student population (Saka, 2012). Data were weighted using the CDC-provided weights prior to analysis. The statistical package SAS 9.3 was used for the data analyses. There were three steps for the data analyses.

Step 1. Descriptive statistics were calculated for BMI (using BMI categories, BMI percentiles, & BMI *z*-scores) and risk-protective behaviors as defined by HYRBS data (by sex,

ethnicity, and ethnic-sex groups). The goal was to obtain central tendency measures for the 22 independent and dependent variables: 15 independent variables based on individual items (see Table 2.1), 3 independent variables based on composite scores (see Table 2.1), and 4 BMI dependent outcomes (i.e., percentile score and prevalence of each of the 3 weight statuses [healthy, overweight, obese]). The risk-protective behaviors included dietary behaviors, physical activity, sedentary behaviors (as defined by number of hours in screen time), smoking, and victimization by bullying (see Table 2.1). To calculate the prevalence of categorical variables, responses were dichotomized as either engaging in some degree of the behavior ("1") or not ("0") (see Table 2.1). The median was calculated for BMI percentiles as an ordinal variable. The means, standard error of means, and *N* sizes were computed for continuous variables. Univariate linear regressions (for continuous outcomes) and logistic regressions (for categorical outcomes) were conducted to determine whether there were ethnic, sex, and ethnic-sex "interaction" group differences for each of the weight-status prevalence and the risk-protective variables. Given the large *N* size and number of tests conducted, alpha was set at < 0.0001 and the maximum coefficient of determination—the proportion of variance of the dependent variable accounted for by the independent variable (R^2)—needed to be greater than 0.01 (or > 1.0 %).

Step 2. The means, standard error of means, and *N* sizes were computed for the dependent measure of BMI *z*-scores overall, and by ethnic, sex, and ethnic-sex groups. Subsequently, univariate and multiple linear regressions were performed to determine whether there were ethnic, sex, and ethnic-sex "interaction" group differences in BMI *z*-scores. For this step, only respondents with complete data (i.e., ethnicity, sex, & BMI *z*-scores) were analyzed. To determine if there was statistical significance in the mean differences among the ethnic groups, Student's *t*-test was used. For these comparisons, alpha was set at 0.05 to balance Type I

versus Type II errors, given the importance of revealing potential ethnic differences for this sample.

Step 3. Multinomial logistic regressions were performed to determine the associations between the independent variables (i.e., demographics, risk-protective factors) with the relative weight-status ratios (i.e., healthy vs. overweight, & healthy vs. obese). This included the creation of three models. Tables 2.3 – 2.5 indicate variables used for each model.

Table 2.3 Model 1: Demographic variables

Category	Variable	Reference Group
Demographics	BMI Group	Weight status with healthy used as reference group, compared to overweight and obese weight statuses
	Ethnicity	Native Hawaiians used as reference group
	Sex	Males used as reference group
	Grade Level	12th grade used as reference group

Table 2.4 Model 2: Demographic variables followed by health-related risk-protective independent variables (i.e., dietary behaviors, physical activity, sedentary behaviors)

Category	Variable	Reference Group
Demographics	BMI	Weight status with healthy used as reference group, compared to overweight and obese weight statuses
	Ethnicity	Native Hawaiians used as reference group
	Sex	Males used as reference group
	Grade Level	12th grade used as reference group
Dietary Behaviors	Fruit/Vegetable	Students who consumed 5 or more fruits or vegetables per day during the past 7 days
Physical Activity	Physical Activity	Students who engaged in 5 to 7 days of physical activity for at least 60 minutes
	Sports Team Participation	Students who played on 1 or more sports teams during the past 12 months
Sedentary Behaviors	Total Screen Time	Students who spent a total of 3 or more hours engaged in screen time

Table 2.5 Model 3: Demographic and all risk-protective variables

Category	Variable	Reference Group
Demographics	BMI	Weight status with healthy used as reference group, compared to overweight and obese weight statuses
	Ethnicity	Native Hawaiians used as reference group
	Sex	Males used as reference group
	Grade Level	12^{th} grade used as reference group
Dietary Behaviors	Fruit/Vegetable	Students who consumed 5 or more fruits or vegetables per day during the past 7 days
Physical Activity	Physical Activity	Students who engaged in 5 to 7 days of physical activity for at least 60 minutes
	Sports Team Participation	Students who played on 1 or more sports teams during the past 12 months
Sedentary Behaviors	Total Screen Time	Students who spent a total of 3 or more hours engaged in screen time
Smoking	Smoking	Students who smoked at least 1 or 2 days during the past 30 days
Bullying Victimization	Bullying	Students who were bullied either on school property or electronically

Sample Description

Table 2.6 presents the sample description regarding weight status, grade level, ethnicity, age, and BMI median by sex and overall population. This table is based on only those who indicated sex and ethnicity, and had a calculated BMI. However, given the purposes of the present study, this table did not include those who were categorized as being underweight.

Table 2.6 Description of the sample (unweighted) and population (weighted) based on demographic variables

	Total			Females			Males		
	Unweighted Frequency	Weighted Frequency	Weighted %	Unweighted Frequency	Weighted Frequency	Weighted %	Unweighted Frequency	Weighted Frequency	Weighted %
Total (weighted row %)	4,028	41,155	100.0	2,160	20,647	50.2	1,868	20,508	49.8
Weight Status									
Healthy	2,820	28,899	70.2	1,610	15,775	76.4	1,210	13,124	64.0
Overweight	649	6,290	15.3	323	2,745	13.3	326	3,544	17.3
Obese	559	5,966	14.5	227	2,127	10.3	332	3,839	18.7
Grade Level									
9th Grade	1,060	11,702	28.7	569	5,776	28.2	491	5,926	29.2
10th Grade	955	10,517	25.8	545	5,294	25.8	410	5,222	25.7
11th Grade	948	9,575	23.5	505	4,937	24.1	443	4,638	22.8
12th Grade	1,027	9,010	22.1	522	4,481	21.9	505	4,529	22.3
Ethnicity									
Filipino	747	10,818	30.7	363	4,695	26.6	384	6,123	34.7
Japanese	243	1,686	4.8	127	895	5.1	116	790	4.5
Multi-ethnic non-Hawaiian	207	1,290	3.7	113	676	3.8	94	614	3.5
Native Hawaiian	1,164	11,243	31.9	661	5,999	34.0	503	5,244	29.7
Other (American Indian, Alaska Native, Hispanic/Latino)	102	1,018	2.9	53	433	2.5	49	585	3.3
Other Asian	165	2,052	5.8	91	1,036	5.9	74	1,016	5.8
Other Pacific Islander	197	1,431	4.0	104	735	4.2	93	696	3.9
White	372	5,750	16.3	207	3,173	18.0	165	2,577	14.6
Age (in years)									
m (standard error of means)	4,028		15.7 (0.07)	2,160		15.7 (0.08)	1,868		15.8 (0.08)
BMI									
Median	4,028		68.2	2,160		63.0	1,868		73.4

Population Comparisons:
Ethnicity χ^2 [7, N = 3,197] = 2724.4, $p < .0001$
Grade Level χ^2 [3, N = 3,990] = 39.9, $p = .4$
Sex χ^2 [1, N = 4,028] = 0.05, $p = .9$
Weight Status χ^2 [2, N = 4,028] = 2466.6, $p < .0001$

Interactions

Ethnicity x Sex χ^2 [7, N = 3,197] = 30.3, $p = .006$
Grade x Sex χ^2 [3, N = 3,990] = 1.1, $p = 1.0$
Weight Status x Sex χ^2 [2, N = 4,028] = 81.8, $p < .0001$

The weighted sample included approximately equal proportions of females and males. The average age of the respondent was 15.7 years. Overall, the median BMI percentile for the sample was 68.2 (see also Table 2.7b), which is consistent with the majority (70.2%) of the sample categorized as being a healthy weight status. More females (76.4%) were categorized as having a healthy weight status compared to males (64.0%), who were more likely to be either overweight or obese ($p = .006$).

When examining the ethnic distribution of the weighted sample, there were more Native Hawaiians (31.9%; about one third) than other ethnic groups. The remaining ethnic distribution was as follows in decreasing order: 30.7% Filipino, 16.3% White, 5.8% Other Asian, 4.0% Other Pacific Islander, 4.8% Japanese, 3.7% Multi-ethnic, and 2.9% Other (comprised of American Indian/Alaska Native, African American/Black, & Hispanic/Latino). Regarding sex by ethnicity, only the Filipino and "Other" ethnic groups had more males in their samples than females ($p < .0001$).

Step 1: Description of Individual Items and Comparisons with Ethnicity and Sex

For Step 1, Tables 2.7 – 2.10 present the descriptive statistics of the 22 variables that were examined. The variables included 18 risk-protective variables (15 individual independent variables & 3 composite variables) and the 4 dependent weight-status variables as defined in the Data Analyses Section (BMI percentile; healthy, overweight, & obese) overall, and by sex, ethnicity, and ethnicity-sex groups. The data used for these tables were weighted, including participants who were missing sex, ethnicity, and/or BMI, and excluding those categorized as being underweight according to BMI category.

Table 2.7 Descriptive statistics of individual items and composites for overall weighted sample and sex

		Item	1 Fruit Juice	2 Fruit	3 Green Salad	4 Potatoes	5 Carrots	6 Other Vegetables	7 Soda	8 Milk	9 Fruits and Vegetables 5+/week
Total		**%**	**72.2%**	**89.0%**	**68.4%**	**57.2%**	**52.8%**	**81.8%**	**82.2%**	**91.5%**	**17.3%**
		Count	28,750	35,173	27,275	22,767	20,922	32,503	32,586	35,857	6,729
		Total	39,830	39,499	39,865	39,772	39,605	39,719	39,644	39,209	38,885
		CI (95%)	(71.7-72.6)	(88.7-89.4)	(68.0-68.9)	(56.8-57.7)	(52.5-53.5)	(81.5-82.2)	(81.8-82.6)	(91.2-91.7)	(16.9-17.7)
Sex[a]											
	Female	**%**	**69.4%**	**90.5%**	**70.1%**	**57.1%**	**52.8%**	**84.1%**	**85.7%**	**93.5%**	**14.7%**
		Count	14,015	18,084	14,126	11,478	10,588	16,889	17,201	18,515	2,914
		Total	20,190	19,982	20,137	20,094	20,054	20,086	20,082	19,794	19,788
		CI (95%)	(68.8-70.0)	(90.1-90.9)	(69.5-70.8)	(56.4-57.8)	(52.1-53.5)	(83.6-84.6)	(85.2-86.1)	(93.2-93.9)	(14.2-15.2)
	Male	**%**	**75.0%**	**87.6%**	**66.7%**	**57.4%**	**52.9%**	**79.5%**	**78.6%**	**89.3%**	**20.0%**
		Count	14,735	17,090	13,150	11,289	10,334	15,613	15,385	17,342	3,815
		Total	19,640	19,518	19,728	19,678	19,551	19,633	19,562	19,415	19,097
		CI (95%)	(74.4-75.6)	(87.1-88.0)	(66.0-67.3)	(56.7-58.1)	(52.2-53.6)	(79.0-80.1)	(78.1-79.2)	(88.9-89.7)	(19.4-20.6)

Table 2.7 (continued) Descriptive statistics of individual items and composites for overall weighted sample and sex

		Item	10 Physical Activity (5+ days/week)	11 Teams	12 Average Daily TV Hours*	13 Average Daily Computer Hours*	14 Sedentary	15 Smoke 1 Day+	16 School - Bully
Total		**%**	**38.5%**	**55.5%**			**57.6%**	**10.1%**	**20.3%**
		Count	15,165	21,733	1.9	1.9	23,697	3,901	8,337
		Total	39,413	39,153	41,155	41,155	41,155	38,565	41,073
		CI (95%)	(38.0-39.0)	(55.0-56.0)	(0.04)	(0.03)	(57.1-58.1)	(9.8-10.4)	(19.9-20.7)
Sex[a]									
	Female	**%**	**28.0%**	**51.7%**			**57.6%**	**10.4%**	**20.7%**
		Count	5,602	10,315	1.8	2.0	11,898	2,021	4,277
		Total	20,025	19,933	20,647	20,647	20,647	19,502	20,624
		CI (95%)	(27.4-28.6)	(51.1-52.4)	(0.06)	(0.05)	(57.0-58.3)	(9.9-10.8)	(20.2-21.3)
	Male	**%**	**49.3%**	**59.4%**			**57.5%**	**9.9%**	**19.9%**
		Count	9,563	11,418	2.0	2.1	11,800	1,880	4,060
		Total	19,388	19,221	20,508	20,508	20,508	19,063	20,449
		CI (95%)	(48.6-50.0)	(58.7-60.1)	(0.06)	(0.06)	(56.9-58.2)	(9.4-10.3)	(19.3-20.4)

***Standard Error of Mean**

Table 2.7 (continued) Descriptive statistics of individual items and composites for overall weighted sample and sex

		Item	17 Electronic - Bully	18 Victim	19 Median BMI Percentile	20 Healthy	21 Overweight	22 Obese
Total		**%**	**15.0%**	**26.8%**	**68.2**	**70.2%**	**15.3%**	**14.5%**
		Count	6,154	10,990		28,899	6,290	5,966
		Total	41,026	41,026		41,155	41,155	41,155
		CI (95%)	(14.7-15.3)	(26.4-27.2)		(69.8-70.7)	(14.9-15.6)	(14.2-14.8)
Sex[a]								
	Female	**%**						
		Count	**18.9%**	**30.0%**	**63.8**	**76.4%**	**13.3%**	**10.3%**
		Total	3,908	6,196		15,775	2,745	2,127
		CI (95%)	20,627	20,624		20,647	20,647	20,647
	Male	**%**	(18.4-19.5)	(29.4-30.7)		(75.8-77.0)	(12.8-13.8)	(9.9-10.7)
		Count	**11.0%**	**23.5%**	**73.4**	**64.0%**	**17.3%**	**18.7%**
		Total	2,246	4,793		13,124	3,544	3,839
		CI (95%)	20,399	20,402		20,508	20,508	20,508

Table 2.8 Descriptive statistics of individual items and composites for Filipino and Japanese by overall and sex

		Item	1 Fruit Juice	2 Fruit	3 Green Salad	4 Potatoes	5 Carrots	6 Other Vegetables	7 Soda
Ethnicity[b]									
	Filipino (FIL)	**%**	**66.6%**	**88.6%**	**60.0%**	**51.7%**	**48.2%**	**83.9%**	**84.9%**
		Count	6,962	9,188	6,268	5,380	4,998	8,675	8,777
		Total	10,447	10,367	10,443	10,411	10,362	10,338	10,342
		CI (95%)	(65.7-67.5)	(88.0-89.2)	(59.1-61.0)	(50.7-52.6)	(47.3-49.2)	(83.2-84.6)	(84.2-85.5)
	Female	**%**	**64.0%**	**90.2%**	**60.6%**	**48.9%**	**46.5%**	**87.1%**	**89.2%**
		Count	2,907	4,078	2,743	2,211	2,099	3,939	4,023
		Total	4,543	4,523	4,523	4,523	4,514	4,523	4,510
		CI (95%)	(62.6-65.4)	(89.3-91.0)	(59.2-62.1)	(47.4-50.3)	(45.0-48.0)	(86.1-88.0)	(88.3-90.0)
	Male	**%**	**68.7%**	**87.4%**	**59.5%**	**53.8%**	**49.6%**	**81.4%**	**81.5%**
		Count	4,055	5,110	3,524	3,169	2,899	4,736	4,754
		Total	5,904	5,844	5,921	5,888	5,849	5,816	5,832
		CI (95%)	(67.5-69.9)	(86.6-88.3)	(58.3-60.8)	(52.5-55.1)	(48.3-50.8)	(80.4-82.4)	(80.5-82.5)
	Japanese (JPN)	**%**	**72.8%**	**86.6%**	**77.0%**	**52.4%**	**59.5%**	**83.0%**	**79.7%**
		Count	1,213	1,440	1,277	871	981	1,367	1,324
		Total	1,666	1,662	1,659	1,662	1,648	1,646	1,662
		CI (95%)	(70.6-74.9)	(84.9-87.7)	(74.9-78.9)	(50.0-54.8)	(57.1-61.9)	(81.2-84.8)	(77.7-81.5)
	Female	**%**	**65.2%**	**91.7%**	**82.1%**	**49.4%**	**57.3%**	**88.0%**	**85.1%**
		Count	572	804	720	433	501	761	746
		Total	877	877	877	877	874	865	877
		CI (95%)	(62.0-68.3)	(89.7-93.3)	(79.4-84.5)	(46.1-52.7)	(54.0-60.6)	(85.6-90.0)	(82.6-87.3)
	Male	**%**	**81.3%**	**81.0%**	**71.3%**	**55.7%**	**62.0%**	**77.5%**	**73.6%**
		Count	642	636	557	438	480	606	578
		Total	789	785	782	785	774	782	785
		CI (95%)	(78.5-83.9)	(78.1-83.6)	(68.0-74.3)	(52.3-59.2)	(58.5-65.4)	(74.4-80.3)	(70.4-76.6)

Table 2.8 (continued) Descriptive statistics of individual items and composites for Filipino and Japanese by overall and sex

		Item	8 Milk	9 Fruits and Vegetables 5+/week	10 Physical Activity (5+ days/week)	11 Teams	12 Avg. Daily TV Hours*	13 Avg. Daily Computer Hours *	14 Sedentary
Ethnicity[b]									
	Filipino (FIL)	**%**	**94.1%**	**18.4%**	**30.6%**	**43.5%**			**69.7%**
		Count	9,594	1,884	3,124	4,408	2.3	2.6	7,545
		Total	10,197	10,218	10,209	10,131	10,818	10,818	10,818
		CI (95%)	(93.6-94.5)	(17.7-19.2)	(29.7-31.5)	(42.5-44.5)	(0.09)	(0.10)	(68.9-70.6)
	Female	**%**	**96.8%**	**14.4%**	**17.7%**	**38.5%**			**72.9%**
		Count	4,272	649	792	1,726	2.2	2.6	3,422
		Total	4,412	4,501	4,464	4,483	4,695	4,695	4,695
		CI (95%)	(96.3-97.3)	(13.4-15.5)	(16.6-18.9)	(37.1-39.9)	(0.10)	(0.15)	(71.6-74.1)
	Male	**%**	**92.0%**	**21.6%**	**40.6%**	**47.5%**			**67.3%**
		Count	5,322	1,235	2,332	2,682	2.4	2.5	4,123
		Total	5,785	5,717	5,745	5,649	6,122	6,122	6,123
		CI (95%)	(91.3-92.7)	(20.6-22.7)	(39.3-41.9)	(46.2-48.8)	(0.13)	(0.10)	(66.2-68.5)
	Japanese (JPN)	**%**	**90.3%**	**11.7%**	**46.3%**	**69.2%**			**57.6%**
		Count	1,492	191	768	1,146	1.6	2.1	971
		Total	1,651	1,636	1,657	1,656	1,686	1,686	1,686
		CI (95%)	(88.9-91.7)	(10.2-13.3)	(44.0-48.8)	(66.9-71.4)	(0.12)	(0.10)	(55.2-59.9)
	Female	**%**	**92.7%**	**10.1%**	**34.4%**	**67.8%**			**53.1%**
		Count	811	87	300	593	1.3	2.1	476
		Total	875	862	873	874	895	895	895
		CI (95%)	(90.8-94.2)	(8.3-12.3)	(31.3-37.6)	(64.7-70.9)	(0.13)	(0.11)	(49.9-56.4)
	Male	**%**	**87.7%**	**13.4%**	**59.6%**	**70.8%**			**62.7%**
		Count	681	104	467	554	1.8	2.1	496
		Total	776	774	784	782	790	790	790
		CI (95%)	(85.3-89.9)	(11.2-16.0)	(56.1-62.9)	(67.6-73.9)	(0.13)	(0.09)	(59.4-66.1)

*Standard Error of Mean

Table 2.8 (continued) Descriptive statistics of individual items and composites for Filipino and Japanese by overall and sex

		Item	15 Smoke 1 Day+	16 School - Bully	17 Electronic – Bully	18 Victim	19 Median BMI %tile	20 Healthy	21 Overweight	22 Obese
Ethnicity[b]										
	Filipino (FIL)	**%**	**10.1%**	**20.8%**	**16.8%**	**28.9%**	**68.1**	**67.0%**	**16.5%**	**16.5%**
		Count	1,034	2,249	1,811	3,115		7,250	1,786	1,782
		Total	10,284	10,803	10,769	10,766		10,818	10,818	10,818
		CI (95%)	(9.5-10.7)	(20.1-21.6)	(16.1-17.5)	(28.1-29.8)		(66.1-67.9)	(15.8-17.2)	(15.8-17.2)
	Female	**%**	**9.5%**	**21.5%**	**22.4%**	**34.0%**	**60.7**	**75.3%**	**13.4%**	**11.2%**
		Count	427	1,005	1,048	1,590		3,537	631	527
		Total	4,494	4,681	4,683	4,681		4,695	4,695	4,695
		CI (95%)	(8.7-10.4)	(20.3-22.7)	(21.2-23.6)	(32.6-35.3)		(74.1-76.5)	(12.5-14.4)	(10.3-12.1)
	Male	**%**	**10.5%**	**20.3%**	**12.5%**	**25.0%**	**75.1**	**60.6%**	**18.9%**	**20.5%**
		Count	607	1,244	763	1,524		3,713	1,154	1,255
		Total	5,790	6,123	6,086	6,086		6,123	6,123	6,123
		CI (95%)	(9.7-11.3)	(19.3-21.3)	(11.7-13.4)	(24.0-26.1)		(59.4-61.9)	(17.9-19.8)	(19.5-21.5)
	Japanese (JPN)	**%**	**5.5%**	**15.0%**	**13.9%**	**22.5%**	**65.1**	**75.9%**	**19.2%**	**4.9%**
		Count	91	253	235	378		1,279	323	83
		Total	1,664	1,684	1,682	1,682		1,686	1,686	1,686
		CI (95%)	(4.5-6.7)	(13.4-16.8)	(12.4-15.7)	(20.5-24.5)		(73.8-77.8)	(17.4-21.1)	(4.0-6.1)
	Female	**%**	**3.2%**	**13.7%**	**19.3%**	**24.5%**	**61.4**	**76.5%**	**21.0%**	**2.4%**
		Count	29	122	173	219		685	188	22
		Total	895	895	895	895		895	895	895
		CI (95%)	(2.3-4.6)	(11.5-16.0)	(16.9-22.0)	(21.8-27.4)		(73.7-79.2)	(18.5-23.8)	(1.6-3.7)
	Male	**%**	**8.2%**	**16.6%**	**7.8%**	**20.1%**	**67.8**	**75.1%**	**17.1%**	**7.8%**
		Count	63	131	61	158		594	135	62
		Total	768	789	787	787		790	790	790
		CI (95%)	(6.5-10.4)	(14.2-19.4)	(6.1-9.8)	(17.4-23.0)		(72.1-78.1)	(14.6-19.9)	(6.2-9.9)

Table 2.9 Descriptive statistics of individual items and composites for Multi-ethnic non-Native Hawaiian and Native Hawaiian by overall and sex

		Item	1 Fruit Juice	2 Fruit	3 Green Salad	4 Potatoes	5 Carrots	6 Other Vegetables	7 Soda
Ethnicity[b]									
	Multi-ethnic non-Hawaiian (MULTI)	**%**	**71.7%**	**89.6%**	**64.0%**	**53.5%**	**48.1%**	**85.5%**	**84.6%**
		Count	901	1,146	819	683	615	1,094	1,080
		Total	1,256	1,280	1,280	1,278	1,280	1,280	1,277
		CI (95%)	(69.2-74.2)	(87.7-91.1)	(61.3-66.6)	(50.7-56.2)	(45.3-50.8)	(83.4-87.3)	(82.5-86.5)
	Female	**%**	**68.8%**	**88.8%**	**72.5%**	**48.5%**	**45.1%**	**87.5%**	**86.4%**
		Count	465	600	490	327	305	591	584
		Total	676	676	676	674	676	676	676
		CI (95%)	(65.2-72.2)	(86.2-90.9)	(69.0-75.7)	(44.8-52.3)	(41.4-48.9)	(84.7-89.7)	(83.6-88.8)
	Male	**%**	**75.0%**	**90.5%**	**54.5%**	**58.9%**	**51.4%**	**83.2%**	**82.6%**
		Count	436	547	329	356	310	503	497
		Total	581	604	604	604	604	604	602
		CI (95%)	(71.4-78.4)	(88.0-92.6)	(50.5-58.4)	(55.0-62.8)	(47.3-55.3)	(80.1-86.0)	(79.3-85.4)
	Native Hawaiian (NH)	**%**	**71.1%**	**87.9%**	**70.8%**	**59.7%**	**51.8%**	**74.9%**	**79.0%**
		Count	7,655	9,349	7,586	6,388	5,511	8,040	8,438
		Total	10,759	10,631	10,718	10,691	10,640	10,728	10,675
		CI (95%)	(70.3-72.0)	(87.3-88.5)	(69.9-71.6)	(58.8-60.7)	(50.8-52.7)	(74.1-75.8)	(78.3-79.8)
	Female	**%**	**66.2%**	**87.6%**	**71.4%**	**61.0%**	**51.1%**	**77.5%**	**82.1%**
		Count	3,839	4,989	4,113	3,500	2,942	4,462	4,717
		Total	5,798	5,693	5,763	5,739	5,756	5,758	5,744
		CI (95%)	(65.0-67.4)	(86.8-88.5)	(70.2-72.5)	(59.7-62.2)	(49.8-52.4)	(76.4-78.6)	(81.1-83.1)
	Male	**%**	**76.9%**	**88.3%**	**70.9%**	**58.3%**	**52.6%**	**72.0%**	**75.5%**
		Count	3,816	4,360	3,472	2,888	2,569	3,578	3,721
		Total	4,961	4,938	4,955	4,952	4,883	4,970	4,931
		CI (95%)	(75.7-78.1)	(87.4-89.2)	(68.8-71.3)	(56.9-59.7)	(51.2-54.0)	(70.7-73.2)	(74.2-76.6)

Table 2.9 (continued) Descriptive statistics of individual items and composites for Multi-ethnic non-Native Hawaiian and Native Hawaiian by overall and sex

		Item	8 Milk	9 Fruits and Vegetables 5+/week	10 Days of Physical Activity (5+ days/week)_	11 Teams	12 Avg. Daily TV Hours *	13 Avg. Daily Computer Hours *	14 Sedentary
Ethnicity[b]									
	Multi-ethnic non-Hawaiian (MULTI)	**%**	**94.4%**	**13.8%**	**37.3%**	**61.7%**			
		Count	1,186	173	477	785	2.0	1.9	2.0
		Total	1,257	1,255	1,278	1,272	1,290	1,290	1,290
		CI (95%)	(92.9-95.5)	(12.0-15.8)	(34.7-40.0)	(59.0-64.3)	(0.10)	(0.13)	(0.10)
	Female	**%**	**95.8%**	**10.2%**	**29.3%**	**61.7%**			
		Count	628	69	198	415	1.9	1.8	1.9
		Total	655	674	675	673	675	676	675
		CI (95%)	(94.1-97.2)	(8.2-12.8)	(26.0-32.9)	(57.9-65.3)	(0.20)	(0.20)	(0.20)
	Male	**%**	**92.8%**	**18.0%**	**46.3%**	**61.8%**			
		Count	558	104	279	370	2.1	2.0	2.1
		Total	602	581	603	599	614	614	614
		CI (95%)	(90.3-94.5)	(15.0-21.2)	(42.3-50.3)	(57.8-65.6)	(0.13)	(0.25)	(0.13)
	Native Hawaiian (NH)	**%**	**93.4%**	**14.7%**	**43.1%**	**62.9%**			
		Count	9,825	1,534	4,577	6,643	1.8	1.6	1.8
		Total	10,516	10,409	10,618	10,559	11,243	11,243	11,243
		CI (95%)	(92.9-93.9)	(14.1-15.4)	(42.2-44.1)	(62.0-63.8)	(0.06)	(0.06)	(0.06)
	Female	**%**	**94.2%**	**10.7%**	**29.8%**	**57.3%**			
		Count	5,343	605	1,705	3,250	1.8	1.7	1.8
		Total	5,669	5,646	5,719	5,673	5,998	5,999	5,998
		CI (95%)	(93.6-94.8)	(9.9-11.1)	(28.6-31.0)	(56.0-58.6)	(0.08)	(0.10)	(0.08)
	Male	**%**	**92.5%**	**19.5%**	**58.6%**	**69.5%**			
		Count	4,482	929	2,872	3,394	1.9	1.5	1.9
		Total	4,846	4,763	4,899	4,885	5,244	5,244	5,244
		CI (95%)	(91.7-93.2)	(18.4-20.7)	(57.2-60.0)	(68.2-70.8)	(0.13)	(0.07)	(0.13)

*Standard Error of Mean

Table 2.9 (continued) Descriptive statistics of individual items and composites for Multi-ethnic non-Native Hawaiian and Native Hawaiian by overall and sex

		Item	15 Smoke 1 Day+	16 School - Bully	17 Electronic - Bully	18 Victim	19 Median BMI %ile	20 Healthy	21 Overweight	22 Obese
Ethnicity[b]										
	Multi-ethnic non-Hawaiian (MULTI)	**%**	**14.1%**	**19.5%**	**23.4%**	**30.8%**	**61.1**	**79.1%**	**9.8%**	**11.1%**
		Count	167	251	302	397		1,020	126	144
		Total	1,189	1,289	1,290	1,289		1,290	1,290	1,290
		CI (95%)	(12.2-16.1)	(17.4-21.7)	(21.2-25.8)	(28.3-33.4)		(76.8-81.2)	(8.3-11.5)	(9.6-13.0)
	Female	**%**	**16.0%**	**19.8%**	**31.1%**	**33.2%**	**61.1**	**83.9%**	**11.2%**	**4.8%**
		Count	95	133	210	224		567	76	33
		Total	593	675	676	675		676	676	676
		CI (95%)	(13.3-19.2)	(16.9-22.9)	(27.7-34.7)	(29.7-36.8)		(80.9-86.5)	(9.1-13.8)	(3.5-6.8)
	Male	**%**	**12.2%**	**19.2%**	**15.0%**	**28.2%**	**60.1**	**73.7%**	**8.2%**	**18.1%**
		Count	73	118	92	173		453	50	111
		Total	596	614	614	614		614	614	614
		CI (95%)	(9.9-15.1)	(16.3-22.5)	(12.4-18.0)	(24.8-31.9)		(70.2-77.1)	(6.2-10.6)	(15.2-21.3)
	Native Hawaiian (NH)	**%**	**9.0%**	**20.6%**	**14.2%**	**25.3%**	**74.7**	**65.8%**	**16.0%**	**18.1%**
		Count	945	2,307	1,590	2,843		7,403	1,800	2,040
		Total	10,503	11,207	11,216	11,220		11,243	11,243	11,243
		CI (95%)	(8.5-9.6)	(19.8-21.3)	(13.5-14.8)	(24.5-26.2)		(65.0-66.7)	(15.3-16.7)	(17.4-18.9)
	Female	**%**	**10.2%**	**21.5%**	**17.0%**	**27.8%**	**72.4**	**70.9%**	**14.9%**	**14.1%**
		Count	585	1,291	1,021	1,665		4,255	896	845
		Total	5,736	5,996	5,996	5,996		5,999	5,999	5,999
		CI (95%)	(9.4-11.0)	(20.5-22.6)	(16.1-18.0)	(26.6-28.9)		(69.8-72.1)	(14.1-15.9)	(13.3-15.0)
	Male	**%**	**7.6%**	**19.5%**	**10.9%**	**22.5%**	**77.5**	**60.0%**	**17.2%**	**22.7%**
		Count	361	1,016	569	1,178		3,148	904	1,192
		Total	4,767	5,211	5,219	5,224		5,244	5,244	5,244
		CI (95%)	(6.9-8.4)	(18.4-20.6)	(10.1-11.8)	(21.4-23.7)		(58.7-61.3)	(16.2-18.3)	(21.6-23.9)

Table 2.10 Descriptive statistics of individual items and composites for Other and Other Asian by overall and sex

		Item	1 Fruit Juice	2 Fruit	3 Green Salad	4 Potatoes	5 Carrots	6 Other Vegetables	7 Soda
Ethnicity[b]									
	Other (OTHER)	**%**	**80.6%**	**83.8%**	**65.7%**	**56.6%**	**48.7%**	**78.3%**	**75.1%**
		Count	752	793	621	526	458	741	710
		Total	933	946	946	929	941	946	946
		CI (95%)	(77.9-83.0)	(81.3-86.0)	(62.6-68.6)	(53.4-59.8)	(45.5-51.9)	(75.6-80.8)	(72.2-77.7)
	Female	**%**	**78.9%**	**92.7%**	**68.5%**	**52.4%**	**53.3%**	**75.2%**	**79.0%**
		Count	331	389	287	212	222	315	331
		Total	419	419	419	405	417	419	419
		CI (95%)	(74.8-82.6)	(90.0-94.9)	(63.9-72.8)	(47.5-57.2)	(48.4-58.0)	(70.8-79.1)	(74.8-82.6)
	Male	**%**	**81.9%**	**76.7%**	**63.4%**	**59.8%**	**45.0%**	**80.9%**	**72.0%**
		Count	421	404	334	313	236	426	379
		Total	514	527	527	524	524	527	527
		CI (95%)	(78.3-85.0)	(72.9-80.1)	(59.2-67.4)	(55.5-63.8)	(40.8-49.3)	(77.3-84.0)	(67.9-75.6)
	Other Asian (OA)	**%**	**76.1%**	**97.5%**	**72.4%**	**54.2%**	**51.5%**	**90.8%**	**92.7%**
		Count	1,544	1,977	1,469	1,100	1,038	1,841	1,852
		Total	2,028	2,028	2,028	2,028	2,014	2,028	1,997
		CI (95%)	(74.2-77.9)	(96.7-98.1)	(70.5-74.3)	(52.1-56.4)	(49.4-53.7)	(89.4-92.0)	(91.5-93.8)
	Female	**%**	**68.5%**	**99.8%**	**68.9%**	**55.7%**	**55.0%**	**89.2%**	**96.7%**
		Count	709	1,035	714	577	563	924	1,002
		Total	1,036	1,036	1,036	1,036	1,024	1,036	1,036
		CI (95%)	(65.5-71.2)	(99.5-100.0)	(66.0-71.7)	(52.7-58.7)	(51.9-58.0)	(87.2-90.9)	(95.4-97.6)
	Male	**%**	**84.1%**	**95.0%**	**76.1%**	**52.7%**	**47.9%**	**92.5%**	**88.5%**
		Count	834	942	755	523	474	917	850
		Total	991	992	992	992	990	992	960
		CI (95%)	(81.8-86.3)	(93.4-96.2)	(73.4-78.7)	(49.6-55.8)	(44.8-51.0)	(90.6-93.9)	(86.4-90.4)

Table 2.10 (continued) Descriptive statistics of individual items and composites for Other and Other Asian by overall and sex

		Item	8	9	10	11	12	13	14
			Milk	**Fruits and Vegetables 5+/week**	**Days of Physical Activity (5+ days/week)_**	**Teams**	**Avg. Daily TV Hours ***	**Avg. Daily Computer Hours ***	**Sedentary**
Ethnicity[b]									
	Other (OTHER)	**%**	**87.4%**	**15.5%**	**37.7%**	**62.6%**			**60.7%**
		Count	798	142	357	582	2.3	2.1	617
		Total	913	914	946	930	1,018	1,018	1,018
		CI (95%)	(85.1-89.4)	(13.3-18.0)	(34.7-40.9)	(59.4-65.6)	(0.19)	(0.18)	(57.6-63.6)
	Female	**%**	**99.6%**	**3.3%**	**27.8%**	**47.8%**			**62.0%**
		Count	393	13	117	200	2.3	2.3	268
		Total	394	403	419	419	433)	433	433
		CI (95%)	(98.6-100.0)	(1.9-5.4)	(23.8-32.4)	(43.0-52.5)	(0.22)	(0.23)	(57.2-66.3)
	Male	**%**	**78.0%**	**25.2%**	**45.6%**	**74.6%**			**59.7%**
		Count	405	129	240	382	2.3	2.1	349
		Total	519	511	527	511	585	585	584
		CI (95%)	(74.3-81.4)	(21.7-29.2)	(41.3-49.8)	(70.8-78.3)	(0.33)	(0.26)	(55.7-63.7)
	Other Asian (OA)	**%**	**95.7%**	**17.5%**	**23.5%**	**40.4%**			**73.0%**
		Count	1,931	352	476	820	1.7	2.9	1,499
		Total	2,017	2,014	2,028	2,028	2,052	2,052	2,052
		CI (95%)	(94.8-96.5)	(15.9-19.2)	(21.7-25.4)	(38.3-42.6)	(0.08)	(0.013)	(71.1-74.9)
	Female	**%**	**95.1%**	**15.9%**	**13.9%**	**41.9%**			**77.2%**
		Count	976	163	144	434	1.5	3.1	800
		Total	1,026	1,024	1,036	1,036	1,036	1,036	1,036
		CI (95%)	(93.6-96.3)	(13.8-18.3)	(11.9-16.1)	(38.9-44.9)	(0.08)	(0.08)	(74.6-79.7)
	Male	**%**	**96.3%**	**19.1%**	**33.5%**	**38.9%**			**68.8%**
		Count	955	189	332	386	1.8	2.7	699
		Total	992	990	992	992	1,016	1,016	1,016
		CI (95%)	(94.9-97.3)	(16.8-21.7)	(30.6-36.5)	(35.9-42.0)	(0.11)	(0.22)	(65.9-71.6)

*Standard Error of Mean

Table 2.10 (continued) Descriptive statistics of individual items and composites for Other and Other Asian by overall and sex

		Item	15 Smoke 1 Day+	16 School - Bully	17 Electronic - Bully	18 Victim	19 Median BMI %ile	20 Healthy	21 Overweight	22 Obese
Ethnicity[b]										
	Other (OTHER)	**%**	**8.0%**	**18.1%**	**11.0%**	**22.2%**	**71.0**	**73.1%**	**11.8%**	**15.0%**
		Count	74	184	112	226		744	120	153
		Total	924	1,018	1,018	1,018		1,018	1,018	1,018
		CI (95%)	(6.4-9.9)	(15.8-20.6)	(9.2-13.1)	(19.8-24.9)		(70.3-75.7)	(9.9-13.9)	(13.0-17.4)
	Female	**%**	**5.8%**	**9.9%**	**10.1%**	**16.1%**	**71.2**	**74.7%**	**15.3%**	**10.1%**
		Count	23	43	44	70		323	66	44
		Total	395	433	433	433		433	433	433
		CI (95%)	(3.8-8.6)	(7.5-13.1)	(7.7-13.4)	(13.0-19.9)		(70.3-78.5)	(12.2-18.9)	(7.7-13.4)
	Male	**%**	**9.7%**	**24.1%**	**11.7%**	**26.7%**	**70.9**	**72.0%**	**9.3%**	**18.7%**
		Count	51	141	69	156		421	54	109
		Total	529	585	584	585		585	585	585
		CI (95%)	(7.4-12.5)	(20.8-27.7)	(9.4-14.7)	(23.2.-30.4)		(68.2-75.5)	(7.1-11.8)	(15.7-22.0)
	Other Asian (OA)	**%**	**6.3%**	**17.4%**	**8.9%**	**21.9%**	**59.4**	**81.2%**	**10.2%**	**8.7%**
		Count	126	357	182	449		1,666	209	178
		Total	1,997	2,048	2,048	2,048		2,052	2,052	2,052
		CI (95%)	(5.3-7.5)	(15.8-19.1)	(7.7-10.2)	(20.2-23.8)		(79.4-82.8)	(9.0-11.6)	(7.5-10.0)
	Female	**%**	**3.0%**	**18.0%**	**10.2%**	**21.6%**	**54.2**	**88.6%**	**9.5%**	**1.9%**
		Count	31	187	106	223		917	99	19
		Total	1,012	1,036	1,036	1,036		1,036	1,036	1,036
		CI (95%)	(2.2-4.3)	(15.8-20.5)	(8.5-12.2)	(19.1-24.1)		(86.4-90.3)	(7.9-11.5)	(1.2-2.8)
	Male	**%**	**9.6%**	**16.8%**	**7.6%**	**22.3%**	**73.2**	**73.6%**	**10.8%**	**15.6%**
		Count	95	170	76	225		748	110	158
		Total	985	1,011	1,011	1,011		1,016	1,016	1,016
		CI (95%)	(8.0-11.6)	(14.6-19.2)	(6.0-9.3)	(19.8-24.9)		(70.8-76.2)	(9.1-12.9)	(13.5-17.9)

Table 2.11 Descriptive statistics of individual items and composites for Other Pacific Islander and White by overall and sex

		Item	1 Fruit Juice	2 Fruit	3 Green Salad	4 Potatoes	5 Carrots	6 Other Vegetables	7 Soda
Ethnicity[b]									
	Other Pacific Islander (OPI)	**%**	**75.6%**	**88.7%**	**70.4%**	**66.2%**	**52.4%**	**78.2%**	**68.8%**
		Count	1,017	1,207	967	904	721	1,070	943
		Total	1,346	1,361	1,373	1,367	1,375	1,368	1,370
		CI (95%)	(73.2-77.8)	(86.9-90.3)	(68.0-72.8)	(63.6-68.6)	(49.8-55.1)	(76.0-80.3)	(66.3-71.2)
	Female	**%**	**77.0%**	**90.0%**	**66.0%**	**70.6%**	**59.8%**	**84.3%**	**70.9%**
		Count	543	634	464	495	422	590	498
		Total	705	704	703	701	705	700	702
		CI (95%)	(73.8-80.0)	(87.6-92.1)	(62.4-69.4)	(67.1-73.9)	(56.2-63.4)	(81.4-86.8)	(67.5-74.2)
	Male	**%**	**74.1%**	**87.3%**	**75.0%**	**61.5%**	**44.7%**	**71.9%**	**66.6%**
		Count	475	573	502	409	299	480	445
		Total	641	657	670	666	670	668	669
		CI (95%)	(70.6-77.3)	(84.4-89.6)	(71.5-78.1)	(57.7-65.0)	(40.9-48.4)	(68.3-75.1)	(62.9-70.0)
	White (WH)	**%**	**78.6%**	**91.3%**	**76.3%**	**66.0%**	**58.9%**	**87.9%**	**82.6%**
		Count	4,421	5,004	4,308	3,720	3,304	4,930	4,640
		Total	5,626	5,480	5,643	5,643	5,605	5,610	5,620
		CI (95%)	(77.5-79.6)	(90.5-92.0)	(75.2-77.4)	(64.7-67.1)	(57.7-60.2)	(87.0-88.7)	(81.5-83.5)
	Female	**%**	**78.5%**	**95.0%**	**83.3%**	**70.4%**	**63.7%**	**92.5%**	**84.3%**
		Count	2,476	2,940	2,623	2,217	1,989	2,888	2,639
		Total	3,156	3,093	3,150	3,150	3,119	3,122	3,131
		CI (95%)	(77.0-79.9)	(94.2-95.8)	(81.9-84.8)	(68.8-71.9)	(62.1-65.4)	(91.5-93.4)	(83.0-85.5)
	Male	**%**	**78.7%**	**86.5%**	**67.6%**	**60.3%**	**52.9%**	**82.1%**	**80.4%**
		Count	1,945	2,065	1,685	1,503	1,315	2,042	2,002
		Total	2,470	2,388	2,493	2,493	2,485	2,489	2,489
		CI (95%)	(77.1-80.3)	(85.0-87.8)	(65.7-69.4)	(58.4-62.2)	(51.0-54.9)	(80.5-83.5)	(78.8-81.9)

Table 2.11(continued) Descriptive statistics of individual items and composites for Other Pacific Islander and White by overall and sex

		Item	8 Milk	9 Fruits and Vegetables 5+/week	10 Days of Physical Activity (5+ days/week)_	11 Teams	12 Avg. Daily TV Hours *	13 Avg. Daily Computer Hours *	14 Sedentary
Ethnicity[b]									
	Other (OTHER)	**%**	**86.3%**	**21.7%**	**33.2%**	**62.1%**			**69.7%**
		Count	1,172	288	446	830	2.3	2.6	7,545
		Total	1,359	1,324	1,346	1,338	10,818	10,818	10,818
		CI (95%)	(84.3-88.0)	(19.6-24.1)	(30.7-35.7)	(59.4-64.6)	(0.09)	(0.10)	(68.9-70.6)
	Female	**%**	**80.2%**	**23.8%**	**26.3%**	**59.2%**			**72.9%**
		Count	558	165	185	406	2.2	2.6	3,422
		Total	696	693	703	685	4,695	4,695	4,695
		CI (95%)	(77.0-83.0)	(20.8-27.1)	(23.3-29.7)	(55.5-62.9)	(0.10)	(0.15)	(71.6-74.1)
	Male	**%**	**92.6%**	**19.4%**	**40.7%**	**65.1%**			**67.3%**
		Count	614	123	261	425	2.4	2.5	4,123
		Total	663	632	642	652	6,122	6,122	6,123
		CI (95%)	(90.4-94.4)	(16.6-22.7)	(36.9-44.5)	(61.4-68.7)	(0.13)	(0.10)	(66.2-68.5)
	Other Asian (OA)	**%**	**82.8%**	**21.0%**	**47.4%**	**61.6%**			**57.6%**
		Count	4,646	1,132	2,660	3,440	1.6	2.1	971
		Total	5,612	5,405	5,614	5,584	1,686	1,686	1,686
		CI (95%)	(81.8-83.8)	(19.9-22.0)	(46.1-48.7)	(60.3-62.9)	(0.12)	(0.10)	(55.2-59.9)
	Female	**%**	**87.8%**	**22.1%**	**38.5%**	**57.1%**			**53.1%**
		Count	2,742	670	1,212	1,794	1.3	2.1	476
		Total	3,124	3,028	3,150	3,139	895	895	895
		CI (95%)	(86.1-89.9)	(20.7-23.6)	(36.8-40.2)	(55.4-58.9)	(0.13)	(0.11)	(49.9-56.4)
	Male	**%**	**76.5%**	**19.5%**	**58.7%**	**67.3%**			**62.7%**
		Count	1,904	462	1,448	1,646	1.8	2.1	496
		Total	2,488	2,377	2,464	2,445	790	790	790
		CI (95%)	(74.8-78.2)	(17.9-21.1)	(56.8-60.7)	(65.4-69.2)	(0.13)	(0.09)	(59.4-66.1)

*Standard Error of Mean

Table 2.11 Descriptive statistics of individual items and composites for Other Pacific Islander and White by overall and sex

		Item	15 Smoke 1 Day+	16 School - Bully	17 Electronic - Bully	18 Victim	19 Median BMI %ile	20 Healthy	21 Overweight	22 Obese
Ethnicity[b]										
	Other (OTHER)	**%**	**10.1%**	**20.8%**	**16.8%**	**28.9%**	**68.1**	**67.0%**	**16.5%**	**16.5%**
		Count	1,034	2,249	1,811	3,115		7,250	1,786	1,782
		Total	10,284	10,803	10,769	10,766		10,818	10,818	10,818
		CI (95%)	(9.5-10.7)	(20.1-21.6)	(16.1-17.5)	(28.1-29.8)		(66.1-67.9)	(15.8-17.2)	(15.8-17.2)
	Female	**%**	**9.5%**	**21.5%**	**22.4%**	**34.0%**	**60.7**	**75.3%**	**13.4%**	**11.2%**
		Count	427	1,005	1,048	1,590		3,537	631	527
		Total	4,494	4,681	4,683	4,681		4,695	4,695	4,695
		CI (95%)	(8.7-10.4)	(20.3-22.7)	(21.2-23.6)	(32.6-35.3)		(74.1-76.5)	(12.5-14.4)	(10.3-12.1)
	Male	**%**	**10.5%**	**20.3%**	**12.5%**	**25.0%**	**75.1**	**60.6%**	**18.9%**	**20.5%**
		Count	607	1,244	763	1,524		3,713	1,154	1,255
		Total	5,790	6,123	6,086	6,086		6,123	6,123	6,123
		CI (95%)	(9.7-11.3)	(19.3-21.3)	(11.7-13.4)	(24.0-26.1)		(59.4-61.9)	(17.9-19.8)	(19.5-21.5)
	Other Asian (OA)	**%**	**5.5%**	**15.0%**	**13.9%**	**22.5%**	**65.1**	**75.9%**	**19.2%**	**4.9%**
		Count	91	253	235	378		1,279	323	83
		Total	1,664	1,684	1,682	1,682		1,686	1,686	1,686
		CI (95%)	(4.5-6.7)	(13.4-16.8)	(12.4-15.7)	(20.5-24.5)		(73.8-77.8)	(17.4-21.1)	(4.0-6.1)
	Female	**%**	**3.2%**	**13.7%**	**19.3%**	**24.5%**	**61.4**	**76.5%**	**21.0%**	**2.4%**
		Count	29	122	173	219		685	188	22
		Total	895	895	895	895		895	895	895
		CI (95%)	(2.3-4.6)	(11.5-16.0)	(16.9-22.0)	(21.8-27.4)		(73.7-79.2)	(18.5-23.8)	(1.6-3.7)
	Male	**%**	**8.2%**	**16.6%**	**7.8%**	**20.1%**	**67.8**	**75.1%**	**17.1%**	**7.8%**
		Count	63	131	61	158		594	135	62
		Total	768	789	787	787		790	790	790
		CI (95%)	(6.5-10.4)	(14.2-19.4)	(6.1-9.8)	(17.4-23.0)		(72.1-78.1)	(14.6-19.9)	(6.2-9.9)

Filipino - FIL	Multi-ethnic non-Native Hawaiian - MULTI	Other – OTHER	Other Pacific Islander – OPI
Japanese - JPN	Native Hawaiian – NH	Other Asian – OA	White -WH

[a]Statistically significant difference between sexes: (Likelihood ratio $p < .0001$, $R^2 > .01$)

F > M: Items 2, 3, 6, 7, 8, 17, 18, 20

M > F: Items 1, 9, 10, 11, 21, 22

[b]Statistically significant differences between ethnic groups compared to Native Hawaiians: (Likelihood ratio $p < .0001$, $R^2 > .01$)

Item 2	NH < OA	Item 20	NH > OPI
Item 7	NH > OPI	Item 21	NH < OPI
Item 11	NH > FIL, OA	Item 22	NH < OPI; NH >WH
Item 14	NH < FIL, OA; NH > OPI, WH		

Statistically significant interactions ($p < .0001$, $R^2 > .01$):

Ethnicity x Sex – Items 8 (Note: Item 19, BMI median percentile, was not tested; see Step 2 below using the BMI *z*-score)

Overall Findings

When examining the protective nature of increased healthy dietary behaviors, including the consumption of fruits and vegetables, the majority of students responded that they consumed fruits, green salad, potatoes, carrots, and other vegetables at least one time per day. However, when these responses were added together to determine if students consumed these foods five or more times per day within the past seven days, less than one in five students (17.3%) met this cut off. Regarding the examination of the protective behavior of increased physical activity, only 38.5% of the respondents were physically active for five to seven days within the previous seven days. More than half (55.5%) of the students participated on at least one sports' team within the past year.

Of the risk behaviors examined in this study, 57.6% of students engaged in sedentary behaviors. As mentioned in the Measurement section (Table 2.1), to determine the composite for sedentary behaviors, the total number of hours on average per day that the respondent spent watching television was added to the total number of hours on average that the respondent spent on the computer for non-school work or played video games. Only 10.1% of students reported smoking at least one day in the past 30 days, while more than a quarter of all students indicated that they were victims of bullying, either at school, electronically, or both. As mentioned in Table 2.1, to determine whether the students were a victim, they only had to indicate "yes" to one type of bullying. Of those who were bullied, being a victim at school was more prevalent than being bullied electronically (20.3% vs. 15.0%, respectively).

Finally, when examining the BMI categories, the majority of the students were categorized as having a healthy weight status (70.2%). Only 15.3% were categorized as being overweight and the remaining 14.5% were categorized as being obese.

Findings by Sex

There was a statistical difference in prevalence of engagement of 14 of the 22 risk-protective behaviors by sex (Likelihood ratio, $p < .0001$, $R^2 > .01$). Females reported significant higher levels for 8 of these 14 variables, including consumption of fruit (Item 2), green salad (Item 3), other vegetables (Item

6), soda (Item 7), milk (Item 8), victim of electronic bullying (Item 17), victim of bullying (composite variable of both types of bullying – Item 18), and healthy weight status (Item 20). Males reported significant higher levels for six of the items: fruit juice (Item 1), fruit/vegetable consumption (Item 9), 5 or more days of physical activity (Item 10), sports' team participation (Item 11), overweight (Item 21), and obese weight status (Item 22). The remaining seven variables (potatoes – Item 4, carrots – Item 5, average daily television hours – Item 12, average daily computer hours – Item 13, sedentary behaviors – Item 14, victim of bullying at school – Item 16, and smoking – Item 15) did not entail a statistically significant difference. Item 19, BMI percentile, was analyzed in depth during Step 2 of the Data Analysis.

Findings by Ethnicity

The overall main effect of ethnicity was significant for all items (Likelihood ratio, $p < .0001$, $R^2 > .01$). The main effect for ethnicity was tested for each of the variables, excluding BMI percentile (Item 19; see Step 2). In performing the Proc Surveylogistic procedure in SAS, Native Hawaiians were indicated as the reference group. Non-Native Hawaiian ethnic groups were not compared against each other, given the focus of this study on Native Hawaiians in comparison to other ethnic groups. The results indicated a significant difference in prevalence for seven variables when comparing Native Hawaiians and the other ethnic groups. Native Hawaiians reported *higher* levels against certain ethnic groups (which are noted in parentheses below) for five of the seven variables. These variables included the dietary behaviors of consumption of soda – Item 7 (> Other Pacific Islander); sports' team participation – Item 11 (> Filipino & Other Asian); sedentary behaviors – Item 14 (> Other Pacific Islander & White); healthy weight status – Item 20 (> Other Pacific Islander); and being obese – Item 22 (> White).

Native Hawaiians reported *lower* levels when compared against certain ethnic groups for four of the seven variables. These variables included the dietary behaviors of consumption of fruit - Item 2 (< Other Asian), sedentary behaviors - Item 14 (Filipino & Other Asian); overweight - Item 21(< Other Pacific Islanders); and obese - Item 22 (< Other Pacific Islanders).

Interaction Effects

Finally, the ethnicity-by-sex interaction was significant ($p < .0001$, $R^2 > .01$) for only Item 8, consumption of milk. The significant interaction meant that the outcomes among the ethnic groups differed depending on sex. Other Pacific Islander males had a higher rate than their female counterparts. White and Other females had a higher rate than their male counterparts. The remaining five ethnic groups did not appear to have gender differences.

Step 2: BMI *z*-scores by Ethnicity and Sex

For Step 2, univariate and multiple linear regressions were performed to determine whether there were differences across sexes, ethnic groups, and ethnic-sex groups in weight status as measured by continuous BMI *z*-scores. Table 2.12 presents the means, standard error of means, and *N* sizes by ethnicity and sex with BMI *z*-scores as the outcome.

Table 2.12 Means, standard error of means, and N sizes of BMI *z*-scores by ethnicity and sex

	Females			Males			Total		
Ethnicity	Average	Standard Error of Mean	*N*	Average	Standard Error of Mean	*N*	Average	Standard Error of Mean	*N*
Filipino (FIL)	0.33	0.07	4,695	0.63	0.05	6,123	0.50	0.04	10,818
Japanese (JPN)	0.28	0.07	895	0.42	0.06	790	0.34	0.06	1,686
Multi-ethnic non-Hawaiian (MULTI)	0.38	0.11	676	0.49	0.09	614	0.43	0.07	1,290
Native Hawaiian (NH)	0.55	0.04	5,999	0.88	0.05	5,244	0.70	0.04	11,243
Other (OTH)	0.59	0.08	433	0.64	0.12	585	0.62	0.08	1,018
Other Asian (OA)	0.09	0.10	1,036	0.47	0.20	1,016	0.28	0.15	2,052
Other Pacific Islander (OPI)	1.02	0.05	735	1.11	0.18	696	1.06	0.07	1,431
White (WH)	0.07	0.05	3,173	0.30	0,05	2,577	0.17	0.04	5,750
Total	0.38	0.03	17,642	0.65	0.04	17,645	0.51	0.03	35,288

The main effects of sex and ethnicity were statistically significant at $p < 0.5$; however, the interaction between sex and ethnicity was not significant. The average BMI *z*-score of males was significantly higher than for females. Referring to ethnicity, Other Pacific Islanders' average BMI *z*-score was significantly higher than all other ethnic groups. Native Hawaiians' average BMI *z*-score was significantly higher than all remaining ethnic groups (i.e., Filipino, Multi-ethnic non-Native Hawaiian, Japanese, Other, Other Asian, and White).

Step 3: Hierarchical Model-Building

Finally, Step 3 utilized multinomial logistic regressions (see Table 2.13) to determine the ratios between the healthy weight status and the overweight status, and between the healthy weight status and the obese weight status. These analyses found that there were significant differences between sexes, grade levels, and certain ethnic groups (*p<.05)*. Given the complexity in interpreting the results, the following is a general and conceptual explanation of Model 1's first odds ratio (i.e., 0.44) for females relative to males (as the reference group). Table 2.1 shows females were coded "1" and males were coded "2," in using multinomial logistic regression, with the higher coded group used as the reference group. Conceptually, for the odds ratio of 0.44 for females who were obese compared to healthy, the first step is to calculate the ratio between healthy-weight students and obese students for each sex. Females had a prevalence of 76.4% (95% CI 75.7-77.0) having a healthy weight status and a prevalence of 10.3% (95% CI 9.9-10.7) for being obese. The ratio of healthy weight to obese is therefore 7.4:1 (for every 7.4 healthy -weighted females, there was 1 obese female). Males had a prevalence of 64.0% (95% CI 63.3-64.6) having a healthy weight and a prevalence of 18.7% (95% CI 18.2-19.3) for being obese. The ratio of healthy weight to obese is therefore 3.4:1 (for every 3.4 healthy weighted males, there was 1 obese male). The second step is then to take each sex's ratio of healthy weighted students to obese students and to calculate the ratio between males and females. Because males were used as the reference group, the ratio was 3.4:7.4 (males:females), resulting in an odds ratio of 0.44.

Table 2.13 Hierarchical multinomial logistic regression

Variable Categories	Weight Status	Model 1: Demographics			Model 2			Model 3: All Variables		
		OR****	95% CI	*p*	OR****	95% CI	*p*	OR****	95% CI	*p*
Gender:										
Females	Obese	0.44	(0.34, 0.56)	***	0.37	(0.27, 0.50)	***	0.34	(0.26, 0.44)	***
	Overweight	0.64	(0.46, 0.90)	**	0.65	(0.45, 0.94)	*	0.67	(0.46, 0.99)	*
Grade										
9th Grade	Obese	1.20	(0.85, 1.71)	.3075	1.31	(0.90, 1.90)	.1657	1.21	(0.81, 1.81)	.3529
	Overweight	1.42	(1.00, 2.00)	.0511	1.36	(0.91, 2.02)	.1300	1.24	(0.84, 1.82)	.2758
10th Grade	Obese	1.20	(0.77, 1.85)	.4219	1.28	(0.87, 1.87)	.2096	1.19	(0.79, 1.78)	.4100
	Overweight	1.59	(1.16, 2.19)	**	1.55	(1.11, 2.16)	**	1.46	(1.06, 2.00)	*
11th Grade	Obese	1.13	(0.73, 1.74)	.5838	1.15	(0.72, 1.84)	.5576	1.22	(0.75, 1.97)	.4277
	Overweight	1.06	(0.76, 1.48)	.7384	1.01	(0.70, 1.49)	.9233	0.96	(0.67, 1.37)	.8245
Ethnicity:										
Filipino	Obese	0.83	(0.57, 1.19)	.3104	0.65	(0.45, 0.95)	*	0.64	(0.45, 0.92)	*
	Overweight	0.95	(0.73, 1.25)	.7308	0.93	(0.70, 1.24)	.6338	0.83	(0.63, 1.09)	.1815
Japanese	Obese	0.24	(0.11, 0.51)	**	0.23	(0.11, 0.49)	***	0.23	(0.12, 0.47)	***
	Overweight	1.07	(0.59, 1.94)	.8328	1.05	(0.57, 1.92)	.8886	0.94	(0.50, 1.75)	.8418
Multi-ethnic non-Native Hawaiian	Obese	0.47	(0.29, 0.74)	**	0.35	(0.21, 0.58)	***	0.33	(0.20, 0.55)	***
	Overweight	0.49	(0.28, 0.85)	*	0.46	(0.26, 0.82)	**	0.46	(0.25, 0.84)	*
Other	Obese	0.44	(0.22, 0.88)	*	0.32	(0.10, 0.99)	*	0.28	(0.08, 1.06)	.0601
	Overweight	0.63	(0.38, 1.05)	.0732	0.71	(0.40, 1.24)	.2228	0.57	(0.32, 1.02)	.0582
Other Asian	Obese	0.38	(0.11, 1.32)	.1267	0.30	(0.09, 1.04)	.0583	0.28	(0.08, 0.99)	*
	Overweight	0.50	(0.28, 0.88)	*	0.52	(0.31, 0.88)	*	0.47	(0.28, 0.78)	**
Other Pacific Islanders	Obese	2.43	(1.56, 3.79)	***	1.98	(1.26, 3.09)	**	1.63	(0.81, 3.29)	.1708
	Overweight	2.01	(1.44, 2.80)	***	1.81	(1.24, 2.64)	**	1.65	(1.16, 2.35)	**
White	Obese	0.24	(0.15, 0.39)	***	0.23	(0.14, 0.38)	***	0.24	(0.14, 0.40)	***
	Overweight	0.52	(0.32, 0.84)	**	0.51	(0.32, 0.82)	**	0.49	(0.31, 0.78)	**

*$p < .05$; **$p < .01$; ***$p < .0001$; **** Odds Ratio

Table 2.13 (continued) Hierarchical multinomial logistic regression

Variable Categories	Weight Status	Model 1: Demographics			Model 2			Model 3: All Variables		
		OR****	95% CI	*p*	OR****	95% CI	*p*	OR****	95% CI	*p*
Behaviors										
Fruits/Vegetables (< 5 fruits/vegetables per day)	Obese				0.80	(0.50, 1.27)	.3381	1.06	(0.66, 1.72)	.8066
	Overweight				0.93	(0.66, 1.32)	.6912	1.06	(0.70, 1.61)	.7901
Physical Activity (< 5 days)	Obese				1.81	(1.18, 2.78)	**	1.70	(1.09, 2.64)	*
	Overweight				0.75	(0.51, 1.11)	.1536	0.73	(0.50, 1.05)	.0921
Sports Teams (0 teams)	Obese				1.12	(0.79, 1.57)	.5263	1.22	(0.88, 1.70)	.2385
	Overweight				1.14	(0.81, 1.59)	.4574	1.27	(0.88, 1.83)	.1999
Sedentary (< 3 hours/day)	Obese				0.88	(0.61, 1.28)	.5044	0.90	(0.62, 1.32)	.6024
	Overweight				1.14	(0.83, 1.56)	.4209	1.10	(0.79, 1.53)	.5631
Smoking (did not smoke within past 30 days)	Obese							1.22	(0.78, 1.90)	.3831
	Overweight							1.17	(0.71, 1.92)	.5506
Victim of Bullying (not bullied)	Obese							0.66	(0.41, 1.09)	.1027
	Overweight							0.82	(0.62, 1.09)	.1665

*p < .05; **p < .01; ***p < .0001; **** Odds Ratio

The first model examined the three demographic factors of sex, grade level, and ethnicity as the independent variables. The reference groups were males, 12th graders, and Native Hawaiians. The significant findings related to sex were that females had a lower overweight-to-healthy-weight ratio than males (OR = 0.64), and a lower obese-to-healthy-weight ratio (OR = 0.44) compared to males. Compared to 12th graders, the only significant finding was that 10th graders had a higher overweight-to-healthy-weight ratio (OR = 1.59). The ethnicity variable had the most significant findings when comparing the overweight-to-healthy ratio of the other ethnic groups compared to Native Hawaiians. Three ethnic groups had lower overweight-to-healthy ratios than Native Hawaiians: Multi-ethnic non-Native Hawaiian (OR = 0.49), Other Asian (OR = 0.50), and White (OR = 0.52). Four ethnic groups had significant differences in their obese-to-healthy ratio compared to Native Hawaiians. These ethnic groups had lower ratios compared to Native Hawaiians: Japanese (OR = 0.24), Multi-ethnic non-Native Hawaiian (OR = 0.47), Other (OR = 0.44), and White (OR = 0.24). The only ethnic group that had a greater overweight-to-healthy ratio, as well as a greater obese-to-healthy ratio than Native Hawaiians was Other Pacific Islander (OR = 2.01 & 2.43, respectively).

The second model added dietary behaviors, physical activity, and sedentary behaviors to Model 1. The reference group for each additional behavior was the group that engaged in the behavior. In comparing Model 1 to Model 2, all statistically significant effects remained. However, there were two additional statistically significant effects: (1) Filipino < Native Hawaiian in obese-to-healthy ratio; and (2) those who engaged in less than 5 days of physical activity > those who did engaged in at least 5 days of physical activity in obese-to-healthy ratio.

The third model added the behaviors of smoking and bullying victimization (either on school property or electronically) to Model 2. In comparing Model 2 to Model 3, two effects were no longer statistically significant: (1) Other < Native Hawaiians in obese-to-healthy ratio; and (2) Other Pacific Islander > Native Hawaiians in obese-to-healthy-ratio. There was one additional statistically significant effect: (1) Other Asians < Native Hawaiians in obese-to-healthy ratio.

Discussion

This study examined adolescent risk-protective behaviors and their association with overweight and obesity using the Hawai‘i High School Youth Risk Behavior Survey (HYRBS) to answer the research question, “Is there an association between weight status (healthy, overweight or obese) and dietary behaviors, physical activity, sedentary behaviors, smoking and bullying victimization among Hawai‘i public school adolescents and are there differences in association by ethnic-sex groups?” The associations were analyzed by ethnicity, sex, and the ethnicity-sex interaction. Analyzing the association of risk-protective behaviors allowed for a greater understanding of the context of adolescent excess weight, thereby providing additional information on how to screen for and identify adolescents with appropriate programming and interventions.

Sex, Weight Status, and Risk-Protective Behaviors

Several differences were found by sex when answering all three aims of the study, Aims 1 (risk-protective prevalence/levels), 2 (BMI *z*-scores), and 3 (hierarchical model building). Overall, females were healthier than males based on the three weight measures (i.e., higher prevalence of a healthy weight status & lower prevalence of overweight & obese statuses; lower average BMI *z*-scores, & higher healthy-to-overweight ratio, and healthy-to-obese ratio). In addition, females self-reported engaging in weight-related behaviors that were healthier and significantly different from males (e.g., consumption of fruit, green salad, other vegetables, & milk). However, females had a higher prevalence than males in the consumption of soda. In addition, males had a higher prevalence of consuming fruit juice and fruit/vegetables overall (composite score), being physically active five or more days in the past week, and participating on at least one team, even with the higher BMI. The findings of this study related to sex were inconsistent with the previous research of Sweeting (2008) that focused on the differences in weight status. However, the findings were consistent when focused on dietary behaviors, and physical activity (Must & Tybor, 2006; Singh, Kogan, Siapush, & van Dyck, 2008).

Finally, females self-reported higher levels of being electronically bullied and of being bullied overall (composite).

Ethnicity, Weight Status, and Risk-Protective Behaviors

Overall, ethnicity was found to be associated with weight status and risk-protective behaviors. Similar to the analysis of sex, several differences were found by ethnicity when answering all three aims of the study, Aims 1 (risk-protective prevalence/levels), 2 (BMI *z*-scores) and 3 (hierarchical model building). With the focus of this study on Native Hawaiians, the general finding was that Native Hawaiians had less healthy weight outcomes as compared to the other ethnic groups, except for Other Pacific Islanders. In particular, Native Hawaiians had: (1) significantly higher prevalence of obesity (than White); (2) significantly higher BMI *z*-scores than the ethnic groups except for Other Pacific Islanders; and (3) significantly higher overweight-to-healthy weight status than Multi-ethnic non-Native Hawaiian, Other Asian, & White; and (4) higher obese-to-healthy weight status than Filipino, Japanese, Mutli-ethnic non-Native Hawaiian, Other & White). These findings confirm previous literature that found ethnic minority status to be an independent risk factor for obesity (Hawai‘i Health DataWarehouse, 2012; Singh, Kogan, Van Dyck, & Siapush, 2008).

Although Native Hawaiians reported a significantly higher prevalence of sports team participation than Filipino and Other Asian, they also reported a significantly higher prevalence of consumption of soda than Other Pacific Islanders, and a significantly higher prevalence of sedentary behaviors than Other Pacific Islanders and Whites. These findings were consistent with previous research that found that there were ethnic differences in physical activity engagement and healthy eating habits, likely due to the influences of culture (Bauer et al., 2011; Cutler et al., 2011; Kumanikaya, 2008; McGuire et al., 2002; Trost et al., 2003; Wilson & Dolman, 2007 & 2009).

Risk-Protective Behaviors and Healthy-to-Overweight and Healthy-to-Obese Ratios

The previous sections discussed sex and ethnicity as main effects. Step 3 analyses addressed Aim 3 in the development of a more comprehensive model. When statistically controlling for the demographic

variables (i.e., grade, sex, & ethnicity), only physical activity was found to be a protective factor for the obese-to-healthy ratio. Specifically, for those students who engaged in 5 or more days per week of 60 minutes or more of physical activity, there was a lower obese-to-healthy weight status ratio. This finding is consistent with previous research indicating that physical activity is one of the factors associated with having a healthy weight status versus having an obese weight status (Olds, Ferrar, Schranz, & Maher, 2011; Ward, Dowda, Felton, Trost, Dishman, & Pate, 2006). For example, Olds et al. (2011) found that Australian students 9-16 years old who had a healthy weight status engaged in more sports-related physical activity than those who had an obese weight status.

Limitations and Strengths of Study

There are several limitations of this study. First, this study is based on the premise that BMI is useful in determining adolescents' weight status. BMI is the most commonly used measure of obesity; yet, it may not be the best measure of actual biological wellness (e.g., muscle-to-fat ratio). BMI is associated with fatness and provides a simple way to provide a reasonable measure of body fat. However, the overall body mass of an individual may also include muscle and lean mass, and there is no distinction of the body's composition when reporting the BMI. Athletes, who have a higher lean muscle ratio to fat, sometimes have a BMI that may indicate overweight or obesity, but these individuals are in fact healthy (Flegal & Ogden, 2011). Additionally, Daniels, Khoury, and Morrison (1997) found that BMI is not an equivalent measure of percent body fat for each ethnic-sex group and that sex maturation and distribution of body fat need to be included in the analysis when making comparisons.

Second, due to the study focusing on the weight statuses of healthy, overweight, and obese, the underweight status category was removed from the analysis. Removing the underweight weight status category may result in having ethnic groups disproportionately categorized. The ethnic groups that this primarily would affect are those ethnic groups that have a greater tendency to have underweight respondents (i.e., Japanese).

Third, the alpha level for Step 1 of the analyses was set at $< .0001$ and a $R^2 > .01$. The alpha level was set conservatively because of the large sample size, large number of items analyzed, and large

number of tests and comparisons. However, this may have increased Type II errors (false negatives; non-significant associations actually exist in the population). At a lower alpha (i.e., <.05), more relationships may have been found to be significant. Steps 2 and 3 utilized an alpha of < .05 to determine significance in the BMI *z*-score analysis and the hierarchical model building. By selecting an alpha of < .05, there was the opportunity to balance Type I versus Type II errors, given the importance of revealing ethnic differences for this unique sample. For Step 2, the alpha of < .05 was also more appropriate in that only one item was being analyzed.

Fourth, as with most secondary data analyses, there were limitations associated with the HYRBS. The HYRBS data are based on adolescent self-report, which is subject to recall bias and social desirability bias (Brener, Billy, & Grady, 2003). Calculating the students' BMI based on self-reported weight and height may underestimate the percent of overweight or obese students, as weight tends to be underestimated and height tends to be overestimated (Elgar, Roberts, Tudor-Smith, & Moore, 2005; Sherry, Jefferds, & Grummer-Strawn, 2007). Troped et al. (2007) examined the reliability and validity of YRBS physical activity items among middle school students and found that the amount of time the students actually engaged in moderate-to-vigorous physical activity (using accelerometers) was underreported on the YRBS. However, there are advantages to self-reported data, including an efficient means of data collection on constructs difficult to obtain otherwise.

In addition, the HYRBS surveys only public school students in Hawai'i. The consequence of only surveying public school students is the exclusion of the 18% of Hawai'i's school-age children who attend private schools and the remaining students who attend charter schools or who are home schooled. Due to the results of the survey being based only on public school-age students, they are limitations in the generalizations that may be made from the findings. Although there are differences across public schools, overall it is assumed that there are greater differences between public and private students due to the potential for greater resources in private schools and greater socio-economic status of private-school students compared to public-school students.

Another potential limitation is that the current HYRBS tool is limited to the questions that are currently asked. The HYRBS does not collect demographic information from the student beyond age, grade, sex, and ethnic group. Additional questions that would be helpful in assessing the context of a health outcome such as obesity are not asked, including questions related to socio-economic status and parents' occupation and highest level of education. Socio-economic status has been found to be a factor of obesity (Singh, Kogan, Van Dyck, & Siapush, 2008).

Strengths of this study include examining data at the state level and using weights to obtain better state-wide estimates, determining associations among certain risk-protective behaviors and weight statuses that have been under-researched, and examining the moderating roles of ethnic and sex group membership within Hawai'i's diverse population. Due to the population-based nature of the HYRBS, the data allowed for comparisons between healthy-weighted students versus both overweight and obese students. This allowed for an increased understanding of what may contribute to the differences between the groups analyzed and how best to intervene.

Implications

At the *Intrapersonal Level*, ethnicity is an important risk factor in obesity. Native Hawaiians, who are the indigenous people of Hawai'i and comprise 24% of the state population, have higher prevalence of obesity than almost all other groups in the state. Consequently, they tend to suffer a great deal of health complications that affect their overall well-being. Further research is needed to explore the role of ethnicity and associated factors, such as cultural identity and socio-economic status, in obesity. In addition, adolescents' perspectives on ethnicity and obesity could be examined.

Second, this study suggests that females have a healthier weight status than males. Therefore, in creating interventions for the different sexes, additional context is needed to understand their current engagement in risk-protective behaviors and how engagement changes through adolescent development. An example is the protective behavior of increased physical activity. Through adolescence, there is a natural decrease in the engagement in physical activity for both genders (Belanger, Gray-Donald, O'Loughlin, Paradis, & Hanley, 2009; Singh, Kogan, Siapush, & van Dyck, 2008). However, females

tend to have a greater decrease over time than males in physical activity, as this study supports, as well as a lower participation on sports' teams.

Third, the finding that less than five days of physical activity increasing the obese-to-healthy weight status ratio suggests that obesity prevention and control interventions should promote physical activity. However, the finding that adolescent males engaged in more physical activity than females suggests that gender-sensitive physical activity programs may be needed.

Future Research

Future research should investigate the gaps of this study as outlined in the limitations section and should examine other levels of the SEM for their influences on unhealthy weight in adolescents.

Regarding the limitations, BMI is currently the most accessible measurement of obesity. However, future research could examine other means of determining obesity in adolescents that takes into consideration measurements beyond height and weight, including non-self-reported physiological indicators. Regarding the removal of the underweight weight status, future research could compare all weight statuses across ethnic groups to determine if the associations are similar to the findings of this study,

Some of the limitations related to the HYRBS may be open to amelioration. For example, the 2014 Legislature of the Hawai‘i considered Senate Concurrent Resolution 51, through which "each private school is requested to administer a youth risk behavior survey to students in grades six to twelve attending its school." If private schools are added to the HYRBS data collection, then future research could examine differences between public and private schools. This information would allow for a broader understanding of Hawai‘i's adolescent population engagement in select behaviors. Another possible way to reduce limitations of the HYRBS is to expand survey questions to gather richer and more culturally appropriate data. For example, because many Hawai‘i residents eat rice, asking about scoops of white rice consumed, in addition to potatoes consumed, would provide a better picture of starch intake. Questions related to socio-economic status could be added, such as number in household, Medicaid status, and parents' education level.

Interpersonal Relationship Level

Parents and peers influence adolescents' engagement in weight-related behaviors and the adolescents' weight status (Bauer et al., 2011; Cutler et al., 2011; Trost et al., 2003). The literature suggests that parents can help their teens engage in healthy behaviors by modeling these behaviors and by providing tangible and emotional support for these behaviors (Heitzler et al., 2010; Rutkowski & Connelly, 2011; Wright et al., 2008). Finnerty et al. (2010) found that peers can influence physical activity behaviors in children age 9-13 years, but not dietary behaviors. Salvy et al. (2007) found that, in the presence of friends, overweight adolescents consumed more food if eating with an overweight peer compared to eating with a non-overweight peer. To determine how the research is aligned with the behaviors of Hawai'i high school students, additional research needs to be performed that examines the association between weight status and parent-adolescent relationship, as well as peer-to-peer relationship.

Organization and Policy Levels

School environment and policies have an influence on youth behaviors. These relationships could not be explored in this study, as all respondents attended public school. Future research is needed to determine if Native Hawaiian adolescent outcomes differ between public- and private-school environments. Hawai'i's enrollment in private schools for school-age children is twice that of the national enrollment (18% vs. 9%). Furthermore, there are private schools within the State that were created primarily for Native Hawaiian students.

Local and national policies are being considered or have been enacted that could affect weight status of Hawai'i adolescents. These include the Department of Education Wellness Guidelines, which were introduced in the 2006-2007 school year and had to be fully implemented in the 2010-2011 school year. These prohibit foods that are of minimal nutritional value—foods in which the first ingredient is sugar, and foods containing artificial transfat. Childhood obesity may decrease the longer these guidelines are in effect. Beyond the DOE Wellness Guidelines, there is the continued effort by health advocates to introduce and enact bills to increase taxes or fees on sugar-sweetened beverages, hoping that increased prices will decrease consumption of these beverages.

Conclusion

Overall, the findings of this study begin to answer the questions regarding the differences between sex, ethnicity, and ethnic-sex groups, and the association between weight statuses and risk-protective behaviors for adolescents of Native Hawaiian, Pacific Islander, and Asian American ancestry in Hawai‘i. The findings from this study demonstrated that in order to help reduce the prevalence of adolescent overweight and obesity, interventions increasing physical activity may be helpful, but programming may need to be both gender- and culturally appropriate. This knowledge can assist in evaluating current programs and guidelines that are in place and recommending environmental changes to foster healthy behaviors among adolescents.

Chapter 3

Native Hawaiian Adolescents' Weight Status, Physical Activity, Dietary behaviors, and Sedentary Behaviors by Private and Public School

Abstract

Background

In Hawai'i, Native Hawaiian adolescents have the second highest prevalence of obesity (18.1%) among the major ethnic groups. While individual behavioral change is needed to reduce obesity, according to the Socio-Ecological Health Behavior Model, organizations such as schools can play a role in creating environments and policies to facilitate healthy behaviors. The majority of school-aged children in Hawai'i attend public schools, while 18% attend private schools, including 16% of Native Hawaiian students. However, little is known about how private school students differ from public school students on indicators of well-being. This is due, in part, to lack of comparable data across public and private schools. For example, to ascertain adolescents' weight status and their engagement in risk-protective behaviors, the Hawai'i Youth Risk Behavior Survey (HYRBS) is administered every other year. However, this tool is only administered in public schools and not in private schools in Hawai'i.

Purpose

For this study, relevant items of the 2011 HYRBS survey were administered in the spring of 2013 to Native Hawaiian 9th graders attending a private school, and findings were compared to data from the Native Hawaiian 9th graders in public school who had participated in the 2011 HYRBS. The study's four aims were: 1) to examine the difference in prevalence of Native Hawaiian adolescent engagement in the behaviors of physical activity, dietary behaviors, and sedentary behaviors (i.e. screen time), and in weight status; 2) to examine the differences in BMI *z*-score by school-type and gender; 3) to determine whether sex, school type, physical activity, dietary behaviors, and sedentary behaviors were associated with relative weight-status ratios (i.e., the proportion of healthy weight status to overweight status, and health

weight status to obese weight status); and 4) to determine if number of years spent in private school (e.g., whether the student entered at kindergarten or 4th, 7th, or 9th grade) was associated with relative weight-status ratios.

Methods

There were four aims to this study. The sample for the first three aims included all 9th grade Native Hawaiian students from both the 2011 HYRBS sample (N=335) and the private school sample (N=252). First, using the aggregated data set, descriptive statistics were calculated for weight status, physical activity, dietary behaviors and sedentary behaviors by school type and gender. Second, univariate and multiple linear regressions were performed to determine differences in BMI *z*-scores for school type, sex, and school type-sex groups. Third, multinomial logistic regressions were performed to determine the association between the independent variables with the relative weight-status ratios (i.e., healthy vs. overweight, & healthy vs. obese). Finally, utilizing only the private school data (N=252), multinomial logistic regression was performed to determine the association between the entry grades (kindergarten, & 4th, 7th, 9th grades) into the private school with the relative weight-status ratios (i.e., healthy vs. overweight, healthy vs. obese).

Results

Overall the results from this study indicated significant associations in weight status by sex, school type, and engagement in risk-protective behaviors. The main findings were reflected in the hierarchical model building, which suggested that females and those who attended the private school had a lower risk of being obese compared to males and those who attended public school. When including risk-protective behaviors in the models, students who engaged in five or more days per week of physical activity had a lower risk of being obese, compared to those who were engaged in physical activity for less than five days. In addition, and perhaps counter-intuitively, students who consumed fruits/vegetables less than five times per day had a lower risk of being obese. There was no association between the number of years spent in the private school and the healthy-to-overweight ratio or healthy-to-obese ratio. Several

additional statistically significant findings provided further information on the differences between the sexes and between the school types, including interaction effects.

Conclusion

School policies may be able to influence the weight status and adolescent engagement in healthy behaviors related to participation in physical activity and dietary behaviors. Beyond policies formed at the school level, the resources that are available to the students at school also play a role in the engagement of behaviors and weight status. Due to the variability of resources, school-based interventions need to be tailored to individual schools and school types to ensure that they are appropriate for the student population and the schools themselves.

Although, this study focused on the differences between school types, additional research is needed to further examine whether there are differences within school type (e.g., across public school and across private schools). Moreover, the socio-economic status of students and their families should be controlled in future analysis. This additional information would be valuable in further showing how the levels of the socio-ecological model intersect to influence adolescent health status.

Introduction

Among youth in Hawaii, Native Hawaiian adolescents have the second-highest prevalence of obesity, following Other Pacific Islander adolescents. Approximately a third (31.3%) of all Native Hawaiian adolescents are obese (15.8%) or overweight (15.5%), according to the 2011 High School Hawai‘i Youth Risk Behavior Survey (HYRBS; Hawai‘i Health Data Warehouse, 2012). For youth, obesity is defined by a body mass index (BMI) of greater than 95th percentile for age and sex.

Research has found that adolescents who are obese have a greater likelihood than healthy-weight adolescents to become obese adults (Broyles, 2008; Daniels et al., 2005; Dietz, 1998; Goo, Wu, Chum lea, & Roche, 2002), and this association appears to hold in Hawaii. For example, data from the 2012 Behavioral Risk Factor Surveillance System (BRFSS) estimated that 44.4% of Native Hawaiian adults, 18 years and older, were categorized as obese (BMI greater than or equal to 30) (Behavior Risk Surveillance Survey [BRFSS], 2012) compared to about 30% of the general population (HYRBS; Hawai‘i Health Data Warehouse, 2012). The earlier the onset of obesity, the earlier one sees signs of diseases typically found in older adults, such as cardiovascular disease, diabetes, and metabolic syndrome, all of which are now being seen at younger ages (Burrowes, 2010; Daniels et al., 2005; Goran, Ball, & Cruz, 2008; Raitakari et al., 2008; Spiotta & Luma, 2008).

Socio-Ecological Model

The problem of adolescent obesity is multifactorial, and these factors originate from various aspects of an individual’s life. The Socio-Ecological Model (SEM) of Health Behaviors illustrates that health-related behaviors are determined by multiple levels of intrapersonal, interpersonal, organizational, community, and public policy factors (McElroy, Bibeau, Steckler, & Glanz, 1998).

On the individual level, socioeconomic status (SES), gender, and ethnicity influence weight status. Concerning SES, Native Hawaiians are disadvantaged. Compared to the overall state of Hawai‘i poverty rate of 11.2 %, 14.4% of Native Hawaiians live in poverty (American Community Survey, U.S.

Census, 2010). Additionally, Native Hawaiians have the lowest timely high school graduation rates of the state's major ethnic groups. About 70% of Native Hawaiian students graduate from high school in 4 years, compared to 78% statewide. These factors influence the types of jobs Native Hawaiians obtain, the economic status of their families, the neighborhoods they live in, and ultimately the resources parents and caregivers have for their children.

Schools, located in the third level of SEM, have been identified as a key setting for public health strategies to lower or prevent the prevalence of overweight and obesity among adolescents (Institute of Medicine, 2005). In Hawai'i, about 18% of students (and 16% of Native Hawaiian students) attend private schools, which usually offer students more resources than public schools. The present study focuses on this level of the model, looking at the potential influence of private versus public school on adolescent risk behaviors and weight status, while controlling for intrapersonal-level variables.

Schools

Regardless of the type of school attended, students spend a great percentage of their early lives in school (Story, Kaphingst, & French, 2006). According to Story, Nanney, and Schwartz (2009) schools can impact students' health outcomes (i.e., obesity) and well-being with policies related to nutrition and physical activity.

Nutrition-related Policies. In 2004, the U.S. Congress mandated, through the Child Nutrition and Women, Infants, and Children (WIC) Reauthorization Act, that school districts participating in any federally reimbursed school meal program develop a local school wellness policy by the beginning of the 2006-2007 school year (Robert Wood Johnson, 2009). These policies are influencing student nutrition choices. For example, according to the School Health Policies and Programs Study (2006), 77% of schools nationally offered a choice between two or more different fruits or types of 100% fruit juice each day for lunch, and 81% offered lettuce, vegetable, or bean salads a la carte to students during a typical week. However, at the same time, 33% of elementary schools, 71% of middle schools, and 89% of high schools also provided students with opportunities to buy other foods and drinks via vending machines,

school stores, or snack bars that may not be healthy (O'Toole, et al., 2007). Foods and drinks offered in these competitive settings included sports drinks, sodas, and high-fat and high-salt snacks. According to federal policy for foods sold outside of the Child Nutrition Program, schools did not need to abide by the same wellness regulations. Jaime and Lock (2009) conducted a literature review on the effectiveness of changing nutritional guidelines and implementing pricing interventions on foods sold in schools. They found some evidence for effectiveness. However, more needs to be done to continue to positively influence students' diets and behaviors while they are in school (Brown & Summerbell, 2009).

Physical Activity Policies. There are no federal government standards regarding physical activity in school or physical education (PE) class time. Rather, each state in the nation develops its own policies (The National Association for Sport and Physical Education and the American Heart Association, 2006), and research suggests that these policies are not always enforced (Perna et al., 2012; Sanchez-Vaznaugh et al., 2012). The *Shape of the Nation Report 2012* by the National Association for Sport and Physical Education and the American Heart Association found that 38 of the 50 states mandated physical education (PE) in elementary, middle, and high schools; however, there were no minimum requirements. To further address schools' PE programs at a national level, two objectives were included in *Healthy People 2020*: to "increase the proportion of the nation's public and private schools that require daily PE for all students" and "increase the proportion of adolescents who participate in daily school PE" (Healthy People 2020, 2012).

A reasonable hypothesis would be that students who attend high schools requiring regular PE would have a lower weight status than students attending high schools with few required credits of PE. It may be difficult to prove this hypothesis, in part because it is difficult to control for variation in frequency and length of PE classes, attendance, and individual student effort (Drake et al., 2012). Some research has found that adding and lengthening PE classes and increasing active time during the class were associated with greater student engagement in moderate-to-vigorous physical activity, but not with reduction of BMI (Kahn et al., 2002). However, the adoption of healthy behaviors, increased cardiovascular levels, and positive educational outcomes are reasons for PE to continue to be part of schools' curriculum.

School Type: Hawai‘i Public Schools

Hawai‘i has only one large school district for the entire state, and approximately 82% of school-aged children attend public schools (American Community Survey, 2010). As a state that receives federal funding from the Child Nutrition Program, Hawai‘i was required to develop Wellness Guidelines during school year 2007-2008 as earlier discussed. The Wellness Guidelines focused on nutrition, physical activity, and overall wellness of the students. All of Hawai‘i’s public schools are held to the same Wellness Guidelines and had until school year 2010-2011 to implement the guidelines, with an annual assessment to determine the degree of adoption and implementation of the guidelines. During the 2010-2011 school year, a survey was provided and answered by 100% of all Hawai‘i public schools to determine the implementation of the guidelines.

One of the main aspects of Hawai‘i’s nutritional policies focused on products that were sold in vending machines on school property. According to the State Board of Education Policy 6810, healthy beverages are presently defined as milk, flavored milk, water, and fruit juice containing at least 50 percent juice or other beverage choices as deemed appropriate by the State of Hawai‘i Department of Education (HDOE). Other aspects of the policy included recommending limits on the amount of sugar served, eliminating trans-fat in the students’ diets, and increasing the availability of fruits, vegetables, and foods high in fiber.

Hawai‘i’s guidelines also presently outline that elementary school students receive a minimum of 45 minutes per week of PE in Grades K-3, 55 minutes per week in Grades 4-5, and 107 minutes in Grade 6. Secondary schools, including those with Grade 6, are required to have 200 minutes per week, but only in one grade. In other words, during the year the student is enrolled in PE, the student must participate in 200 minutes per week for 1.0 PE credit required for graduation (Hawai‘i State Department of Education, 2013; National Association for Sport and Physical Education, 2010). Despite the specificity of the State Wellness Guidelines, they were limiting because they still do not provide targets for expected health outcomes for students.

The state also requires schools to collect height and weight on students upon entrance and upon entering Grade 7 (*Shape of the Nation Report*, 2012). Select public middle schools and high schools also participate in the Hawai‘i Youth Risk Behavior Survey (HYRBS), which is administered every other year (during the odd years). The next survey will be administered during school year 2014-2015. The HYRBS collects self-reported height and weight from students. From this information, BMI, and therefore weight status, can be determined and analyzed. However, there is no indication that the data collected from the health form or the HYRBS are used in understanding students' obesity levels either at the student level (health form) or school level (HYRBS, anonymous survey).

School Type: Private Schools

Although the large majority of school-aged children in Hawai‘i attend public schools, 18% of all school-age children and 16% of all Native Hawaiian school-age children attend private schools in Hawai‘i (American Community Survey, 2006-2010). These rates compare to a national percentage of approximately 9.9% of the 53.3 million school-aged students in the U.S. (Frumkin, 2006). Private schools in Hawai‘i differ in the targeted student body population and tuition cost. Private schools in Hawai‘i include parochial as well as independent non-religious-based schools. Private school tuition ranges from approximately $3,250 to over $25,000 (Hawai‘i Independent Association of Schools, 2012). The grade composition of private schools also varies across schools. Anecdotally and in general, private schools appear to have more resources (i.e., financial, opportunities, and facilities) than public schools, and students who attend private schools appear to come from families from higher SES who are able to afford the tuition of private schools.

There are private schools in Hawai‘i that receive funding from the U.S. Department of Agriculture (USDA) Child Nutrition Program, and thus, are required to meet the nutrition standards and comply with dietary guidelines. However, as stated previously, foods provided that are not part of the reimbursable program (e.g., foods in vending machines) are not held to these same guidelines. In addition, due to the independent nature of private schools, the State of Hawai‘i Wellness Guidelines do

not apply to private schools. Therefore, private school-implemented policies vary. Regarding physical activity and PE, there are no national or local guidelines that are followed by Hawai‘i’s private schools.

The Selected Private School of this Study

The private school engaged in this study does not receive federal funds for its nutrition program. Student lunches are included in the cost of tuition. Students who live on campus (referred to as “boarders”) are also provided breakfast and dinner. Although the private school does not receive funding from the USDA, the food served meets the USDA’s nutritional guidelines for adolescents. However, on the high school campus, there are vending machines that sell soda and other snacks (also known as competitive foods). Other competitive foods are sold as fundraisers by various school clubs and organizations.

Beyond the school’s mission of students progressing educationally, the goal of the school’s PE department is to lay an early foundation develop positive student health and overall well-being. Due to the targeted student population—Native Hawaiian adolescents—and the generally poorer health outcomes experienced by this population compared to other major ethnic groups in Hawai‘i, the private school’s administrators continue to have PE programs that are vital parts of the curricula. PE is required at every grade level, including all four years of high school. The school also provides opportunities for students to engage in physical activity (e.g., use of gyms) before school, during school hours, and after school. Students who entered the school prior to high school already have been introduced to the PE program. To ensure that the students are maintaining their physical ability during the school year, as part of the PE program, freshmen culminate the year with a 10 kilometer (km; 6.2 miles) run, and sophomores culminate the year with a biathlon (800 meter swim and 4-mile run). Juniors and seniors train for annual community events (a road race or ocean swim) and are provided with a 10-week training schedule by their instructors aimed at achieving their fitness goals based on fitness timed tests.

Behaviors

In this section, the literature on associations between nutrition, physical activityand sedentary behaviors and weight status is summarized.

Dietary Behaviors. Due to the physical growth that occurs during adolescence, as well as the long-term effects of the nutritional decisions, appropriate nutrition is important. According to the U.S. Department of Agriculture (USDA) and U.S. Department of Health and Human Services (USDHHS) in 2010, only 9% of adolescents consumed the recommended daily five servings of fruits, vegetables, and whole grains. According to the 2010 National Youth Physical Activity and Nutrition Study (NYPANS), a third of high school students (28.5%) consumed fruits less than one time per day, and a third (33.2%) consumed vegetables less than one time per day. The results of the data were found to be significantly different by ethnicity/race for consumption of vegetables, with non-Hispanic white students consuming 1.4 vegetables per day, compared to non-Hispanic black (1.0) and Hispanic students (1.1).

In their review of the literature, Pearson and Biddle (2011) found evidence of a direct relationship between dietary intake, physical activity, and excess weight in teens. Adolescents who were less likely to engage in physical activity were less likely to eat fruits and vegetables and had a higher intake of fast foods and energy-dense foods, resulting in increased excess weight. When examining correlates of fruit and vegetable consumption, Neumark-Sztainer et al., (2003) found that the strongest correlates of consumption of these foods were home availability as well as taste preference. Campbell (2009) also found that factors such as family and culture influenced the dietary choices of adolescents.

Physical Activity. Two aspects of engagement of physical activity found to be linked to excess weight have been: 1) the amount of time the adolescent spends in engaging in physical activity; and 2) sports team participation. Research consistently has shown an inverse relationship between physical activity and obesity, with increased engagement in physical activity decreasing the likelihood of an adolescent being or becoming obese (Must & Tybor, 2006; Patrick et al., 2004). Adolescents' engagement in physical activity is important to examine because, during this development phase, lifelong physical activity patterns are established. According to Patrick et al. (2004), the primary risk factor among youth

for being overweight status is the lack of vigorous physical activity. However, only 18% of high school students nationally achieved a physical activity level of 60 minutes of moderate-to-vigorous physical activity (MVPA) daily for seven days a week as recommended (CDC, 2011; World Health Organization [WHO], 2012). Peart et al. (2011) found that the more time students engaged in MVPA (according to the accelerometer), the less likely they were to be classified as obese (OR = 0.75, 95% CI = 0.59-0.95).

Additionally, research has suggested that sports' team participation has a direct association with weight status. Drake et al. (2012) found that students who played on three teams, as compared with those who did not particulate on any sports team, were 27% less likely to be overweight or obese (when these weight statuses were combined) and 39% less likely to be obese (when the overweight group was separated from the obese group).

Sedentary Behaviors. When examining "screen time," research suggests that the more time spent watching television or playing computer or video games, the greater the likelihood of increased BMI (Peart et al., 2011; Perez, et al., 2011). According to Peart et al. (2011), youth who watched at least two hours of television or video each day, compared to those who watched less than two hours (American Pediatric Association [APA] guidelines), were almost twice as likely to be categorized as obese compared to those who were normal weight (OR = 1.84, 95% CI 1.24-2.69). Regarding gender, Perez et al. (2011) found that boys who watched more television, or played computer or video games regardless of effort spent in physical activity, had an increased likelihood to be obese. On average girls engaged in this behavior for 4.1 hours per day compared with boys, at 5.9 hours per day. Researchers have also interpreted sedentary behavior as the inverse of physical activity for adolescents—that is, the amount of time that the adolescent is not engaging in physical activity. In a review of correlates of adolescent physical activity, Sallis, Prochaska, and Taylor (2000) found that engagement in sedentary behaviors after school and on weekends was consistently and inversely related to engagement in physical activity. However, to determine how both the lack of physical activity and the amount of screen time may influence weight status, both behaviors need to be examined together. For example, Eisenmann et al. (2006), utilizing the 2001 national YRBS data, found that high levels of screen time (greater than 3 hours

daily) and low physical activity increased risk of being overweight or obese among 14 to 18 year olds. Similar to Eisenmann, Perez et al. (2011) found that boys who participated in organizational physical activity and watched two or less hours per day of television, were less likely to become obese than boys who did not participate in organizational physical activity and watched three or more hours of television (i.e., screen time). In a comparable study of Australian adolescents, Maher et al. (2012) found that screen time and physical activity levels were both independent predictors of weight status.

Youth Risk Behavioral Surveillance System

The Youth Risk Behavior Surveillance System (YRBSS) was developed by the Division of Adolescent and School Health of CDC, DHHS. One part of the YRBSS is the Youth Behavior Risk Survey (YRBS). The YRBS is administered in states and local jurisdictions every other year. It assesses six important risk domains that contribute to the leading causes of mortality, morbidity, and social problems among youth in the U.S. Those six areas are: 1) behaviors contributing to injuries and violence, 2) alcohol or other drug use, 3) tobacco use, 4) general risk behaviors, 5) dietary behaviors, and 6) physical activity.

Students in Hawai‘i are administered the YRBS through a collaboration between the State of Hawai‘i Department of Education and State of Hawai‘i Department of Health. In Hawai‘i, the survey is referred to as the Hawai‘i YRBS (HYRBS) (Saka, 2012). The high school version of the survey first was administrated in 1991 and has been administered since during odd-numbered years. The response rate for the HYRBS exceeds 60%. The HYRBS is comprised of national survey questions and state-specific questions (see Appendix A). In 2011, there were an additional 26 Hawai‘i state-specific questions. The survey is a means for the state to obtain data on certain behaviors that are not collected by other tools. Currently there is a limitation of school-collected information on BMI and risk-protective behaviors external to the HYRBS. Therefore, there is a dependency on the HYRBS for such data.

Purpose

The overall purpose of this study was to examine differences between public school and private school Native Hawaiian adolescents regarding weight status. There were four aims of the study:

1) To examine the difference in prevalence of Native Hawaiian adolescents' engagement in the behaviors of dietary behaviors, physical activity, and screen time based on school type. Native Hawaiian adolescents from only Grade 9 were examined because studies have indicated that there is decline in physical activity between the ages of 13 and 18 (Sallis, 2000), as well as a decline in consumption of fruit intake and dairy intake and an increase in soda consumption (Story & Stang, 2005). It is hypothesized that private school Native Hawaiians will have higher self-reported rates of healthy behaviors as compared to public school Native Hawaiians because they have more resources and perhaps better wellness policies.

2) To examine the differences in BMI *z*-scores by school-type and gender. In examining Native Hawaiian adolescents from only Grade 9, it is hypothesized that students who attend public school will have higher average BMI z-scores than students who attend private schools.

3) To determine whether school type, dietary behaviors, physical activity, and sedentary behaviors are associated with relative weight-status ratios. In examining Native Hawaiian adolescents from only Grade 9, it is hypothesized that public school students will have a lower healthy-to-obese ratio compared to private school students, and that those who engaged in physical activity for at least five days and those who consume fruits and vegetables five times or more per day would have higher healthy-to-obese ratios.

4) To determine whether the main entry grades (kindergarten, Grades 4, 7, and 9) into the selected private school were associated with relative weight-status ratios. It is hypothesized that students who entered the private school in kindergarten will have a higher healthy-to-obese ratio compared to those who entered in later grades.

Method

Procedures

The public school High School HYRBS follows the national High School YRBS procedures for parent permission, youth assent, and administration. The 2011 HYRBS was administered between September 2010 and April 2011. Items in the 2011 HYRBS relevant to this study were compiled into a survey tool administered to private school 9th graders. The private school sample was administered the school-specific survey (see Appendix E) during the spring 2013 semester, with required parental permission (see Appendix B), student assent (see Appendix C), and additional permission from the school's administration.

In both public and private schools, students with signed consent forms were administered the surveys at their respective schools. There were no data from youth who were absent or suspended on the day of administration, or those who had dropped out of high school. Personally identifiable information was not collected, assuring anonymity.

As noted, the HYBRS response rate is 60%, and 2011 data were available for this study from 335 public school 9th graders. In the private school, 252 9th graders completed the survey, for a participation rate of 56%. Weights from the HYRBS were not used in order to be able to compare the public school data with the private school data. This study was approved by the University of Hawai‘i at Mānoa's Institutional Review Board (IRB).

Measures

To align both the HYRBS and the school-specific survey, the school-specific survey utilized the same questions from the HYRBS. The areas that were retained included dietary behaviors, screen time, and physical activity. Student's self-reported their height and weight, and CDC calculation methods were used to determine BMI, the BMI *z*-score, and the weight status categories (obese, overweight, and healthy weight) for the private school sample. Table 3.1 describes the demographic, independent, and dependent variables used in the data analyses.

Table 3.1 Description and coding of the demographic, independent, and dependent variables

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
Demographics		Age		How old are you?	A. 12 years old or younger B. 13 years old C. 14 years old D. 15 years old E. 16 years old F. 17 years old G. 18 years old or older	• 1 = 12 years old • 2 = 13 years old • 3 = 14 years old • 4 = 15 years old • 5 = 16 years old • 6 = 17 years old • 7 = 18 years old
		Sex		What is your sex?	A. Female B. Male	• 1 = Female • 2 = Male
		School Type		What type of school do you attend?	A. Public B. Private	• 1 = Public • 2 = Private
		Ethnicity		Are you Hispanic?	A. Yes B. No	• 1 = Yes • 0 = No
				What is your race? (Select one or more responses)	A. American Indian or Alaska Native B. Black or African American C. Filipino D. Japanese E. Native Hawaiian/Part Hawaiian F. Other Asian G. Other Pacific Islander H. White	• 3 = Filipino • 4 = Japanese • 5 = Other Asian • 6 = Other Pacific Islander • 7 = White • 9 = Multi-ethnic Non-Native Hawaiian • 10 = Other • 11 = Native Hawaiian

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
Independent Variable		Fruit juice	1	During the past 7 days, how many times did you drink 100% fruit juices?	A. I did not drink 100% fruit juice during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1= drank fruit juice at least 1-3 times during the past 7 days • 0 = did not drink fruit juice during the past 7 days
	Dietary Behaviors (8 items, 1 composite)	Fruit	2	During the past 7 days, how many times did you eat fruit?	A. I did not eat fruit during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1 = ate fruit at least 1-3 times during the past 7 days • 0 = did not eat fruit during the past 7 days
		Green salad	3	During the past 7 days, how many times did you eat green salad?	A. I did not eat green salad during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1 = ate green salad at least 1-3 times during the past 7 days • 0 = did not eat green salad during the past 7 days

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
		Potatoes	4	During the past 7 days, how many times did you eat potatoes? (Do not count French fries, fried potatoes, or potato chips)	A. I did not eat potatoes during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1 = ate potatoes at least 1-3 times during the past 7 days • 0 = did not eat potatoes during the past 7 days
		Carrots	5	During the past 7 days, how many times did you eat carrots?	A. I did not eat carrots during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1 = ate carrots at least 1-3 times during the past 7 days • 0 = did not eat carrots during the past 7 days
		Other vegetables	6	During the past 7 days, how many times did you eat other vegetables?	A. I did not eat other vegetables during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1 = ate other vegetables at least 1-3 times during the past 7 days • 0 = did not eat other vegetables during the past 7 days

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
		Soda	7	During the past 7 days, how many times did you drink a can, bottle, or glass of soda or pop, such as Coke, Pepsi or Sprite? (Do not count diet soda or diet pop)	A. I did not drink soda or pop during the past 7 days B. 1 to 3 times during the past 7 days C. 4 to 6 times during the past 7 days D. 1 time per day E. 2 times per day F. 3 times per day G. 4 or more times per day	• 1 = drank soda at least 1-3 times during the past 7 days • 0 = did not drink soda during the past 7 days
		Milk	8	During the past 7 days, how many glasses of milk did you drink? (Count the milk you drank in a glass or cup, from a carton, or with cereal. Count the half pint of milk served at school as equal to one glass.)	A. I did not drink milk during the past 7 days B. 1 to 3 glasses during the past 7 days C. 4 to 6 glasses during the past 7 days D. 1 glass per day E. 2 glasses per day F. 3 glasses per day G. 4 or more glasses per day	• 1= drank milk at least 1-3 times during the past 7 days • 0 = did not drink milk during the past 7 days

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
		Fruits/ Vegetable	Composite 9	[Consumption of fruits and vegetables based on the following items: fruit juice, fruit, green salad, other vegetables, carrots, and potatoes – Added the amount of each food item to determine the total number eaten per day within the past 7 days.]		• 1 = consumed 5 or more fruits or vegetables per day within the past 7 days (Items 1-6) • 0 = did not consume 5 or more fruits or vegetables per day within the past 7 days (Items 1-6)
	Physical Activity (3 items, no composite)	Physical Activity	10	During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time)	A. 0 days B. 1 day C. 2 days D. 3 days E. 4 days F. 5 days G. 6 days H. 7 days	• 1 = engaged in 5 to 7 days of physical activity for at least 60 minutes during the past 7 days • 0 = engaged in less than 5 days of physical activity for at least 60 minutes during the past 7 days
		Days of PE within a 5 day week	11	In an average week when you are in school, on how many days do you go to physical education (PE) classes?	A. 0 days B. 1 day C. 2 days D. 3 days E. 4 days F. 5 days	0 = 0 days 1 = 1 day 2 = 2 days 3 = 3 days 4 = 4 days 5 = 5 days

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
		Sports Team Participation	12	During the past 12 months, on how many sports teams did you play? (Count any team run by your school or community groups.)	G. 0 teams H. 1 team I. 2 teams J. 3 or more teams	• 1 = played on at least 1 sports team during the past 12 months • 0 = did not play on at least 1 sports team during the past 12 months
		Television	13	On an average school day, how many hours do you watch TV?	A. I do not watch television B. Less than 1 hour per day C. 1 hour per day D. 2 hours per day E. 3 hours per day F. 4 hours per day G. 5 or more hours per day	0 = 0 hours 0.5 = less than 1 hour per day 1 = 1 hour 2 = 2 hours 3 = 3 hours 4 = 4 hours 5 = 5 or more hours
	Sedentary Behaviors (2 items, 1 composite)	Computer/ Video Games	14	On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work? (Include activities such as Xbox, Playstation, Nintendo DS, iPod touch, Facebook and the Internet)	A. I do not play video or computer games or use a computer for something that is not school work B. Less than 1 hour per day C. 1 hour per day D. 2 hours per day E. 3 hours per day F. 4 hours per day G. 5 or more hours per day	0 = 0 hours 0.5 = less than 1 hour per day 1 = 1 hour 2 = 2 hours 3 = 3 hours 4 = 4 hours 5 = 5 or more hours

Type	Category (# of items)	Construct	Item #	Description	Rating Scale	Coding
		Sedentary Behaviors	Composite 15	[Total screen time based on 2 items.]		• 1 = Spent 3 or more hours engaged in TOTAL screen time based on total number of hours watched television (Item 11) AND played computer/video games (Item 12) • 0 = Spent 2 or less hours engaged in TOTAL screen time
Dependent Variable	Weight Status	BMI percentile	16	[Percentile based on age and sex.]		• No coding was necessary
		Weight status	17-19	[CDC's categories of weight status,]		• 2 = 5^{th} %ile $\leq$ BMI $< 85^{th}$ %ile (Healthy) • 3 = 85^{th} %ile $\leq$ BMI $< 95^{th}$ %ile (Overweight) • 4 = BMI $\geq 95^{th}$ %ile (Obese)

Demographic Variables

Demographic variables included sex and age. School type was determined by the data set. Because only 9th-grade Native Hawaiian students were part of this study, only one of the HYRBS ethnicity questions was used to determine the students' ethnicity for the public school students. This question stated, "What is your race?" There were the following choices: "American Indian or Alaska Native, Black or African American, Filipino, Japanese, Native Hawaiian/Part Hawaiian, Other Asian, Other Pacific Islander, and White." Students who selected the option of "Native Hawaiian/Part Hawaiian" alone or with one or more of the ethnicity options were classified as Native Hawaiian. This is traditionally done for Hawai‘i data, as most Native Hawaiians are of mixed ancestry, and there was the desire to capture as many Native Hawaiians as possible. All non-Hawaiian students were excluded from this study.

Independent Variables

There were a total of 13 independent variables, which were used to construct 2 composite scores (i.e., dietary behaviors and sedentary behaviors) and 4 BMI dependent outcomes (i.e., %ile score, and prevalence of each of the 3 weight statuses [healthy weight, overweight, obese]).

Behaviors considered protective were those that individuals engaged in to improve overall well-being (e.g., consuming an appropriate number of servings of fruits and vegetables daily). Risk behaviors included three hours or more of daily screen time. Overall, the response options were dichotomized to distinguish students who engaged in the behavior and those who did not. To determine the cutoff of the number of days the respondents were physically active, guidelines for physical activity was examined. The U.S. Department of Health and Human Services recommends that young people aged 6–17 years participate in at least 60 minutes of physical activity daily. Unfortunately, research has shown that as the adolescents get older, they decrease the amount of time in physical activity (Adams, 2006; Belanger, Gray-Donald, O'Loughlin, Paradis, & Hanley, 2009). Therefore to try to capture the number of physically active students who come close to or met the guidelines, 5-7 days were selected as the cut-off. The exceptions to dichotomizing the variables were with the continuous variables that included number of days that the student attended PE classes, the number of hours the students watched television, and the

number of hours the student played computer or video games. There were no guidelines or standards for dichotomizing these variables.

To determine the composite score for dietary behaviors, the following variables were used: fruit juice, fruit, green salad, carrots, potatoes, and other vegetables. All of the responses were out of seven days. Therefore fractions were used for responses that indicated consumption of the foods less than one time a day. CDC provided this information for the HYRBS dataset as the variable QNFRVG. This was computed in the same manner for the private school data. After determining the code for each of the six variables included in the composite, the codes were added to determine if the respondent consumed fruits or vegetables five or more times per day within the past 7 days. Table 3.2 provides an example of a dietary behavior and how the responses were converted for coding to determine the composite variable.

Table 3.2 Example of how dietary behaviors were converted for coding

	Example	Coding
A.	I did not eat other vegetables during the past 7 days	A = 0
B.	1 to 3 times during the past 7 days	B = 2/7
C.	4 to 6 times during the past 7 days	C = 5/7
D.	1 time per day	D = 1
E.	2 times per day	E = 2
F.	3 times per day	F = 3
G.	4 or more times per day	G =4

There were three independent variables for physical activity, one of which tapped to construct of time spent in physical activity, another determining number of days spent in PE and the last focused sports' team participation. These were not combined into a composite score due to their different relationships with excess weight (Drake et al., 2012; Patrick et al., 204; Peart et al., 2011).

To determine the composite variable for sedentary behaviors, the numbers of hours the student engaged in watching television and playing video/computer games were added together. Both of these behaviors and their association with excess weight have been studied in previous research on sedentary behaviors (Eisenmann et al., 2006; Peart et al., 2011; Perez, et al., 2011). The American Academy of

Pediatrics recommends that children and adolescents should be limited to no more than one or two hours of daily screen time entertainment (American Academy of Pediatrics, 2012).

Dependent Variables

Weight Status. The overall dependent variable construct was the student's weight status (i.e., healthy, overweight, or obese) as determined by the body mass index (BMI). The respondents on both surveys were asked to self-report their height and weight. With these data, the BMI was determined using the following formula: 703 x weight (pounds) / [height (inches)]^2. Using the CDC (2001) specifications, the results were then transformed to both BMI *z*-scores and BMI percentiles, and students were grouped into three weight status categories based on age and sex:

- Healthy: 5th percentile or greater but less than 85th percentile
- Overweight: 85th percentile or greater but less than 95th percentile
- Obese: 95th percentile or greater

Given the focus of Native Hawaiian adolescents, and their tendency to have a greater prevalence of being overweight or obese, this study examined adolescents who were only of healthy weight, overweight, and obese. Analysis excluded data from students categorized as underweight (i.e., BMI of less than 5th percentile). Only four students in the sample were categorized as underweight.

Data Analyses

The statistical package SAS 9.3 was used for data analyses. There were four steps to the data analyses. For these four steps, the alpha was set at $p<0.05$ to balance Type I versus Type II errors, given the importance of revealing potential differences for this sample. The proportion of variance of the dependent variable accounted for by the independent variable (R^2)—needed to be greater than 0.01 (or > 1.0 %). This level was set so that very small effects would not be highlighted (i.e., less than 1% of the variance accounted for).

Step 1, With the goal of obtaining central tendency measures for the independent and dependent variables, descriptive statistics were calculated for BMI (using BMI categories, & BMI percentiles) and risk-protective behaviors by sex, school type, and sex-school type groups.

There were 13 independent variables and 2 composite scores that comprised the independent variables and 4 BMI dependent outcomes (i.e., %ile score, prevalence of each of the 3 weight statuses [healthy, overweight, obese]). Dietary behaviors consisted of eight independent variables and one composite variable, physical activity included three independent variables (with no composite), and sedentary behaviors consisted of two independent variables and one composite variable (see Table 3.1). To calculate the prevalence of categorical variables, responses were dichotomized as engaging in some degree of the behavior ("1") or not ("0") (see Table 3.1). The median was calculated for BMI percentiles (as an ordinal variable). The means, standard deviation, and *N* sizes were computed for continuous variables. Univariate linear regressions (for continuous outcomes) and logistic regressions (for categorical outcomes) were conducted to determine whether there were sex, school type and sex-school type "interaction" group differences for each of the weight-status prevalence and the risk-protective variables.

Step 2. The means, standard deviations, and *N* sizes were computed for the dependent measure of BMI *z*-scores overall, by school type, sex, and school type-sex groups. Subsequently, univariate and multiple linear regressions were performed to determine whether there were school type, sex, and school type-sex "interaction" group differences in BMI *z*-scores.

Step 3 Multinomial logistic regressions were performed to determine if there were associations between the independent variables (i.e., demographics, risk-protective factors) with the relative weight-status ratios (i.e., healthy vs. overweight, & healthy vs. obese). This included the creation of two models. Tables 3.3 – 3.4 indicate variables used for each model.

Table 3.3 Model 1: Demographic variables

Category	Variable	Reference Group
Demographics	BMI Group	Weight status with healthy used as reference group, compared to overweight and obese weight statuses
	School Type	Private school used as the reference group
	Sex	Males used as reference group

Table 3.4 Model 2: Demographic variables and health related risk-protective behaviors

Category	Variable	Reference Group
Demographics	BMI Group	Weight status with healthy used as reference group, compared to overweight and obese weight statuses
	School Type	Private school used as the reference group
	Sex	Males used as reference group
Dietary Behaviors	Fruit/Vegetable	Students who consumed 5 or more fruits or vegetables per day during the past 7 days
Physical Activity	Physical Activity	Students who engaged in 5 to 7 days of physical activity for at least 60 minutes
	Sports Team Participation	Students who played on 1 or more sports teams during the past 12 months
	Physical Education (PE)	Students who attended PE at least once during the week
Sedentary Behaviors	Total Screen Time	Students who spent a total of 3 or more hours engaged in screen time

Step 4 of the study incorporated only those students who attended the private school (n=252). These data were analyzed to determine the association between the independent variable of entry level for private school students and weight status ratios (i.e., healthy vs. overweight, & healthy vs. obese). The main entry levels examined were kindergarten, 4th grade, 7th grade, and 9th grade. Kindergarten was used as the reference group. Only one model was created (see Table 3.5).

Table 3.5 Model 1: Demographic variables

Category	Variable	Reference Group
Demographics	BMI Group	Weight status with healthy used as reference group, compared to overweight and obese weight statuses
	Entry point	Students who entered the private school at Kindergarten

Results

Sample Description

The sample for this study included 9th grade Native Hawaiian students in the HYRBS data set and the private school database who had a weight status of healthy weight, overweight, or obese (those who met guidelines as underweight were excluded). The 2011 High School HYRBS data set included 4,329 students who completed the survey; 337 of them were Native Hawaiian 9th graders, and thus, retained for the study. For this sample, if the student selected Native Hawaiian as their only ethnic group or one of many, they were categorized as Native Hawaiian. All other students were removed from the data set. The private school data set included 252 Native Hawaiian 9th-grade students who completed the survey. Thus, the study sample included 589 Native Hawaiian 9th graders.

Table 3.6 Sample description by weight status, school type and sex

	Total		**Females**		**Males**	
	Frequency	%	Frequency	%	Frequency	%
Weight Status						
Healthy	380	67.4	233	70.6	147	62.8
Overweight	105	18.6	62	18.8	43	18.4
Obese	79	14.0	35	10.6	44	18.8
School Type						
Public	337	57.1	187	53.9	148	61.7
Private	252	42.9	160	46.1	92	38.3
BMI percentile						
Median	74.5		71.7		77.5	

Interactions:

Sex χ^2 [1, N=587] = 19.5, p < .0001
Weight Status χ^2 [2, N=564] = 295.9, p <.0001
Type χ^2 [1, N=588] = 11.4, p = .0007
Sex*Weight Status χ^2 [2, N=564] = 7.8, p = .0201
Sex*Type χ^2 [1, N=587] = 3.5, p = .0613

Table 3.6 presents the sample description by weight status, school type, and sex. The majority of the students (67.4%) were categorized as having a healthy weight status. This is consistent with the overall median BMI percentile of 74.5 for all students, as well as the median BMI percentile of 71.7 for females and 77.5 for males (see Table 3.5). There was a statistical difference (p < .05) between sexes (males > females), weight statuses (healthy > overweight, obese), and school type (public > private). Regarding interactions, only the sex-weight status interaction was statistically significant (p < .05)

whereby males had a higher percentage of respondents who were obese compared to females who had a higher percentage of respondents who were of healthy weight status.

Step 1: Description of Individual Items and Comparisons with School Type and Sex

For Step 1, Tables 3.7-3.9 present the descriptive statistics of the 19 variables that were examined. The variables included 15 risk-protective variables (13 individual independent variables and 2 composite variables) and the 4 dependent weight-status variables as defined in the Data Analyses Section (BMI percentile; healthy weight, overweight, & obese) overall, and by sex, school type, and school type-sex groups.

Table 3.7 Descriptive statistics for aggregated sample of public and private school students – Overall and by Sex

		Item	1	2	3	4	5	6	7
			Fruit juice	**Fruit**	**Green salad**	**Potatoes**	**Carrots**	**Other vegetables**	**Soda**
Total		**%**	**74.9%**	**92.3%**	**78.9%**	**60.0%**	**56.3%**	**80.2%**	**84.6%**
		Count	429	528	453	342	321	459	483
		Total	573	572	574	571	570	572	571
		CI (95%)	(71.2-78.2)	(89.8-94.2)	(75.4-82.1)	(55.8-63.8)	(52.2-60.3)	(76.8-83.3)	(81.4-87.3)
Sex									
	Female	**%**	**72.1%**	**92.9%**	**81.5%**	**57.5%**	**56.0%**	**83.2%**	**85.6%**
		Count	246	315	278	195	191	283	291
		Total	341	339	341	339	341	340	340
		CI (95%)	(67.2-76.6)	(89.7-95.2)	(77.1-85.3)	(52.2-62.7)	(50.7-61.2)	(78.9-86.8)	(81.5-88.9)
	Male	**%**	**78.8%**	**91.4%**	**75.4%**	**63.4%**	**56.7%**	**75.9%**	**83.1%**
		Count	182	212	175	147	130	176	192
		Total	231	232	232	232	229	232	231
		CI (95%)	(73.1-83.6)	(87.1-94.4)	(69.5-80.5)	(57.0-69.3)	(50.3-63.0)	(70.0-80.9)	(77.8-87.4)

Table 3.7 (continued) Descriptive statistics for aggregated sample of public and private school students – Overall and by Sex

	Item	8	9	10	11	12	13	14	15
		Milk	**Fruit/Vegetable (FRVG)**	**5-7 Days of Physical Activity (PA)**	**1+ Days of PE**	**1+ Teams**	**Avg. Daily TV hours (SD)**	**Avg. daily computer/video hours (SD)**	**Sedentary**
Total	**%**	**89.7%**	**18.3%**	**45.8%**	**80.2%**	**69.3%**	**1.5 hours**	**1.9 hours**	**51.5%**
	Count	506	102	260	454	390			303
	Total	564	559	568	112	568	566	561	588
	CI (95%)	(86.9-92.0)	(15.3-21.7)	(41.7-49.9)		(64.7-72.3)	(1.4)	(1.6)	(47.5-55.5)
Sex[a]									
Female	**%**	**89.6%**	**17.3%**	**39.3%**	**80.1%**	**67.7%**	**1.5 hours**	**2.1 hours**	**55.3%**
	Count	301	58	132	270	226			192
	Total	336	335	336	337	334	335	334	347
	CI (95%)	(85.9-92.4)	(13.6-21.7)	(34.2-44.6)		(62.8-72.7)	(1.5)	(1.6)	(50.1-60.5)
Male	**%**	**89.9%**	**19.7%**	**55.4%**	**80.3%**	**71.5%**	**1.5 hours**	**1.6 hours**	**46.3%**
	Count	205	44	128	183	163			111
	Total	228	223	231	228	228	230	226	240
	CI (95%)	(85.3-93.2)	(15.0-25.4)	(49.0-61.7)		(64.9-76.6)	(1.4)	(1.6)	(40.1-52.6)

Table 3.8 Descriptive statistics for public school sample - Overall and by Sex

	Item	1	2	3	4	5	6	7
		Fruit juice	**Fruit**	**Green salad**	**Potatoes**	**Carrots**	**Other vegetables**	**Soda**
School Type[b]								
Public	**%**	**74.7%**	**86.8%**	**71.0%**	**63.6%**	**53.8%**	**72.2%**	**76.8%**
	Count	239	277	228	203	171	231	245
(PUB)	Total	320	319	321	319	318	320	319
	CI (95%)	(69.6-79.1)	(82.7-90.1)	(65.8-75.7)	(58.2-68.7)	(48.3-59.2)	(67.0-76.8)	(71.9-81.1)
Female	**%**	**72.4%**	**86.6%**	**72.0%**	**62.6%**	**54.1%**	**76.7%**	**76.7%**
	Count	131	155	132	112	98	138	138
	Total	181	179	181	179	181	180	180
	CI (95%)	(65.4-78.4)	(80.8-90.8)	(66.0-78.9)	(55.3-69.3)	(47.4-61.8)	(70.0-82.2)	(70.0-82.2)
Male	**%**	**77.7%**	**87.1%**	**68.6%**	**65.0%**	**53.3%**	**66.4%**	**77.0%**
	Count	108	122	96	91	73	93	107
	Total	139	140	140	140	137	140	139
	CI (95%)	(70.1-83.8)	(80.6-91.7)	(60.5-75.7)	(56.8-72.4)	(45.0-61.4)	(58.3-73.7)	(69.3-83.2)

Table 3.8 (continued) Descriptive statistics for public school sample - Overall and by Sex

	Item	8	9	10	11	12	13	14	15
		Milk	**FRVG**	**5-7 Days of PA**	**1+ Days of PE**	**1+ Teams**	**Avg. Daily TV hours (SD)**	**Avg. daily computer/video hours (SD)**	**Sedentary**
School Type [b] Public (PUB)	**%**	**92.0%**	**15.7%**	**43.4%**	**64.7%**	**61.4%**	**1.9 hours**	**1.7 hours**	**53.4%**
	Count	287	48	137	203	191			179
	Total	312	306	316	314	311	313	309	335
	CI (95%)	(88.4-94.5)	(12.0-20.2)	(38.0-48.9)		(55.9-66.7)	(1.6)	(1.7)	(48.1-58.7)
Female	**%**	**90.9%**	**14.9%**	**37.9%**	**62.4%**	**59.4%**	**2.1 hours**	**1.8 hours**	**57.8%**
	Count	160	26	67	111	104			108
	Total	176	175	177	178	175	175	175	187
	CI (95%)	(85.7-94.3)	(10.3-20.9)	(31.0-45.2)		(52.0-66.4)	(1.6)	(1.6)	(50.6-64.6)
Male	**%**	**93.4%**	**16.8%**	**50.4%**	**67.7%**	**64.0%**	**1.7 hours**	**1.6 hours**	**48.0%**
	Count	127	22	70	92	87			71
	Total	136	131	139	136	136	138	134	148
	CI (95%)	(87.9-96.5)	(11.4-24.1)	(42.2-58.5)		(55.6-71.6)	(1.4)	(1.7)	(40.1-56.0)

Table 3.9 Descriptive statistics for private school sample - Overall and by Sex

		1	2	3	4	5	6	7
		Fruit juice	**Fruit**	**Green salad**	**Potatoes**	**Carrots**	**Other vegetables**	**Soda**
School Type[b]								
Private	**%**	**75.1%**	**99.2%**	**89.0%**	**55.2%**	**59.5%**	**90.5%**	**94.4%**
(PRV)	Count	190	251	225	139	150	228	238
	Total	253	253	253	252	252	252	252
	CI (95%)	(69.4-80.0)	(97.2-99.8)	(84.5-92.2)	(49.0-61.2)	(53.4-65.4)	(86.2-93.5)	(90.9-96.7)
Female	**%**	**71.9%**	**100.0%**	**91.3%**	**51.9%**	**58.1%**	**90.6%**	**95.6%**
	Count	115	160	146	83	93	145	153
	Total	160	160	160	160	160	160	160
	CI (95%)	(64.5-78.3)	(97.7-100.0)	(85.8-94.7)	(44.2-59.5)	(50.4-65.5)	(85.1-94.2)	(91.2-97.9)
Male	**%**	**80.4%**	**97.8%**	**85.8%**	**60.9%**	**61.2%**	**90.2%**	**92.4%**
	Count	74	90	79	56	57	83	85
	Total	92	92	92	92	92	92	92
	CI (95%)	(71.2-87.3)	(92.4-99.4)	(77.3-91.6)	(50.7-70.2)	(51.7-71.2)	(82.4-94.8)	(85.1-96.3)

Table 3.9 (continued) Descriptive statistics for private school sample - Overall and by Sex

Item		8	9	10	11	12	13	14	15
		Milk	**FRVG**	**5-7 Days of PA**	**1+ Days of PE**	**1+ Teams**	**Avg. daily TV hours (SD)**	**Avg. daily computer/video hours (SD)**	**Sedentary**
School Type[b]									
Private (PRV)	**%**	**86.9%**	**21.3%**	**48.8%**	**99.6%**	**79.0%**	**0.9 hours**	**2.0 hours**	**49.0%**
	Count	219	54	123	251	199			124
	Total	252	253	252	252	252	255	254	253
	CI (95%)	(82.2-90.5)	(16.7-26.8)	(42.7-55.0)		(73.5-83.5)	(1.1)	(1.5)	(42.9-55.1)
Female	**%**	**88.1%**	**20.0%**	**40.9%**	**100%**	**76.7%**	**0.8 hours**	**2.3 hours**	**52.5%**
	Count	141	32	65	159	122			84
	Total	160	160	159	159	159	161	160	160
	CI (95%)	(82.2-92.3)	(14.5-26.9)	(33.5-48.6)		(69.6-82.6)	(1.0)	(1.5)	(44.8-60.1)
Male	**%**	**84.8%**	**23.9%**	**63.0%**	**98.9%**	**82.6%**	**1.0 hour**	**1.6 hours**	**43.5%**
	Count	78	22	58	91	76			40
	Total	92	92	92	92	92	93	93	92
	CI (95%)	(76.1-90.7)	(16.4-33.6)	(52.8-72.2)		(73.6-89.0)	(1.1)	(1.4)	(33.8-53.7)

Note: CI = Confidence Interval. SD = standard deviation

[a]Statistically significant difference between sexes: (Likelihood ratio, $p < .05$, $R^2 > .01$):
Females > Males: Item 6, 15; Males > Females: Items 10, 19 (see Table below)

[b]Statistically significant differences between school type: (Likelihood ratio, $p < .05$, $R^2 > .01$):

PRV > PUB: Items 2, 3, 6, 7, 11, 12; PUB > PRV: Items 8, 13, 19 (see Table below)

Statistically significant interactions ($p < .05$, $R^2 > .01$):
School Type x Sex: Items 13, 18 (see Table below), 19 (see Table below)

Table 3.10 Descriptive statistics of dependent variable weight status (%ile, BMI categories) by aggregated sample, school type and gender

		Item	16	17	18	19
			Median BMI %tile	Healthy	Overweight	Obese
Total		**%**	**74.5**	**67.4%**	**18.6%**	**14.0%**
		Count		380	105	79
		Total		564	564	564
		CI (95%)		(63.4-71.1)	(15.5-21.9)	(11.2-16.9)
Sex						
	Female	**%**	**71.7**	**70.6%**	**18.8%**	**10.6%**
		Count		233	62	35
		Total		330	330	330
		CI (95%)		(65.1-74.8)	(14.8-23.2)	(7.7-14.3)
	Male	**%**	**77.5**	**62.8%**	**18.4%**	**18.8%**
		Count		147	43	44
		Total		234	234	234
		CI (95%)		(56.0-68.2)	(13.8-23.6)	(14.2-24.1)
School Type	**Public (PUB)**	**%**	**75.8**	**65.0%**	**17.5%**	**17.5%**
		Count		204	55	55
		Total		314	314	314
		CI (95%)		(59.5-70.0)	(13.7-22.1)	(13.7-22.1)
	Female	**%**	**72.8**	**70.4%**	**14.0%**	**15.7%**
		Count		121	24	27
		Total		172	172	172
		CI (95%)		(63.1-76.7)	(9.6-19.9)	(11.0-21.9)
	Male	**%**	**80.9**	**58.5%**	**21.8%**	**19.7%**
		Count		83	31	28
		Total		142	142	142
		CI (95%)		(50.2-66.2)	(15.8-29.3)	(14.0-27.0)
	Private (PRV)	**%**	**73.1**	**70.4%**	**20.0%**	**9.6%**
		Count		176	50	24
		Total		250	250	250
		CI (95%)		(64.5-75.7)	(15.5-25.4)	(6.5-13.9)
	Female	**%**	**70.6**	**70.9%**	**24.1%**	**5.1%**
		Count		112	38	8
		Total		159	159	159
		CI (95%)		(62.9-77.0)	(17.9-31.1)	(2.6-9.6)
	Male	**%**	**74.0**	**70.0%**	**13.0%**	**17.4%**
		Count		64	12	16
		Total		92	92	92
		CI (95%)		(59.5-78.0)	(7.6-21.4)	(11.0-26.4)

Overall Findings

When examining the protective nature of increased healthy dietary behaviors, including the consumption of fruits and vegetables consumed at least once during the past seven days, the majority of the respondents engaged in this behavior. Yet, in determining the composite variable (Item 9), less than one in five students (18.3%) met the cutoff of fruits/vegetables at least five or more times per day within the past seven days. Regarding the examination of the protective behavior of increased physical activity, only 45.8% of the respondents were physically active for five to seven days within the previous seven days, and 80.2% of the respondents attended PE at least once during the school week. However, more than two in three students participated on a sports team within the past 12 months. Examining the risk behavior of screen time, which in this study was used as a proxy for sedentary behaviors, one in two students (51.5%) engaged in three or more hours of screen time daily. Finally, regarding BMI categories, the majority of the students were categorized as having a healthy weight status (67.4%) with a median BMI percentile of 74.5, while 18.6% were categorized as being overweight, and the remaining 14.0% were categorized as being obese.

Findings by Sex

There was a statistical significant sex difference (Likelihood ratio, $p < .05$, $R^2 > .01$) in prevalence for three of the risk-protective behaviors and one weight status. Females reported significant higher levels of consumption of other vegetables (Item 6) and engagement in sedentary behaviors (Item 15), while males reported significant higher levels of engagement in physical activity for 5-7 days (Item 10) within the past seven days, and were more likely to be obese (Item 19).

Findings by School Type

The overall main effect of school type was significant for nine items (Likelihood ratio, $p < .05$, $R^2 > .01$). There was a statistical difference in prevalence for eight risk-protective behavior and one weight status. Private school students reported higher levels of consuming fruit (Item 2), green salad (Item 3), other vegetables (Item 6), and soda (Item 7), and greater number of students attended PE at least once a week (Item 11) and participated in sports teams (Item 12). Public school students reported higher levels of

consuming milk (Item 8), indicated greater numbers of hours watched television (Item 13) and had a higher prevalence of obesity (Item 19).

Findings by School Type-Sex Interaction

Finally, the school type-sex interaction was significant ($p < .05$, $R^2 > .01$) for one risk-protective behavior (i.e., number of hours watching television [Item 13]) and two weight statuses (i.e., being overweight [Item 18] and obese [Item 19]). Public school females had a higher prevalence than their male counterparts for watching television, whereas private school males had a higher prevalence than their female counterparts. For both school types, males had a higher prevalence of being obese than their female peers. However, more than three times as many private school males were obese compared to private school females (17.4% vs. 5.1%, respectively), whereas, the difference between public school students was not as large (males 19.7%, females 15.7%). Additionally, private school females had a higher prevalence of being overweight compared to their male peers (24.1% vs. 13.0%), whereas public school males had a higher prevalence of being overweight compared to their female peers (21.8% vs. 14.0%).

Step 2: BMI *z*-scores by School Type and Sex

For Step 2, univariate and multiple linear regressions were performed to determine whether there were differences across sexes, school type, and school type-sex groups in weight status as measured by continuous BMI *z*-scores. Table 3.11 presents the means, standard deviations, and *N* sizes by school type and sex with BMI *z*-scores as the outcome.

Table 3.11 Means, standard deviation, and *N* sizes of BMI *z*-scores by school type and sex.

	Males			Females			Total		
Type	Mean	SD	*N*	Mean	SD	*N*	Mean	SD	*N*
Public	0.87	0.88	142	0.60	0.92	172	0.72	0.91	314
Private	0.65	1.00	92	0.53	0.77	158	0.57	0.86	250
Total	0.78	0.93	234	0.57	0.85	330	0.65	0.89	564

SD = Standard Deviation

The main effects of sex and school type were statistically significant at $p < .05$; however, the interaction between sex and school type was not significant. The average BMI *z*-score of males was significantly higher than for females. Referring to school type, public school students' average BMI *z*-score was significantly higher than the private school students' average BMI *z*-score.

Step 3: Hierarchical Model-Building

Step3 utilized multinomial logistic regression (see Table 3.12) to determine the ratio between the healthy-weight status and overweight status, and between the healthy-weight status and obese status for the overall sample. These analyses found that there were significant differences in the ratio of weight statuses between sexes, school type, and engagement in risk-protective behaviors when comparing ratios of healthy-weight status to obese status.

Table 3.12 Multinomial logistic regression analyses of weight status – demographics and risk and protective behaviors

Variable Categories	Weight Status	Model 1: Demographics			Model 2: Demographics + Behaviors		
		OR****	95% CI	*p*	OR****	95% CI	*p*
Sex:							
Females	Obese	0.53	(0.32, 0.86)	*	0.43	(0.25, 0.72)	**
	Overweight	0.91	(0.58, 1.41)	0.6600	0.88	(0.50, 1.41)	0.6015
Males	Obese	1.00	Reference		1.00	Reference	
	Overweight	1.00	Reference		1.00	Reference	
Type							
Public	Obese	1.88	(1.12, 3.18)	*	2.33	(1.29, 4.21)	**
	Overweight	0.94	(0.61, 1.45)	0.7882	0.96	(0.58, 1.59)	0.8706
Private	Obese	1.00	Reference		1.00	Reference	
	Overweight	1.00	Reference		1.00	Reference	
Behaviors							
Physical Activity (< 5 days)	Obese				1.80	(1.02, 3.18)	*
	Overweight				1.12	(0.069, 1.82)	0.6466
Sports Teams (0 teams)	Obese				1.01	(0.56, 1.82)	0.9780
	Overweight				1.13	(0.67, 1.91)	0.6425
Physical Education	Obese				0.73	(0.36, 1.47)	0.3766
	Overweight				0.96	(0.49, 1.86)	0.8969
Fruits/Vegetables (< 5 f/v per day)	Obese				0.45	(0.24, 0.85)	*
	Overweight				0.91	(0.50, 1.66)	0.7600
Sedentary (< 3 hours/day)	Obese				1.28	(0.76, 2.15)	0.3586
	Overweight				1.12	(0.71, 1.76)	0.6286

*$p < .05$; **$p < .01$; ***$p < .0001$ **** Odds Ratio

The first model indicated significant findings related to sex, where females had a higher healthy weight-to-obese weight status ratio (OR = 0.53; $p < .05$). Related to school type, the significant finding was private school students had a higher healthy weight-to-obese weight status compared to public school students (OR = 1.88; $p < .05$).

The second model included dietary behaviors, physical activity, and sedentary behaviors to the demographics analyzed in Model 1 above. In comparing the two models, there were two additional statistically significant effects: (1) Those who engaged in less than 5 days of physical activity had a lower healthy weight-to-obese ratio than those who engaged in 5 days or more of physical activity; and (2) Those who consumed fruits/vegetables less than five times per day within the past seven days were more likely than those who consumed fruits/vegetables five or more times per day to have a healthy weight-to-obese ratio. In other words, the expected risk of being obese is lower for those who engaged in five or more days of physical activity within the week, but higher for those that consumed fruits/vegetables five or more times per day.

Step 4: Distribution and Multinomial Logistic Regression for Private School Students

Finally, the last step of the analyses examined only students in the private school data set (N = 252). Table 3.13 shows the distribution of weight status among the primary entry grades into the private school.

Table 3.13 Weight status of private school students by entry grade and sex (%)

Entry Grade	Healthy	Overweight	Obese
Kindergarten	31 (79.5)	5 (12.8)	3 (7.7)
K - Females	21 (84.0)	4 (16.0)	
K – Males	10 (71.4)	1 (7.1)	3 (21.4)
4th Grade	20 (64.5)	8 (25.8)	3 (9.7)
4 - Females	12 (57.1)	6 (28.6)	3 (14.3)
4 – Males	8 (80.0)	2 (20.0)	
7th Grade	65 (69.2)	20 (21.3)	9 (9.6)
7- Females	41 (70.7)	14 (24.1)	3 (5.2)
7 – Males	24 (66.7)	6 (16.7)	6 (16.7)
9th Grade	55 (68.8)	16 (20.0)	9 (11.3)
9 - Females	36 (70.6)	13 (25.5)	2 (3.9)
9 – Males	19 (66.7)	3 (10.3)	7 (24.1)
Other grades	4 (80.0)	1 (20.0)	
Females	2 (66.7)	1 (33.3)	
Males	2 (100)		

The multinomial logistic regression analysis examined the private school data set to determine whether entry grade into the school was associated with differences in the ratio of healthy weight status-to-overweight, and the ratio of healthy weight-to-obese for the private school sample. For the multinomial logistic regression analysis, the entry grade of kindergarten was used as the reference group. The model included the entry grade as the only variable to examine (see Table 3.14). The four students who entered the private school in grade levels beyond the main entry points were removed due to the small sample size.

Table 3.14 Multinomial logistic regression analyses of weight status based on entry grade level

Variable Categories	Weight Status	Model 1: Entry Grade		
		OR*	95% CI	*p*
Entry grade level				
9th	Obese	1.69	(0.43, 6.71)	0.4553
	Overweight	1.80	(0.60, 5.40)	0.2917
7th	Obese	1.43	(0.36, 5.66)	0.6096
	Overweight	1.91	(0.66, 5.56)	0.2365
4th	Obese	1.55	(0.28, 8.45)	0.6126
	Overweight	2.48	(0.71, 8.66)	0.1547
Kindergarten	Obese	1.00	Reference	
	Overweight	1.00	Reference	

*** Odds Ratio**

The results of this analysis revealed that, although there may have been differences in the distribution across entry grade levels of weight statuses, there were no statistically significant differences between the ratios examined in the multinomial logistic regression. Therefore, students entering the private school in Grades 4, 7, and 9 did not have a significant higher or lower ratio of overweight-to-healthy weight status or obese-to-healthy weight status compared to those who entered the private school in kindergarten.

Discussion

This study examined risk-protective behaviors and their association with overweight and obesity, to answer the overall research question, "Is there a difference in engagement of healthy behaviors and weight status for 9th-grade Native Hawaiian students by school type (public vs. private)?" The associations were analyzed by sex, school type, and school type-sex interaction. The study found that there were significant differences by sex, school type, and interaction of school type-sex. However, there were no significant differences in length of time at the private school and weight status.

Weight Status, Sex, and Risk-Protective Behaviors

Several differences were found by sex when answering three of the four aims—specifically Aims 1 (risk-protective prevalence/levels), 2 (BMI *z*-scores), and 3 (hierarchical model building). Overall, females were healthier than males based on three weight measures (i.e., lower prevalence of obese status; lower average BMI *z*-scores, and higher healthy-to-obese ratio). In addition, females self-reported engaging in consuming other vegetables, while also reporting higher prevalence of sedentary behaviors. However, males had a higher prevalence of being physically active five or more days in the past week, even with the higher BMI. The findings of this study related to sex were inconsistent with the previous research of Sweeting (2008) that focused on the differences in weight status. However, the findings were consistent when focused on dietary behaviors and physical activity (Must & Tybor, 2006; Singh, Kogan, Siapush, & van Dyck, 2008).

Weight Status, School-Type and Risk-Protective Behaviors

Overall, school type was associated with weight status and engagement in risk-protective behaviors. Similar to the analysis of sex, several differences were found by school-type when answering the three aims that focused on comparing school types—Aims 1 (risk-protective prevalence/levels), 2 (BMI *z*-scores) and 3 (hierarchical model building). The general finding was that compared to private school students, public school students had: 1) significantly higher prevalence of obesity, 2) significantly higher BMI *z*-scores and 3) significantly higher obese-to-healthy weight status. Regarding school type and risk protective behaviors, compared to public school students, private school students had significantly higher prevalence of: 1) consuming healthier foods (fruit, green salad, and other vegetables), 2) consuming soda; 3) participation in five to seven days of physical activity; 4) sports' team participation; and 5) attending PE classes at least once during the week. Public school students had significantly higher prevalence of: 1) consuming milk and 2) watching television on average for a greater number of hours. The participation in physical activity and sports' team participation could be related to school policies, as well as resources that are available to the students throughout the school day. As mentioned earlier, the DOE has limited Wellness Guidelines, requiring only a single year of PE during high school, whereas, the selected private school requires PE all four years of high school. Sports' team

participation is also affected by the resources that are available at the school, such as the number of sports' teams available, as well as the coaching resources. Durant et al. (2009), in examining school environment and adolescent physical activity, found a positive association between the number of PE days and accessibility of school fields for use after school and overall engagement in physical activity.

Risk-Protective Behaviors and Healthy-to-Overweight and Healthy-to-Obese Ratios

The previous sections discussed sex and school-type as main effects. When statistically controlling for the demographic variable (i.e., sex) and school type in Aim 3, only physical activity was found to be a protective factor for the obese-to-healthy ratio. These findings were aligned with previous research that has found physical activity to have the greatest influence on weight status (Must & Tybor, 2006; Patrick et al., 2004). Surprisingly, consuming fruits and vegetables five or more times per day was found to be positively associated with a higher obese-to-healthy ratio.

Private School Entry Point and Healthy-to-Overweight and Healthy-to-Obese Ratios

Due to the more intense high school PE program at the private school compared to public schools, it was hypothesized that the students who entered the private school at an earlier grade level will have a lower weight status due to a stronger foundation in PE. However, there were no significant differences in the ratio of healthy weight-to-overweight or healthy weight-to-obese between the kindergarten entry grade level and any of the later entry grades (i.e., 4^{th}, 7^{th}, 9^{th}). This finding indicated the need to understand the greater context of the students outside of school that is also influencing their behaviors, as well as the possibility of future research with a larger sample for increased power.

Limitations and Strengths

There are several limitations of this study. First, the private school included in the study was chosen due to its high percentage of Native Hawaiian students. Thus, the results of this study may not be generalizable to Native Hawaiian students who attend other private schools in Hawai‘i. A future comparison between mixed groups of students from various private schools would be helpful in evaluating if the results of this study are repeatable.

Second, as with most secondary data analyses, there were limitations associated with the HYRBS. The HYRBS was also the foundation for the private school survey. Overall, data from both the HYRBS and the private school survey data were based on adolescent self-report, which is subject to recall bias and social desirability bias (Brener, Billy, & Grady, 2003). For example, Troped et al. (2007) examined the reliability and validity of YRBS physical activity items among middle school students. They found that the amount of time the students actually engaged in moderate-to-vigorous physical activity (using accelerometers) was under-stated when reported on the YRBS. However, Troped et al. (2007) did not examine whether such biases affected the estimates of the correlations among the variables in question. Additionally, there was non-response bias, as the data sets did not include data from students who declined to participate and those who were absent on the day of the administration of the surveys.

Another potential limitation is that the current HYRBS asks only certain health-related questions. The HYRBS does not collect demographic information from the student beyond age, grade, sex, and ethnic group. Additional questions that would be helpful in assessing the context of health outcomes such as obesity include socio-economic status and parents' occupation and highest level of education. Socio-economic status has been found to be a factor of obesity (Singh, Kogan, Van Dyck, & Siapush, 2008).

It was curious to find that consuming less fruits and vegetables was associated with a lower obese-to-healthy weight status. This finding could be an artifact of measurement, as the YRBS questions related to fruit and vegetable consumption do not focus on quantity or how the fruits and vegetables were prepared. Instead, the questions focus on the number of times per day the fruits or vegetables are consumed (see Table 3.2 for calculation). Additionally, the fruits and vegetables, such as carrots and potatoes, that are included in the composite score, may not always be defined as a fruit or vegetable in calculations for other studies. These limitations of the YRBS are similar to the limitation found in the literature review by Roark and Niederhauser (2013) in determining fruit and vegetable consumption.

A third limitation was the timing of the surveys. The HYRBS was administered during the school year between the fall of 2010 and the spring of 2011. The private school survey was administered during the spring of 2013. Therefore, although both groups consisted of 9th graders, they were in the 9th grade in

different school years—separated by two to three years. However, there was unlikely any major differences due to the two- to three-year gap between the two cohorts.

Fourth, the surveys were cross-sectional, and causation cannot be determined. For example although physical activity has been related to reducing obesity, obese children may have limited engagement in physical activity because they are obese. Using cross-sectional surveys, it is impossible to tell if being obese results in their physical activity limitations or if limited physical activity resulted in obesity. Obese children may want to participate less in physical activity because they are self-conscious of their weight and the reaction of their peers (Must & Tybor, 2006).

Finally, the underweight status students were removed from the study. However, there were only four students who were categorized as underweight, so the results were likely not impacted significantly by these omissions.

The main strength of this study is the relatively ethnic-homogenous population of Native Hawaiians, allowing the differences within the group to be better understood. Therefore, as the prevalence of adolescent obesity continues to increase for the Native Hawaiian population, the results of this study can help in developing targeted programs and interventions for these adolescents by better understanding how certain factors may contribute to adolescents' behaviors.

Implications

When examining the overall findings from this study regarding the differences between sex, school type, and risk-protective behaviors, additional questions arise as to what these results mean. At the *Intrapersonal Level*, the study suggests that females have a healthier weight status compared to males. However, males engaged in more physical activity compared to females. Therefore, how interventions are created that target the use of physical activity as the key to reduction of weight status may be different for each sex. In addition, there is the need to understand how members of different sexes may perceive their weight status as being within the norm or not; this was not part of this study.

Additionally, although Native Hawaiian adolescents have the second highest prevalence of being overweight and obese, there are differences between school-type. Therefore, there needs to be increased

need to understand why this difference exists. As stated earlier, the private school that was used for this study may also be different when compared to other private schools in Hawai‘i due to the high Native Hawaiian representation and the lower cost of tuition. Therefore, it is important to determine whether this difference between school type arose because of selection bias (those who applied to the private school and enrolled were different to begin with) and/or because overall private schools may have more resources than public schools, and so on. Future studies need to examine this research question across similar and dissimilar school types. Overall, for the selected private school, there is importance placed on maintaining the physical education program by the administration in an effort to help reduce the prevalence of the chronic disease in Native Hawaiians.

This study did not find a significant difference in healthy weight-to-obese or healthy weight-to-overweight ratio when examining entry level into the private school. However, more studies in this area are warranted because this study also found that the private school students were, overall, more healthy than the public school students. Moreover, examining high school students later in high school, such as in their senior year or as part of a longitudinal study, could help to develop a clearer understanding of what the length of time at the private school means in terms of students' weight status. The way the study was developed, those who entered the school in 9^{th} grade had been in high school for only a semester.

Finally, in understanding the finding that those who consumed fruits and vegetables less than five times per day had a higher healthy weight-to-obese ratio compared to those who consumed fruits and vegetables five or more times per day, again greater context is needed. A limitation of the study was the use of the HYRBS, which only asks how many times per day the student consumed the food in question, and does not ask about quantity or volume of food. To be more culturally appropriate, there is a need for more state-specific questions that address local eating habits (e.g., volume of rice).

Future Research

This study is important because it provides findings that could lead to appropriate interventions based on school type to increase engagement in healthy behaviors and decrease the percent of Native

Hawaiian overweight and obese adolescents. It also provided opportunity to examine additional levels of the socio-ecological model and how they influence schools and the adolescents.

Interpersonal Traits – Demographic Information

Lower socio-economic status (SES) has been associated with obesity (Boumtje et al., 2005; Goodman et al., 2003; Lee, Harris & Gordon-Larsen, 2009), although some research has found a limited relationship between income and the prevalence of obesity for adolescents, perhaps due to differences in estimating income and poverty (Ogden, Lamb, Carroll, & Flegal, 2010). In Hawai‘i, no research has been done that demonstrates a direct link between poverty and obesity, but Native Hawaiians overall tend to have higher prevalence of both poverty and obesity than other ethnic groups in the state (American Community Survey, 2010; Hawai‘i Health Data Warehouse, BRFSS, 2012; Hawai‘i Health Data Warehouse, YRBS, 2012). The HYRBS does not collect demographic information on parent/caregiver educational attainment or financial status, and no SES variables were added to the survey based on HYRBS administered to the private school students. Attending a private school is sometimes seen as a proxy for a higher SES. However, the selected private school in this study is endowed, and 80% of the students who attend the private school in this study receive financial aid. Thus, in this case, private school attendance may not serve as a proxy for SES, and future studies of adolescent obesity should consider adding SES survey items.

The selected private school has resources and policies that should support increased engagement in healthy dietary behaviors and physical activity. These findings are comparable to Vissers et al. (2008) where they found that being overweight or obese was more prevalent in vocational secondary schools or those which provided practice-oriented education compared to general secondary education which prepared the student for further education.

Additionally, the findings from the analysis that examined the entry points of the private school determined that length of time at school was not associated with the ratio of healthy-to-overweight and healthy-to-obese. This finding leads to further questions as to influences outside of school environment.

Society Level of Model - Policies

Findings for the public schools may include an examination of how the current Wellness Guidelines are shifting school environments and how these changes will improve the weight status of public school adolescents. For change to occur in public schools, there is the need for policy directives in state law and at the Department of Education or the State Board of Education levels (Story, Nanney & Schwartz, 2009). On a national policy level, schools are currently undergoing struggles to implement the new policies that relate to new nutritional guidelines. More research is needed to understand how the policies that are being formed, how well they are implemented, and how they are affecting schools in Hawai‘i.

Conclusion

Overall, there were differences in Native Hawaiian adolescents' engagement in behaviors as well weight status by school type. School policies can influence the weight status and adolescent engagement in healthy behaviors that are related to participation in physical activity and dietary behaviors. Beyond policies formed at the school level, the resources that are available to the students at their school also play a role in the engagement of behaviors, and therefore, weight status. Due to the variability in resources, interventions need to target individual schools and school types to ensure that they are appropriate for the student population and the schools themselves. Although, this study focused on the differences between school types, additional research is needed to further examine if there are differences across public schools' policies and programs to better understand what is needed to increase healthy behavior engagement and reduce adolescent overweight and obesity. To continue to gain a better understanding beyond the contribution that schools play in determining weight status, examining demographic information such as SES level of student (family) and the community the student is from would be beneficial to relate the availability of resources.

Chapter 4

Engaging Indigenous Adolescents through Photovoice in Understanding Community Barriers and Supports for Physical Activity and Healthy Eating

Abstract

Background

The fourth level of the ecological model, representing environmental influences on health, can present barriers or supports towards healthy eating and physical activity engagement for adolescents. This study explored how overweight and obese Native Hawaiian adolescents perceive their school and neighborhood environments in providing these supports and barriers.

Methods

Student participants age 15-17 with a body mass index (BMI) of greater than or equal to the 95th percentile for age and sex were engaged in the qualitative research method of Photovoice. Through this method, the students took photographs, described the photographs, created story boards, and engaged in a focus group discussion on the barriers and supports found in their school and neighborhood environments towards physical activity and healthy eating.

Results

Overall, students who participated in the study felt the use of photography was a way for them to see their environments from a different perspective. This resulted in learning more about their school and neighborhood environments, how the environments supported the students in engaging in healthy behaviors, and how these environments challenged them to do so. The creation and sharing of the storyboards allowed for broad and meaningful participation from all students. Students from different neighborhoods described similar barriers to engaging in healthy eating and physical activity, including television and electronics (being engrossed in video games and social networking), types of food available (including the pervasiveness of fast food resources), and finding comfort in sleeping and lounging. The supports provided by the private school the students attended, including gyms and healthy

food options in the cafeteria, were noted in the majority of the students' storyboards. The supports that were offered by neighborhood environments differed by the neighborhood. For example, some neighborhoods had "healthier" food stores, which increased access to healthy food options. An overall theme emerging from the focus group was the importance of having the finances to purchase healthy food options, parental support for healthy living, and parental perception of the neighborhood. For example, many youth noted that parents bought fast foods for the family and that parent perception of neighborhood dangers kept them inside, while a few youth related tales of parental encouragement to exercise or lose weight.

Conclusion

Photovoice was effective in helping vulnerable students identify and discuss the environmental influences on health behaviors related to weight status. The findings suggest need for education not only of youth, but also of parents who serve as important role models to adolescents and continue to influence their food choices and physical activity behaviors. The school and neighborhood environments also influence behavior. All of these levels of the Social Ecological Model interact with the individual student, either due to decisions that are made on behalf of the students or by the students themselves. More research is needed to develop and test school and neighborhood policies to improve physical activity and healthy eating among adolescents.

Native Hawaiian Land and Health

"He aliʻi ka ʻāina, he kauwā ke kanaka" *The land is a chief, man is its servant*; Land has no need for man, but man needs the land and works it for a livelihood (Pukui, 1983, #531).

From the Native Hawaiian perspective, the land and environment in which the people live influence their well-being. Before Westernization, Native Hawaiians ate a high-fiber, low-fat diet of foods they fished, hunted, or cultivated themselves. As Hawaiian ethnographer Kepa Maly describes, "The ʻāina, wai, kai and lewa were the foundation of life and the source of spiritual relationship between people and their environs…The health and well-being of the people were reflected in the health of the nature around them." Most Hawaiians today no longer fish and farm their own food. Fast food, sedentary jobs, and a lack of access to land have reduced the number of Hawaiians living the active subsistence lifestyle of their ancestors.

Research shows that Native Hawaiian children have a higher prevalence of obesity than non-Hawaiians in the state of Hawaiʻi. For example, Chai et al. (2003) compared body mass index (BMI) of Native Hawaiian children in Hawaiʻi against norms published by the National Health and Nutrition Examination Survey (NHANES III) and found that twice as many Native Hawaiian children and adolescents were obese compared to the national sample. According to the Hawaiʻi State Youth Risk Behavior Survey (HYRBS), 24% of Native Hawaiian adolescents were obese compared to the state total of 15% in 2011.

As predicted by the Social Ecological Model, healthy living behaviors are impacted by multiple levels of influence, from the individual and interpersonal levels to the environmental and policy levels. In their literature review, Sallis and Glanz (2009) documented the significant influence of the built environment, food environment, and policy environment on healthy eating and physical activity. For adolescents, who are in a period of transition from dependence on parents to independence, the home environment has a critical influence on behavior. For example, adolescents still rely on parents for food, housing, and guidance. Adolescents are rarely autonomous in deciding which foods are available in their

homes. Food that is provided to the adolescents is primarily selected by parents or caregivers, thereby affecting adolescents' consumption. In some neighborhood environments, parents or caregivers may restrict adolescents' physical activity because they have issues regarding the safety of the neighborhood (Gomez, Johnson, Selva & Sallis, 2004; Weir, Etelsohn, & Brand, 2006). If there are limited resources within walking distance to engage in physical activity or healthy eating, adolescents often rely on parents to transport them (Beets et al., 2010; Carver et al., 2010; Molnar, Gortmaker, Bull & Buka, 2004; Weir, Etelsohn, & Brand, 2006).

In addition to the home environment, the surrounding neighborhood environment plays a role in adolescent engagement in healthy behaviors (Ding et al., 2011; Forsyth et al., 2009; Mota, Ribeiro, & Santos, 2009; Richardson, Boone-Heinonen, Popkin, & Gordon-Larsen, 2011). For example, where there is greater availability of supermarkets with fresh food, there is increased consumption of nutritious foods. Increased availability of fast food restaurants is associated with greater consumption of fat in diets. The availability and proximity of physical activity resources increase physical activity engagement (Grow et al., 2008; Santos et al., 2008).

Availability of resources varies by ethnic and economic composition of the neighborhoods (Rahman, Cushing, & Jackson, 2011). Neighborhoods heavily populated with low socio-economic status (SES) and minority groups have a greater presence of fast-food restaurants compared to fresh-food resources. In comparison, fresh-food resources are more available in neighborhoods with a high SES that are populated primarily by Whites. Native Hawaiian adolescents are more likely than adolescents of other ethnic groups to live in poverty and to live in low socio-economic neighborhoods, which often offer limited opportunity to engage in physical activity or healthy eating (U.S. Census, 2011 PUMS 5-yr file). In Hawai'i, Mau and colleagues (2008) similarly found that the Leeward Coast of O'ahu, which is densely populated with Native Hawaiians and has a low SES, has a high prevalence of obesity, a high number of fast-food outlets, and few physical activity resources.

Moreover, the school environment also influences the students' behaviors. Regardless of the types of schools that our youth attend, students spend a great percentage of their early lives in school

(Story, Kaphingst & French, 2006). According to Story, Nanney, Schwartz (2009), schools have been found to influence students' health outcomes (i.e., obesity) and well-being with policies related to nutrition and physical activity. Source of food/nutrition.

Studies that have focused on adolescents' perception of their environments have taken place primarily in the continental? U.S., Australia, and Europe. Findings across these countries suggest that adolescents perceive more barriers than supports to engage in healthy behaviors and that these perceptions are influenced by both parental perceptions and the environmental resources (Ries, Vorhees, Gittlesohnm, Roche & Astone, 2008). Kerr et al. (2008) found that parental perception of safety more heavily affected females' perceptions of the environment compared to males, further limiting their engagement in outdoor activities.

The literature is lacking in two areas—studies on the perceptions of indigenous adolescence and studies that engage adolescents with a BMI greater than or equal to the 95th percentile (categorized as obese). The current study engaged obese indigenous adolescents (Native Hawaiians) in a Photovoice study of their environments and the resources available that supported and challenged their participation in healthy eating and physical activity. For Native Hawaiians, who once had a strong connection to the land and the environment in which they lived, it is important today to understand how adolescents of Native Hawaiian ancestry perceive their environment and how that environment supports or challenges them to engage in healthy behaviors.

Purpose

The overall purpose of the study was to understand how Native Hawaiian adolescents with a BMI of 95th percentile or greater (categorized as obese) perceive barriers and supports to engage in healthy behaviors (physical activity and healthy dietary behaviors) presented by their school and neighborhood environments. The two aims of the study were: 1) to identify and examine perceptions of obese adolescents around environmental barriers and supports to physical activity and healthy eating; and 2) to engage students in a discussion of how to make their environments more supportive of healthy behaviors.

The study was approved by the host school and the University of Hawai‘i at Mānoa’s Institutional Review Board (IRB).

Methods

Study Design: Photovoice

Photovoice is a qualitative study methodology that provides participants an opportunity to be active researchers. The methodology works well with vulnerable populations, as it strives to empower and engage participants through the taking and describing of photographs related to a research question. This methodology is based on theories of critical consciousness, feminist theory, and nontraditional approaches to documentary photography (Wang, 1999).

Wang and Burris first created Photovoice in the 1990’s as a needs assessment tool used by rural women of China. The goals of Photovoice are threefold: “1) to enable people to record and reflect on their environment’s strengths and concerns, 2) to promote critical dialogue and knowledge about important issues through large and smaller group discussion of photographs, and 3) to reach policymakers” (Wang & Burris, 1997, p.369). Photovoice provides study participants an opportunity to share their perspectives on the proposed research questions using photography as the medium. A sub-goal is to stimulate both personal and environment change.

Previous Photovoice studies have demonstrated that this method has been successful in generating discussion among adolescents with regard to health behaviors. For example, the Teen Photovoice Project sponsored by UCLA/RAND and the Center for Disease Control and Prevention (CDC) brought together 16 minority students from Los Angeles (Necheles et al., 2007). The goal of the study was to understand their perceptions of what influenced their health behaviors and to create social marketing products to affect health behavior change in their peers. Another study, based in Australia, engaged adolescents who had a chronic disease to explore through photography how they self-managed their disease (Drew, Duncan, &Sawyer, 2010).

Study Setting

The study took place at a private educational institution on O‘ahu, Hawai‘i. The school serves students from across the state. Students who come from other islands and outside of Hawai‘i have an opportunity to live in dormitories on campus from 7th grade. These students are referred to as “boarders” in this study, and the other students are referred to as “day students.” The school is located on a hillside, requiring students to walk up and down the hill as they move from class to class if time permits. Otherwise, buses are available to transport students.

Participants

Students enrolled in the Health Promotion Education Program (HPE) physical education course were invited to participate. HPE targets obese students (BMI equal to or greater than 95th percentile for age and sex), with the goal of helping them to adopt healthier lifestyles to improve their physical health and well-being. The Photovoice study aligned with the class’ objective.

The 20 students enrolled in the fall 2012 semester of HPE were provided the opportunity to participate in the study. These students received an informational letter to share with their parents, as well as consent forms. Both the parental consent form and student assent form provided consent to audiotape discussions and for students’ pictures to be used in the researcher’s dissertation and future publications. Thirteen students returned signed parental consent and student assent forms and were included in the study. Students who did not receive parental consent engaged in the regularly scheduled physical activity that took place concurrently with the study activities. Each participant received gift certificates worth $20 (e.g., movie tickets and Jamba Juice gift cards) for his/her participation in the project.

Measures

A demographic survey of 11 questions was used to gather data to describe the sample. The survey asked for the student’s grade, sex, zip code and information regarding the parents’/caregivers’ education levels (ranging from high school to graduate level).

The picture-taking portion of the research was guided by four questions: 1) What in your school and neighborhood environments support (i.e. increases opportunity for) you to be physically active?, 2) What in your school and neighborhood environments hinders (i.e. creates barriers for) you to be physically active, 3) What in your school and neighborhood environments supports you to eat healthy?, and 4) What in your school and neighborhood environments hinders you to eat healthy? Following picture taking and storyboard creation, students engaged in a focus group session that was guided by another set of four questions focusing on the school and neighborhood environments: 1) What supports are in your environments to engage in physical activity and healthy eating? 2) What barriers are in your environments that hinder you from engaging in physical activity and healthy eating? 3) What do you feel you can do to change your environments to reduce the barriers and increase the supports to engage in healthy behaviors?, and 4) How does being Native Hawaiian relate to any of these barriers or supports?

Procedures

Photovoice. The Photovoice study took place over six sessions, 80 minutes per session, during the assigned class period (see Table 4.1 for description of each session). The project included the main aspects of Photovoice--photographs, storyboards, and group discussions. As the study began during the middle of the fall semester, the students already had gotten to know one another before the start of the project.

Session 1: Orientation Meeting. The five objectives for the session were for participants to learn: 1) about the researcher; 2) how the current study related to them and the class; 3) the methodology of Photovoice; 4) how previous research has used Photovoice with adolescents; and 5) how to use the cameras in an ethical manner.

Each student received a project timeline along with photography guidelines, a 27-exposure disposable camera, a notebook, and a pen. The notebook was provided to help the students keep track of the pictures taken, as well to write reflections to why the picture was taken. The schedule allowed the students 10 days to complete the picture taking. Each student was asked to take a minimum of 16

photographs, with at least four for each of the four guiding question. The researcher picked up the returned cameras and had the photos developed at a local drugstore.

Table 4.1 Outline of the six Photovoice sessions

Session	Activities	Outcome
1: Orientation meeting	• Collected parental consent forms/student assent forms • Discussed concept of Photovoice • Introduced guiding questions for photo-taking. • Distributed cameras, notebooks, timelines and guidelines for photos • Provided instructions regarding camera use • Answered student questions	• Increased understanding among students of guiding questions for photo-taking • Increased knowledge and skills related to using the camera and tracking photos taken based on the guiding questions
2: Review of photographs	• Provided developed photographs to students • Instructed students in selecting photos for their storyboard and using notes they captured in their notebooks • Paired students together if one did not have photos of his/her own	• Selected at least two photographs for each guiding question
3: Creation of captions and storyboards	• Instructed students in the SHOWED method for writing captions for each photo • Instructed students in the creation of storyboard for their photos and captions	• Created captions for selected photos
4: Continuation of storyboards	• Encouraged students to complete their storyboards.	• Completed storyboards and captions for photos
5: Focus group discussion	• Led a focus group discussion about students' findings and suggestions for change	• Completed focus group
6: Presentation of storyboards	• Facilitated presentation of storyboards by students	• Information presented

Session 2: Review of photographs. The students were provided their set of photographs to begin selection of their pictures for display. The students reviewed their photographs, grouped them based upon the four guiding questions, and selected a minimum of two photographs per guiding question. They were asked to choose the photographs that they felt best illustrated conditions in their environments for each question. These photographs were used in the creation of the individual story boards during session three.

Session 3: Creation of narratives and storyboards. After selecting photographs, students created captions. The SHOWED method was used to prompt students to answer five questions as they developed captions: 1) What do you SEE here? 2) What is really HAPPENING here? 3) How does this related to OUR LIVES? 4) WHY does this situation, concern, or strength exist? And 5) What can we DO to improve the situation, or to enhance these strengths? The SHOWED method was developed by Wallerstein & Bernstein (1988) and adapted for use in Photovoice by Wang & Burris, (1997). The students then used 4 to 8 photos and captions to create a storyboard that answered the research questions.

Session 4: Continuation of building storyboards (shortened class session). Students completed their storyboards and presented them to each other.

Session 5. Focus group discussion. In the group discussion, which was facilitated by the primary researcher, the students were asked four questions. Although some of the focus group questions were similar to the guiding questions for photography (i.e., what supports and barriers do your environments present?), the group discussion also asked students what they might do to reduce barriers and increase supports in their environment and how being Native Hawaiian relates to any identified barriers or supports. The discussion encouraged students to provide information beyond what they had photographed, giving the story behind the storyboard. This session was tape-recorded with the approval of both the parent and student.

Session 6: Presentation of Story Boards and Findings. Students presented their storyboards to the HPE teacher, the researcher, and other study participants.

Throughout the six sessions, the importance of maintaining confidentiality was stressed due to the potentially sensitive nature of some of the comments made during the project, especially during the focus group discussion and the presentations of the storyboards.

Data analyses

Demographic data were analyzed using Excel for frequencies. The focus group discussion and the storyboard presentation sessions were transcribed and analyzed separately from each other. Transcripts

were analyzed using content analysis and grounded theory. In grounded theory, themes emerge during the content analysis instead of being selected a priori to the analysis (Chamaz, 2006). Emerging themes were grouped under the four guiding questions.

Results

Thirteen students were enrolled in the study with signed parental consent and student assent forms. Of these, 12 participated in the focus group discussion and presentation of their storyboards, as one student was sick during the fifth and sixth sessions. Of the 12 remaining students, half were boys. Eight of the students were day students, and four were boarders. Of those who were day students, seven live with extended family, including grandparents and/or aunts and uncles. Nine of the students were upperclassmen (11^{th} or 12^{th} graders).

Of the 12 participants who completed their projects, three students did not submit cameras to be developed. Because these three wanted to continue in the study, each was paired with another student who lived in the same region of the state and had completed the assignment. Pairs were comprised this way so they could share their perspectives of the barriers and supports.

A total of 77 photographs and captions were presented on nine storyboards with an average of eight photographs per storyboard. The storyboards were presented to the researcher, the instructor of the class, and the other study participants. Analyzing the storyboards, captions, and transcribed notes from the storyboard presentations, seven themes (represented through 38 pictures and captions) emerged for environment barriers, while six themes (represented through 39 pictures and captions) emerged for environment supports.

Barriers

Table 4.2 lists the seven themes representing environmental challenge to healthy eating and physical activity. The total number of photographs and story boards associated with each theme are provided, along with an illustrative caption. Photos that are representative of the themes are shown in the text following the table.

Table 4.2 Study Themes from Storyboards - Barriers

Study Themes	Number of Storyboards	Number of Pictures	Example Caption
1. Sucked into electronics	7	9	"I'm so comfortable watching TV…why would I leave?"
2. Junk food, snack food, all this food at home	6	8	"Rice is a big challenge because I over eat it. Every piece of meat or chicken I need to have a little bit of rice with. Since my family only buys white rice, it make a lot unhealthier for me because it is processed and doesn't contain any nutrients"
3. Rather be sleeping	4	5	"My bed is a challenge because it's so comfortable to sleep on and I rather sleep than exercise"
4. Cheap and convenient food in fast-food restaurants	3	4	"Very little money for healthy food choices at home. It's easier to buy cheap fast food than to purchase a whole bunch of healthy foods that will more than likely be wiped out in a couple of days (we have plenty of people in the house). So we end up resorting back to the fast food choices until next payday."
5. Too busy to exercise	3	4	"So much homework, I'm overwhelmed how can I finish all this and workout?"
6. Being lazy	2	2	"Out of laziness a lot of people nowadays would rather drive to their destinations, even if the distance is short enough to walk."
7. Don't go past the garage, it's not safe	1	2	"I chose this picture because it shows that it is a challenge because my parents don't like me going out past our garage by myself."

Theme 1: Sucked into Electronics

Seven of the nine storyboards included photos of electronic equipment or the internet to represent a challenge in their environment. Students found comfort and relaxation with electronics, especially television. They felt that the television drew them in and therefore left no time to go outside and exercise. The same problem arose with the use of the internet and the social networking sites. As found in another theme, "too busy to exercise," the students chose electronics over engaging in healthy behaviors of exercising.

Figure 4.1 Participant photo describing Theme 1: Sucked into Electronics
Caption: "I'm so comfortable watching TV…Why would I leave?"

Theme 2: Junk Food, Snack Food, All this Food at Home

As noted in the literature, students perceived their dependence on parents/caregivers for the food purchased for the household. Six storyboards showed eight pictures of food found in the students' homes.

During a presentation, one of the students said she had tried to convince her family to change their diet and incorporate healthy foods. In response to these requests, she was told that these foods were too expensive. She concluded, "all of the junk food that I have in my house is a great obstacle, because on the days when my grandma is too lazy to cook, I have to eat those snack foods." Food portion sizes were also mentioned during the storyboard presentations, "Living in Hawai'i is a big challenge because of the food. Rice is one of the main things we eat with our dinner. The portion sizes aren't very small either."

Figure 4.2 Participant photo describing Theme 2: Junk Food, Snack Food all this Food – at Home
Caption: "Food, food, food we have so much food"

Theme 3: Rather be sleeping

Six pictures from five storyboards had photographs of beds or couches. Captions associated with these pictures mentioned that being physically active was not relaxing or comfortable. Instead, students said they felt best, most relaxed, and safest when sleeping or lounging. As one boarder commented, "In our [high school] dorms, we have the world's softest couches, and with the world's softest couches, it is hard to ignore your aching feet and tired shoulders." Another student comments that "My bed is a challenge because it's so comfortable to sleep on, and I rather sleep than exercise." Similarly to the use of television and electronics, students felt drawn to their beds and said they would rather be sleeping or relaxing than physically active and sweating.

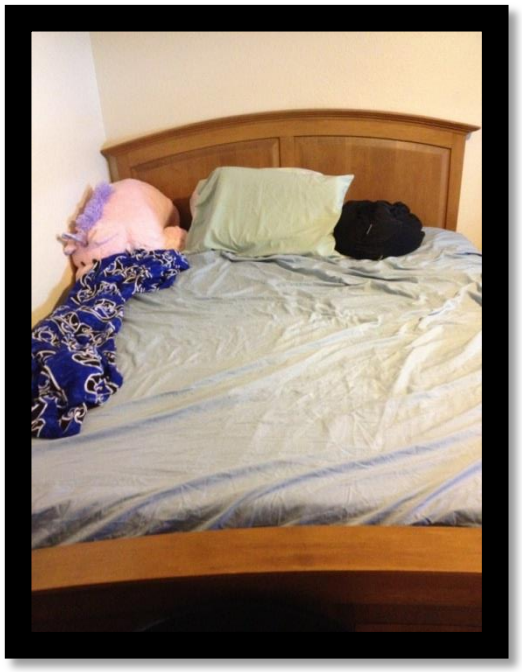


Figure 4.3 Participant photo describing Theme 5: Rather be Sleeping

Caption: "So comfy, so warm, a safe place to lie – why would I leave my safe comfy bed for anything else?"

Theme 4: Cheap and Convenient Food in Fast-Food Restaurants

Photos of fast-food eating places were included on three of nine story boards. During the presentation of the story boards, three students mentioned that their families consumed these foods because they were convenient and low cost. One of the students mentioned "It's a barrier because all the healthy snacks are way more expensive than cheap foods. For example, McDonalds, like you wanna buy a salad, that's $6, and [then] the dollar menu [with burgers $1 each], it's so much more cheap."

Figure 4.4 Participant photo describing Theme 4: Cheap and Convenient Food in Fast-Food Restaurants

Caption: "Temptation…McDonalds is always there right around the corner…cheap good tasting food"

Theme 5: Too Busy to Exercise…

Four students selected to take pictures that were related to the idea of time management, and how homework was a barrier due to the amount of time that it took daily. One student noted "Time management is an issue. Studying and art projects take up most of my time, so I end up pushing my daily hour of exercise aside." Another student focused on the time spent traveling to and from school, therefore not allowing for time to exercise at home. This student also mentioned that he already utilizes one of his free periods to exercise on campus, but is not able to give up his second free period, as he uses that begin his homework.

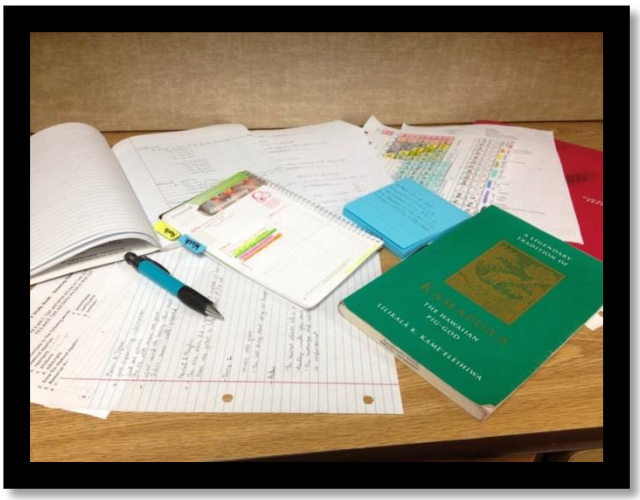


Figure 4.5 Participant photo describing Theme 5: Too busy to exercise

Caption: "So much homework, I'm overwhelmed – how can I finish all this and work out?"

Theme 6: Being Lazy

The concept of being lazy arose through two pictures. The photos suggested that individuals have a choice to be lazy or to engage in healthy behaviors. A photograph of a car, for example, was taken to illustrate that people can choose to walk, but even for short distances people choose to drive.

Figure 4.6 Photo participant describing Theme 6: Being Lazy

Caption: "Out of laziness a lot of people nowadays would rather drive to their destinations, even if the distance is short enough to walk."

Theme 7: Don't go past the garage

Three students mentioned during their storyboard presentations that their parents did not feel that the neighborhood environments were safe. Safety for the students was defined in various ways. One student mentioned "it is a challenge because my parents don't like me going out past our garage by myself." The same student mentioned that his parents were concerned because the environment in which he lives has a "variety of people there, so my parents don't want me going out." These two students had to stay near their house or inside their house at all times. Another student discussed how her father made her wear a reflective jacket when she walked outside, because her neighborhood had no sidewalks, and he wanted to be sure that cars could see her.

Figure 4.7 Participant photo describing Theme 7: Don't go past the garage
Caption: "I chose this picture because it shows that it is a challenge because my parents don't like me going out past our garage by myself."

Supports

Table 4.3 lists the six themes representing environmental supports for healthy eating and physical activity. The total number of photographs and story boards associated with each theme are provided, along with an illustrative caption. Photos that are representative of the themes are shown in the text following the table.

Table 4.3 Study Themes from Storyboards – Supports

Study Themes	Number of Storyboards	Number of Pictures	Example Caption
8. Stairs, gyms, activities (resources for boarders)	7	18	"Ku'i club is something that I participate actively in, and I enjoy pounding kalo and eating a delicious and healthy treat after putting in the hard work. Ku'i not only makes you stronger, it connects you more with your culture."
9. My home	3	5	"Instead of having a one story house, I have a two. This causes me to go up and down rather than just staying on one floor."
10. Long roads to walk	3	6	"A safe place where I'm free to roam and workout" "[This is] a place I like to run, and it's right next to my house."
11. Fitting into a smaller size	2	2	"My goal board consists of all the clothes that I hope to fit in some time soon. It is a real encouragement to me because each morning when I wake up, I know what needs to be done in order to achieve the goals."
12. Surprise, healthy and good tasting	2	5	"These are pictures of a package of mila seeds and bananas. These enable me to live a healthy lifestyle because its great sources of healthy food."
13. Working out with electronics	1	1	"The Wii has many games that allow me to get active, such as Just Dance. I have a lot fun, and at the same time I get to lose weight."

Theme 8: Stairs, gyms, and activities

Thirteen photographs were included of school resources and activities that promoted physical activity, including stairs, gyms, and paddling. The layout of the school itself, with many stairs (four students took photographs of stairs) provides a natural workout throughout the day, with a student creating the following caption "[the school] having so many stairs and hills is a great thing, it helps me to get a little more exercise than usual." Four students took pictures of the gym. Day students have the opportunity to use the resources, such as the gym and pool during the week, and boarders are able to use these resources on weekends as well. As one student commented, "I am able to exercise using treadmills, cross trainers, insanity videos, and weight lifting. When I work out, I work out hard." Another commented that the gym "is available for student use throughout the day. I have no excuse for not working out and exercising, because this is an option that's always available for me to use." Five photos represented the resources that are available specifically for boarders. Although the resources may differ for boarders depending on the dormitory they reside in, boarders have access to overall school resources, such as the pool, outside of normal school hours. As one student stated "In my dorm, there is an exercise room which encourages me to work out because it is easily accessible, and all of the machinery is of great quality. Also, the treadmills encourage everyone to work out, even if it's a [just] power walk"

Figure 4.8 Participant photo describing Theme 8: Stairs, Gyms and Activities

Caption: "Kaahumanu Gym is available for student use throughout the day. I have no excuse for not working out and exercising because there is an option that's always available for me to use."

Theme 9: My Home

Five photos from three students indicated that there are resources available within their home that supported their engagement in healthy behaviors. “This picture (of the backyard) relates to our lives because some people have backyards and instead of having an excuse of not having anywhere to play or exercise, we can play in the backyard.” Another student took a photo of the stairs in her house, which helped her to be active at home.

Figure 4.9 Participant photo describing Theme 9 My Home

Caption: “Instead of having a one story house I have a two. This causes me to go up and down the stairs rather than just staying on one floor.”

Theme 10: Long roads to walk

Some of the environments in which the students lived had parks, basketball courts, and sidewalks that provided the students an opportunity to engage in physical activity. Some environments had more fresh food available or had places to eat besides fast-food restaurants. Eight students took pictures of resources found within their neighborhood environments. The majority of these resources included fields or place to run or walk. A day student took a photograph of a park near his house, noting that this was “a safe place where I’m free to roam and work out.” Another day student took a picture of road near her house, and created a caption, “long roads to walk,” indicating that walking this road was a convenient way to exercise. As noted in an earlier theme, the campus environment offered physical activity opportunities for boarders. For example, a boarder created this caption for his photograph of a field on

campus. “Though students view [the] field as an inconvenience that you have to walk around when it’s raining, many don’t see the opportunity available to them to utilize the field for sports.” For boarders, there are additional resources that are provided to the students such as bikes, exercise rooms, basketball courts, and the swimming pool.

Figure 4.10 Participant photo describing Theme 10: Fields/Environment Resources
Caption: “A safe place where I’m free to roam and work out”

Theme 11: I’m going to fit a smaller size

Although this is not directly related to the environment, a few students had reminders within their bedrooms that motivated them towards a healthier lifestyle. Two students had created goal boards, on which they posted clothes in the size that they wanted to wear. Students also discussed the ability to rely on each other for support, including a student who illustrated her storyboard with a picture of her canoe paddle. As she explained, one of her friends encouraged her to join the paddling team; this support that had been external was now internalized. “It’s motivation, because when you want to participate in a sport and you want to actually compete, then you need to put in maximum effort and with everything you got physically, emotionally, and mentally, and you try your best when it comes to fighting for what you want.”

Figure 4.11 Participant photo describing Theme 11 I'm going to fit a smaller size
Caption: "My goal board consists of all the clothes that I hope to fit in sometime soon. It is a real encouragement to me because each morning when I wake up, I know what needs to be done in order to achieve the goals."

Theme 12: Surprise…healthy and good tasting

Three photographs showed healthy food options within the students' environments. Examples include Hawaiian food, Mila seeds, and bananas. One student was optimistic in stating "In almost every food store there is at least one healthy item that you can buy to eat, at least an item way healthier than all of the other options. Just give it a chance because you might like it." Another student shared the sentiments, "The healthier choices for food might not look as appetizing, but if given a chance they may surprise you."

Figure 4.12 Participant photo describing-Theme 12: Surprise…healthy and good tasting
Caption: "Many people think that Hawaiian food isn't healthy for you when it is actually a lot healthier than the majority of the other foods we eat today. It's all about portion size. You just have to find the right balance.

Theme 13: Working out with electronics

One student took a photograph of her Wii at home, and mentioned that this electronic was a support in her household. This is in contrast to the students who chose to take photos of electronics as barriers to engaging in physical activity.

Figure 4.13 Participant Photo Describing Theme 13: Working out with Electronics
Caption: "The Wii has many games that allow me to get active, such as Just Dance. I have a lot fun, and at the same time I get to lose weight."

Focus group discussion

In addition to the students' presentation of their story boards, the students also participated in a focus group discussion around four questions. The questions explored more in depth how the students felt regarding the supports and barriers in their environment, what they felt they could do to make changes in the environment, and if being Native Hawaiian contributed to their feelings. The discussion allowed students to identify supports and barriers that may not have been brought up during the photograph phase, especially related to people, as students were not allowed to take pictures of people for their storyboards.

1. **What are the supports to engage in the healthy behaviors of physical activity and healthy eating?**

During the group discussion, the theme of parental/family support arose. Students discussed their parents engaging in physical activity with them, walking with them, or providing them the resources needed if not readily available. One student mentioned "They [parents] encourage me to go and exercise, and they'll always pick me up and stuff." Other students mentioned that their family works out with them

or tries to incorporate healthy meals or purchasing healthy foods for them, such as brown rice. One self-motivated student had her parents sign a contract with her. The goal of the contract was for the parents to encourage her to lose weight and for the parents to lose weight themselves. Other students gave examples of how their neighborhood was supportive of healthy eating. For example, one student was happy to live in Kailua, which had Whole Foods and Down to Earth stores.

2. What are the barriers to engage in the healthy behaviors of physical activity and healthy eating?

One barrier that was alluded to during the picture taking stage of the study was high cost of healthy eating. This theme was expanded upon during the focus group discussion. With regards to engaging in healthy eating, one of the students summarized the challenge well "McDonald's is like a dollar. And a sandwich is a dollar. McChicken, one dollar. Salad, five dollars. I should really feed my family with a salad, when five McChickens will feed my family?" In other words, if the family only can spend five dollars for the meal, the family cannot be satisfied with a single salad to split among them. Another student stated "Well the prices, usually, for healthy things are way more expensive, and my parents may not want to go out of their way and spend a bunch of money on stuff that I might not like because I have not tried them so…Yeah like I said oh, I want to try this to be on the healthier side and they'll be like, oh no because we can't afford to buy all of this. So that's why we always go out somewhere to eat…" Another student said that where he lives is the biggest barrier due to the distance it is from school. Between the time spent commuting and the time spent on homework, he did not have time to exercise outside of the time spent at the gym at school. Other students talked about an abundance of fast-food restaurants in their neighborhoods, especially students from the Waianae Coast and Waimanalo, both neighborhoods with large Hawaiian populations.

3. What do you feel you can do to change your environments to reduce the barriers and increase the supports?

Students said that the way for them to change their environments was to begin by changing their own behaviors. Changing their behaviors meant to stop being sedentary, getting rid of junk food, and

being better at managing their time. The students also felt that they could improve their environments with a range of ideas, from persuading family members to change behaviors, going to other schools such as public schools to inform them of ways to be healthier, and working to increase the number of farmer's markets in the environment. A student commented "Persuade your family members. Ask your mom, or your parents, or whoever cooks dinner at your house, ask them to make a healthy dinner rather than a convenient dinner…think about what you're feeding everyone, so that way it would be good for everyone." However, another student noted that it can be difficult to persuade family members, especially kupuna (elders), to change behaviors. Two students said that when they attempted to eat smaller portions, they would get feedback from their family members that they were being ungrateful for the food provided them.

4. Does being Native Hawaiian relate to any of these barriers or supports?

Overall, the students did not feel that being Native Hawaiian related to the barriers or supports that they faced. Regarding food, the students discussed the abundance of food, food always being available at family gatherings, and that this culture of food was not a "Hawaiian" thing but instead a local thing. At the same time, there was the discussion contrasting how our ancestors (Native Hawaiians of long ago) lived to how Native Hawaiians live today. Some of the differences mentioned included food preparation, for example, "They pretty much made their own food. They didn't depend on imports from other places for foods. Native Hawaiians did everything themselves." One student discussed joining the Kuʻi club (a group that pounds kalo into paʻiai) and how her involvement in the club makes her feel closer to her ancestors and want to eat more healthily.

Discussion

The purpose of this study was to answer the research question "How do obese Native Hawaiian adolescents perceive supports and barriers to engage in healthy eating and physical activity in their home and school communities?" By examining the results from the student captions and photographs, along with the focus group discussions, there were four general findings. First, across students' environments,

the majority of the students found similar barriers to engaging in healthy behaviors such as high cost and low availability of healthy food, parent's perception of the safety of the environment, and comforts such as a bed or electronics where the students would rather be spending their time.

Second, the findings confirm that some neighborhood environments have a greater number of supports than others. For example, in the focus group discussion, students contrasted the food environments of Kailua (which has Whole Foods and Down to Earth) with the Waianae Coast and Waimanalo (which have many fast food places and fewer physical activity resources). As expected by findings in the literature, the neighborhood with more options for healthy living (Kailua) has a higher SES that the neighborhoods with fewer options (Waiʻanae and Waimānalo). SES is related to food security, and research has found that food insecurity influences people to choose inexpensive, unhealthy, calorie-dense foods and beverages (Dinour, Bergen, & Yeh, 2007).

The third finding is that school has a major role in supporting physical activity and healthy eating. The students spend the majority of their time at school, and boarders spend almost all their time on campus. Thus, it is not surprising that students took pictures of the school environment. There were common pictures among students such as the stairs, gym, and the fields that were primarily seen as supports. It was when students left the campus that they experienced greater discrepancies in supports, with some home and neighborhood environments having greater supports than others.

Finally, although all students were Native Hawaiian, they did not attribute their supports or barriers to being Native Hawaiian. Instead, students felt it was Hawaiʻi's local culture that surrounded them with food, which is a major component of all gatherings. Additionally, parents and caregivers play an integral role in their adolescents' engagement in healthy behaviors, from foods they provide at home and the financial resources they have available to purchase healthy foods, to providing emotional support, and encouraging the adolescent to participate in healthy behaviors (Berge et al. 2010; Boutelle, 2007; Heitzler, 2010). With that said, there was the aspect of culture that influences behavior as well and that is the respect of the kupuna (elders). Although the students may like to and have tried to talk to their parents

or grandparents about healthy behaviors, there is the need to respect them as well. So if parents and grandparents encourage them to eat or stay home, they must oblige them.

Overall, and similarly to previous Photovoice studies, this methodology was successful in engaging vulnerable adolescents. Throughout the study, the students were encouraged to share their thoughts. During the storyboard presentations, the students included information about what they learned from this study, and all of them mentioned positive ways they could personally change and set better goals for themselves. Also, during the time that the researcher spent with the students, relationships were formed. Trust was built between the researcher and students, as evidenced by the level of sharing that occurred. However, students were more expressive in presenting their storyboards than in the group discussion. A reason for this could be that the storyboard activity provided the students an opportunity to select the photos that they wanted to share and time to create captions. Also, the storyboard presentation environment was perceived as safe, allowing even the shyest individual to present and be heard. In contrast, the focus group did not allow much time to think about responses, and although the primary researcher asked everyone to share, it was harder for some students than others. Overall, however, the method used for this study allowed for different types of learners to share their thoughts and be active participants.

Limitations

There are four main limitations of this study. First, the study took place over 6 weeks and included only one round of photographs. There have been previous suggestions that Photovoice studies with adolescents be 4-6 months in length (Catalani & Minkler, 2010). The additional time would allow the adolescents greater opportunity to research their environments as well as to become comfortable using the camera (Strack, Magill, & McDonagh, 2004). Yet, a benefit of this targeted shorter project was that the study fit within the HPE curriculum and provided an activity appropriate for the HPE class, which has a goal of helping overweight students think more about how they can adopt healthier eating and physical activity habits. In fact, the Photovoice activity built upon information and skills imparted through other parts of the HPE curriculum.

Another limitation was the timing of the start of the study, which did not allow boarders to go home and take pictures of the environments they grew up in. Instead, the boarders took pictures of their dormitories and surrounding areas of the school. However, these students live on campus 9 months of the school year, so for them the school environment would present the major source of barriers and supports to engage in healthy behaviors. Also, of the six sessions, the fourth session was the shortest due to a change in the school schedule. This affected the activities that could take place during that time period.

A goal of Photovoice is for political engagement and social action (Wang & Burris, 1997). However, it was not possible to invite local politicians to our storyboard presentation session due to the project schedule and school calendar. Administrators of the school were interested in attending, but due to the last session being the week prior to finals, they were unable to attend. At the same time, a number of these students were nervous in presenting the information outside of the classroom, expressing that they were most comfortable presenting to their peers, their teacher, and the researcher. As noted in the literature, obese adolescents may feel self-conscious about their weight or may fear reaction of peers and others (Farhat, Iannotti, & Simon-Morton, 2010; Must & Tybor, 2006).

The last limitation is that that the findings were from overweight Native Hawaiian adolescents at one school only. Also the majority of the participants came from two main parts of the island of O‘ahu. Future research may want to include a greater diversity of students.

Implications

Overall, the findings of this study will help to answer the question: “How do obese adolescents perceive their environments and the ability to engage in healthy behaviors?” Having the students participate actively in the study by taking photographs helped them become more aware of their environments and more cognizant of the relationship between environment and engagement in healthy behaviors. The use of photography and self-captioning allowed different perspectives of potentially the same photograph to be shared with the group. The diversity in perceptions encouraged discussion during the focus group. They acknowledged that the school environment offered many supports to healthy eating and physical activity. Also in the focus groups, students discussed the continued importance of

interpersonal relationship in their food and activity choices, especially with parents/caregivers. What would be the implications for this? What recommendations would you give for interventions?

Findings from this study will increase the scientific literature on Native Hawaiian adolescents' health behaviors. This study is important because it examines indigenous adolescents' perspectives, as well as examines the problem of obesity, which is prevalent among Native Hawaiians. The results could lead to greater insight as to the types of programs and interventions that would be beneficial to this group of adolescents. Such as? What recommendations would you give based on the findings?

The school, especially HPE teacher, appreciated the study as a way to engage the students and promote behavior change. To build upon the results and lessons learned from this study, the school could implement this type of participant-based research within the regular PE or health education class. Doing so could provide an opportunity to learn if there are different perceptions across students with different weight status.

Additionally, to greater influence these environments, further research needs to focus on policies that can be implemented at the school environment and those at the neighborhood environment to improve adolescents' opportunities for physical activity and healthy eating. This is especially important for those communities that currently have limited resources that support the engagement of these healthy behaviors.

Chapter 5

Application of the Socio-Ecological Model

The Socio-Ecological Model (SEM) of Health Behavior is based on the premise that health-related behaviors are determined by multiple levels of intrapersonal, interpersonal, organizational, community and public policy factors (McElroy, Bibeau, Steckler & Glanz, 1998). This three-study dissertation aimed to utilize the SEM to explore overweight and obesity in adolescents by focusing on several levels of the model —intrapersonal, organization, and community. Previous research has utilized the SEM to further our understanding of obesity and its control. However, none has focused on an indigenous population, specifically Native Hawaiian adolescents.

Key Findings

Overall the studies of this dissertation resulted in several key findings. The first finding confirmed that there were differences by ethnic group in prevalence of adolescent overweight and obesity and engagement in risk-protective behaviors. As national research has found, lower-SES minority groups such as African Americans and Hispanics, have a higher prevalence of obesity compared to non-Hispanic Whites. These dissertation studies confirmed that Native Hawaiians and Other Pacific Islanders had the highest prevalence of combined overweight and obese adolescents, even after controlling for behavioral variables.

The second finding is that males had a greater obese-to-healthy weight ratio compared to females, as well as higher mean BMI z-score. This finding held in all analyses, even though males had a greater tendency to engage in physical activity and females were more likely to consume healthy foods.

The third finding is that there are differences in obesity between Native Hawaiian adolescents in public and private school, with a higher prevalence of overweight and obese Native Hawaiian students in public schools. The private school had a policy of requiring PE in all four years of high school, whereas the public schools only require a single year of PE for high school students. This finding suggests that school policy can influence adolescent obesity.

The fourth finding is that students who engaged in physical activity at least 5 days a week, regardless of school type, had a greater healthy weight-to-obese ratio. This confirms the importance of physical activity in weight control. It also suggests that interventions that aim to increase physical activity should be tested with Native Hawaiian youth.

The fifth finding is that limitations of resources (financial, community, or school) contribute to an increased weight status. Although, limited resources in the community (neighborhood) and in schools present barriers to healthy lifestyles, limited family financial resources may be the most critical for children and adolescents. Financial resources of the family influence where the family lives, the school the children attend, and the foods that are available in the household. Native Hawaiians as a population experience poverty at a higher rate than the state average, and neighborhoods with many low SES residents tend to have fewer resources to support healthy living (Lee, Harris & Gordon-Larsen, 2009). Native Hawaiians experience relatively high levels both obesity and poverty. Families with limited resources tend to send their children to public schools and, depending on the public school and the school's community, the resources that are available may also limited. Moreover, with a low SES, there is a greater likelihood that there are limited household budgets and that both parents work. For this reason, parents and caregivers may be less likely to engage in physical activity with their adolescents or have the ability to choose healthier foods over energy-dense foods. As confirmed in Study 3, busy parents tend to take their families to eat at McDonalds and buy food off of the value menu, because they are then able to spread their money farther.

Directions for Future Research

The three-study dissertation added to the literature on adolescent obesity, and the literature focusing on Native Hawaiian adolescents. These studies were able to build upon each other, by first focusing on the general population of public school students, then comparing Native Hawaiian students in public and private school, and then confirming that obese Native Hawaiian adolescents perceive barriers in their environments to healthy living.

To build upon the findings from this dissertation, there needs to be further research that examines the interpersonal and policy layers of the Socio-Ecological Model and how the layers interact with the other layers. It would be important to examine how the family and school environments for adolescents in the state affect weight status. The information collected as part of Study 2 that determined the difference between school types is a start. Further information could be gained by adding measures of family and neighborhood context, especially parental education, to the HYRBS. Other survey tools and qualitative data collection protocols could be developed to ascertain information that is not currently collected. For private schools to engage in this research, a similar survey to the survey administered during Study 2 could be implemented. Both students and the parents could take the surveys to understand their engagement in behaviors and perceptions, and the student could be tracked during high school. Understanding the family unit and the role it plays in the supporting or inhibiting of adolescents' engagement in healthy behaviors can help guide the tailoring of obesity prevention efforts to different populations.

Besides understanding the context of family, understanding the peers of an adolescent can provide reasons why students choose to engage in behaviors. Research has found that the relative influence of parents and peers changes through time for adolescents, with peers having a greater influence in later adolescence. The results of this future research could lead to the understanding of how the influence of the interpersonal level permeates through the other levels.

Finally, additional research should examine the culture identity of an adolescent to understand how their identity influences their perceptions of weight and the appropriate engagement in behaviors. Objective data could also be collected to determine if there was a change in weight status by having height and weight measured versus self-reported.

Directions for Future Policy

The finding that limited resources present barriers to healthy behaviors suggests a need for policy interventions to help reduce the prevalence of adolescent obesity. At the school level, policies should

focus on increasing the time that students spend engaged in physical activity and PE classes, along with maintaining appropriate nutrition levels in food served and restricting access to energy-dense foods. All schools should have gyms and other facilities that promote physical activity, and these should be accessible to students before and/or after school. With the implementation of the Wellness Guidelines, schools should be held accountable on all standards related to both physical activity and nutrition. Although the focus at schools has currently been test scores and more academic classes, there is a link between a positive health status and educational attainment.

At the community level, policies should focus on increasing the accessibility to healthy nutrition, physical activity spaces, and increasing the safety of neighborhoods. As found within previous research and Study 3 of this dissertation, rural areas and those that have a lower SES tend to have less accessibility to healthy foods. There could be an increase in farmer markets and more options of places to buy fresh food. With regards to physical activity and safety, these two tend to go together, as parents who do not feel their neighborhood is safe will not allow their adolescent to leave the house. Ways in which policies can help are to build sidewalks and parks, improve lighting, and make parks or public or schools gyms accessible to families.

Conclusion

The three part dissertation examined different factors contributing to adolescent overweight and obesity. To address a complex health outcome of this nature, a multilevel approach to intervention is needed. The Socio-Ecological model lends itself to be the model of choice for complex interventions, as it illustrates the levels of influence. The results of this dissertation have confirmed that additional research is needed to build upon these findings and to gain greater insight to the context of adolescent obesity, especially in Hawai‘i. For programs and policies to be successful, there is a need for collaboration between politicians, community organizations, and individuals from within the community. Without the support of the stakeholders, improvement may not be realized or sustained. Children are our future, and change can occur, when people come together for not only themselves, but for the future.

References

Adams, J. (2007). Trends in physical activity and inactivity amongst US 14–18 year olds by gender, school grade and race, 1993–2003: evidence from the youth risk behavior survey. *BMC Public Health, 6*:57

Aluli, N.E. (1991). Prevalence of obesity in a Native Hawaiian population. *American Journal of Clinical Nutrition, 53*: 1556S-1560S.

American Community Survey (2010). Hawai'i School Enrollment. http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_1YR_S1401&prodType=table Retrieved August 3, 2012.

Atlantis, E., Barnes, E.H., & Singh, M.A.F. (2006). Efficacy of exercise for treating overweight in children and adolescents: a systematic review. *International Journal of Obesity, 30*: 1027-1040.

Bandura, A. (2006). Adolescent development from an agentic perspective. In F. Pajares & T. Urdan (Eds.). *Self-efficacy beliefs of adolescents,* (vol. 5., pp. 1-43). Greenwich, CT: Information Age Publishing.

Bauer, K.W., Friend, S., Graham, D.J., & Neumark-Sztainer, D. (2011). Beyond screen time: Assessing recreational sedentary behavior among adolescent girls. *Journal of Obesity, 2012.* doi:10.1155/2012/183194.

Beets, M.W., Cardinal, B.J., & Alderman, B.L. (2010). Parental societal support and the physical activity-related behaviors of youth: A review. *Health Education Behavior, 37,* 621-644. doi:10.1177/1090198110363884.

Belanger, M., Gray-Donald, K., O'Loughlin, J., Paradis, G., & Hanley. J. (2009). Why adolescents drop the ball: sustainability of physical activity in youth. *American Journal of Preventive Medicine, 37*(1): 41-49.

Berge, J.M., Wall, M., Loth, K., & Neumark-Sztainer, D. (2010). Parenting style as a predictor of adolescent weight and weight-related behaviors. *Journal of Adolescent Health, 46,* 331-338.

Boutelle, K.N, Birkeland, R.W., Hanna, P.J., Story, M., & Neumark-Sztainer, D. (2007). Associations between maternal concerns for healthful eating and maternal eating behaviors, home food availability and adolescent eating behaviors. *Journal of Nutrition Education and Behavior, 39*(5), 248-256.

Brenner, N.D., Billy, J.O., & Grady, W.R. (2003). Assessment of factors affecting the validity of self-reported health-risk behavior among adolescents: evidence from scientific literature. *Journal of Adolescent Health, 33*(6): 436-457.

Broyles, S., Katzmarzyk, P.T., Srinivasan, S.R., Chen, W., Bouchard, C., Freedman, D.S., & Berenson, G.S. (2010). The pediatric obesity epidemic continues unabated in Bogalusa, Louisiana. *Pediatrics, 125,* 900-905.doi:10.1542/peds.2009-2748

Brown, T. & Summerbell, C. (2009). Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. *Obesity Reviews, 10*: 110-141.

Bushnell, O.A. (1993). *The Gifts and Gems of Civilization.* University of Hawaii Press: Hawaii

Campbell, E. (2009). Dietary choices of urban minority high school students. *Pediatric Nursing, 35*(3): 171-180.

Cali, A.M.G., & Caprio, S. (2008). Obesity in children and adolescents.. *Journal of Clinical Endocrinology Metabolism, 93:*S31-S36.

Campbell, E. (2009). Dietary choices of urban minority high school students. *Pediatric Nursing, 35*(3): 171-180.

Carver, A., Timperio, A., Hesketh, K., & Crawford, D. (2010). Are children less active if parents restrict their physical activity and active transport due to perceived risk? *Social Science & Medicine, 70:* 1799-1805

Catalani, C. & Minkler, M. (2010). Photovoice: A review of the literature in health and public health. *Health Education Behavior, 37:* 424-451.

Census (2010). Retrieved from http://2010.census.gov/2010census/popmap/

Centers for Disease Control and Prevention. CDC Fact Sheet. Selected Health Risk Behaviors and Health Outcomes by Race/Ethnicity— National YRBS: 2009 http://www.cdc.gov/healthyyouth/yrbs/pdf/us_disparityrace_yrbs.pdf. Retrieved May 6, 2012.

Centers for Disease Control and Prevention. (2011) National Health and Nutrition Examination Survey. http://www.cdc.gov/nchs/nhanes/about_nhanes.htm. Retrieved July 20, 2012

Centers for Disease Control and Prevention. (2010). Behavioral Risk Factor Surveillance System Prevalence and Trends Data Overweight and Obesity (BMI) – 2010. http://apps.nccd.cdc.gov/brfss/list.asp?cat=OB&yr=2010&qkey=4409&state=All

Centers for Disease Control and Prevention. (2011) National Health and Nutrition Examination Survey. http://www.cdc.gov/nchs/nhanes/about_nhanes.htm. Retrieved July 20, 2012

Centers for Disease Control and Prevention (2012). YRBS – Obesity Trends. http://www.cdc.gov/healthyyouth/yrbs/pdf/us_obesity_trend_yrbs.pdf. Retrieved October 14, 2012.

Chai, D., Kaluhiokalani, N., Little, J., Hetzler, R., Zhang, S., Mikami, J. & Ho, K. (2003). Childhood overweight problem in a selected school district in Hawai‘i . *American Journal of Human Biology, 15*: 164-177.

Chen, X. & Wang, Y. (2012). Is ideal body image related to obesity and lifestyle behaviors in African-American adolescents. *Child Care Health Development, 38*(2): 219-228.

Colon-Ramos, U., Thompson, F.E., Yaroch, A.L., Moser, R.P., McNeel, T.S., Dodd, K.W., Atienza, A.A…Nebling, L. (2009). Differences in fruit and vegetable intake among Hispanic subgroups in California: Results from the 2005 California health interview survey. *Journal American Dietetic Association, 109*: 1878-1885.

Craig, W., Harel-Fisch, Y., Fogel-Grinvald, H., Dostaler, S., Hetland, J., Simons-Morton, B., Molcho, M., de Mato M.G., Overpeck, M., Due, P., & Pickett, W. (2009). A cross-national profile of bullying

and victimization among adolescents in 40 countries. *International Journal of Public Health, 54*(Supplement 2): 216-224.

Cutler, G.J., Flood, A., Hannan, P., & Neumark-Sztainer, D. (2011). Multiple sociodemographic and socioenvironmental characteristics are correlated with major patterns of dietary intake in adolescents. *Journal of the American Dietetic Association, 111*(2), 230-240.

Daniels, S.R., Arnett, D.K., Eckel, R.H., Gidding, S.S., Hayman, L.L., Kumanyika, S…Williams, C.L. (2005). Overweight in children and adolescents: Pathophysiology, consequences, prevention and treatment. *Circulation, 111*: 1999-2012. doi: 10.1161/01.CIR.0000161369.71722.10

Daniels, S.R., Khoury, p.R., & Morrison, J.A. (1997). The utility of body mass index as a measure of body fatness in children and adolescents: differences by race and sex. *Pediatrics, 99*(6): 804-807.

Deckelbaum, R.J. & Williams, C.L. (2001). Childhood obesity: the health issue. *Obesity Research, 9*(Supplement 4): 239S-243S.

De Goede, I.H., Branje, S.J., Delsing, M.J., & Meeus, W.H. (2009). Linkages over time between adolescents' relationships with parents and friends. *Journal of Youth Adolescence, 38*(10): 1304-1315.

Dietz, W.H. (1998). Health consequences of obesity in youth: childhood predictors of adult disease. *Pediatrics, 101*(3 Pt 2): 518-525.

Ding, D., Sallis, J.F., Kerr, J., Lee, S., & Rosenberg, D.E. (2011). Neighborhood environment and physical activity among youth. *American Journal of Preventative Medicine, 41*(4): 442-455.

Dishman, R.K., Dunn, A.L., Sallis, J.F., Vandenberg, R.J., & Pratt, C.A. (2010). Social-cognitive correlates of physical activity in a multi-ethnic cohort of middle-school girls: two-year prospective study. *Journal of Pediatric Psychology, 35*(2): 188-198.

Drake, K.M., Beach, M.L., Longacre, M.R., MacKenzie, T., Titus, L.J., Rundle, A.G., & Dalton, M.A. (2012).Influence of sports, physical education, and active commuting to school on adolescent weight status. *Pediatrics,130*:e296-e304.

Drew, S.E., Duncan, R.E., & Sawyer, S.M. (2010). Visual storytelling: A beneficial but challenging method for health research with young people. *Qualitative Health Research, 20*: 1677-1688. DOI: 10.1177/1049732310377455

Duncan, S.C., Duncan, T.E., & Strycker, L.A. (2005). Sources and types of social support in youth physical activity. *Healthy Psychology, 24*(1): 3-10.

Dupuy, M., Godeau, E., Vignes, C., & Ahluwalia, N. (2011). Socio-demographic and lifestyle factors with overweight in a representative sample of 11-15 year olds in France: Results from the WHO-Collaborative health Behaviour in school-aged children (HBSC) cross-sectional study. *BMC Public Health, 11*: 442-452.

Durant, N., Harris, S.K., Doyle, S., Person, S., Saelens, B.E., Kerr, J…Sallis, J.F. (2009). Relation of school environment and policy to adolescent physical activity. *Journal of School Health, 79*(4): 153-159.

Dwyer, J.J.M, Allison, K.R., Goldenberg, E.R., Fein, A.J., Yoshida, K.K. & Boutilier, M.A. (2006). Adolescent girls' perceived barriers to participation in physical activity. *Adolescence, 41*(161), 75-89.

Eisenmann, J.C., Bartee, R.T., Smith, D.T., Welk, G.J., & Fu, Q. (2008). Combined influence of physical activity and television viewing on the risk of overweight in US youth. *International Journal of Obesity, 32*(4): 613-618.

Elgar, F.J., Roberts, C., Tudor-Smith, C., & Moore, L. (2005). Validity of self-reported height and weight and predictors of bias in adolescents. *Journal of Adolescent Health, 37*(5): 371-375.

Farhat, T. Iannotti, R.J., & Simons-Mortin, B. (2010). Overweight, Obesity, Youth and Health-Risk Behaviors. *American Journal of Preventive Medicine, 38*(3): 258-267. doi:10.1016/j.amepre.2009.10.038.

Finnerty, T., Reeves, S., Dabinett, J., Jeanes, Y.M., & Vogele, C. (2010).Effects of peer influence on dietary intake and physical activity in schoolchildren. *Public Health Nutrition, 13*(3): 376-383.

Flegal, K.M., & Ogden, C.L. (2011). Childhood obesity: Are we all speaking the same language? *Advances in Nutrition, 2*: 159S:166S.

Flegal, K.M., Ogden, C.L., Yanovski, J.A., Freedman, D.S., Shepherd, J.A., Graubard, B.I., & Borrud, L.G. (2010). High adiposity and high body mass index-for-age in US children and adolesents overall and by race-ethnic group. *American Journal of Clinical Nutrition, 91*(4): 1020-1026.

Foltz, J.L., Cook, S.R., Szilagyi, P.G., Auinger, P., Steward, P.A., Bucher, S. & Baldwin, C.D. (2011). US adolescent nutrition, exercise, and screen time baseline levels prior to national recommendations. *Clinical Pediatrics, 50*(5): 424-433.

Forsyth, A., Oakes, J.M., Lee, B. & Schmitz, K.H. (2009). The built environment, walking, and physical activity: Is the environment more important to some people than others? *Transportation Research Part D, 14*: 42-49.

Fox, C.L. & Farrow, C.V. (2009). Global and physical self-esteem and body dissatisfaction as mediators of the relationship between weight status and being a victim of bullying. *Journal of Adolescence, 32*: 1287-1301.

Frumkin, H. 2006. Introduction: Safe and Healthy School Environments. In *Safe and Healthy School Environments*, editedbyH. Frumkin, R.J. Geller, I.L. Rubin, and J.Nodvin, pp. 3–10. New York: Oxford University Press.

Fuddy, L. (2012). Obesity epidemic must be addressed at societal level. *Honolulu Star-Advertiser*. January 12, 2012 A11. Retrieved January 30, 2012. http://staradvertiser.newpaperdiect.com/epaper/services/OnlinePrintHandleer.ashx?issue=

Glanz, K., Mau, M., Steffen, A., Maskarinec, G., & Arriola, K. J. (2007). Tobacco use among Native Hawaiian middle school students: Its prevalence, correlates and implications. *Ethnicity & Health, 12*(3): 227–244.

Goo, S.S., Wu, W., Chumlea, W.C., & Roche, A.F. (2002). Predicting overweight and obesity in adulthood from body mass index values in childhood and adolescence. *The American Journal of Clinical Nutrition, 76*(3): 653-658.

Goodman, E., Adler, N.E., Daniels, S.R., Morrison, J.A., Slap, G.B., & Dolan, L.M. (2003) Impact of objective and subjective social status on obesity in a biracial cohort of adolescence. *Obesity Research, 11*(8): 1018-1026.

Goodwin, D.K., Knol, L.K., Eddy, J.M., Fitzhugh, E.C., Kendrick, O., & Donohue, R.E. (2006). Sociodemographic correlates of overall quality of dietary intake of US adolescents. *Nutrition Research, 26*: 105-110.

Goran, M.I., Ball, G.D.C., & Cruz, M.L. (2003). Obesity and risk of type 2 diabetes and cardiovascular disease in children and adolescents. *The Journal of Clinical Endocrinology & Metabolism, 88*(4): 1417-1427.

Gordon-Larsen, P., Adair, L.S., & Popkin, B.M. (2003). The relationship of ethnicity, socioeconomic factors, and overweight in U.S. adolescents. *Obesity Research,11*(1): 121-129

Gray, W.N., Kahhann, N.A., & Janicke, D.M. (2009). Peer victimization and pediatric obesity: A review of the literature. *Psychology in the Schools, 46*(8): 720-727.

Griffiths, L.J., Wolke, D., Page, A.S., Harwood, J.P., & the ALSPAC Study Team. (2006). Obesity and bullying: different effects for boys and girls. *Archives of Disease in Childhood, 91*: 121-125. doi:10.1136/adc.2005.072314.

Grow, H.M., Saelens, B.E., Kerr, J., Durant, N.H., Norman, G.J., & Sallis, J.F. (2008). Where are youth active? Roles of proximity, active transport, and built environment. *Medicine & Science in Sports & Exercise, 40*(12): 2071-2079.

Guo, Q., Ma, W., Nie, S., Xu, Y., Xu, H., & Zhang, Y. (2010). Relationships between weight status and bully victimization among school-aged adolescents in Guangdong province of China. *Biomedical and Environmental Sciences, 23:* 108-112.

Hawai‘i Health Data Warehouse (2012) Youth Risk Behavior Survey

Heitzler, C.D., Lytle, L.A., Erickson, D.J., Barr-Anderson, D., Sirar, J.R., & Story, M. (2010). Evaluating a model of physical activity. *American Journal of Health Behavior, 34*(5), 593-606.

Hishinuma, E., Umemoto, K.N., Nguyen, T.G., Chang, J.Y., & Bautista, R.P.M. (2012). Epidemiology of mixed martial arts and youth violence in an ethnical diverse sample. *Violence and Victims,27*(1):43-69.

Hood, M.Y., Moore, L.L., Sundarajan-Ramamurti, A., Singer, M., Cupples, L.A., & Ellison, R.C. (2000).Parental eating attitudes and the development of obesity in children. The Framingham children's study. *International Journal of Obesity, 24,* 1319-1325.

Husaini, A.E., Nicholson, L.M., Shera, D., Stettler, N., & Kinsman, S., (2011). Adolescent obesity as a risk factor for high-level nicotine addiction in young women. *Journal of Adolescent Health, 49*(5): 511-517.

Jaime, P.C. & Lock, K. (2009). Do school based food and nutrition policies improve diet and reduce obesity? *Preventive Medicine, 48*: 45-53.

Janssen, I., Craig, W.M., Boyce, W.F., & Pickett, W. (2004). Associations between overweight and obese and bullying behaviors in school-aged children. *Pediatric, 113* 1187-1193.

Kahn, E.B., Ramsey, L.T., Brownson, R.C., Heath, G.W., Howze, E.H., Powell, K.E., Stone, E.J., Rajab, M.W., & Corso, P. (2002). The effectiveness of interventions to increase physical activity. A systematic review. *The American Journal of Preventive Medicine, 22*(4 Supplement): 73-107.

Kerr, J., Norman, G.J., Sallis, J.F., & Patrick, K. (2008). Exercise aids, neighborhood safety, and physical activity in adolescents and parents. *Medicine & Science in Sports & Exercise, 40*(7): 1244-1248. doi: 10.1249/MSS/0b013e31816b8797.

Kim, B., Lee, C.L., Kim, H.S., Ko, I.S., Park, C.G., & Kim, G.S. (2011). Ecological risk factors of childhood obesity in Korean elementary school students. *Western Journal of Nursing Research, XX*(X): 1-21.

Kumanyika, S.K. (2008). Environmental influences on childhood obesity: Ethnic and cultural influences in context. *Physiology & Behavior, 91*: 61-70.

Lai, M., & Saka, S. (2010). Hawaiian Students Compared with Non-Hawaiian Students on the 2009 Hawai‘i Youth Risk Behavior Surveys. Retrieved [February 15, 2012, Year] from http://www.ksbe.edu/spi/PDFS/Reports/Demography_Well-being/yrbs/.

Larson, N. & Story, M. (2008). The adolescent obesity epidemic: Why, how long and what to do about it. *Adolescent Medicine, 19*: 357.379.

Larson, N.I., Story, M., Perry, C.L., Neumark-Sztainer, D., & Hannan, P.J. (2007). Are diet and physical activity patterns related to cigarette smoking in adolescents? Findings from Project EAT. *Preventing Chronic Disease, 4*(3): Findings from Project EAT. Prev Chronic Dis [serial online] 2007 Jul [*date cited*]. Available from: http://www.cdc.gov/pcd/issues/2007/jul/06_0053.htm. Retrieved May 7, 2012.

Laska, M.N., Borradaile, K.E., Tester, J., Foster, G.D., & Gittelsohn, J. (2010). Healthy food availability in small urban food stores: a comparison of four US cities. *Public Health Nutrition, 13*(7): 1031-1035.

Leatherdale, S.T., Wong, S.L., Manske, S.R., & Colditz, G.A. (2008). Susceptibility to smoking and its association with physical activity, BMI, and weight concerns among youth. *Nicotine & Tobacco Research, 10*(3): 499-505.

Lee, H., Harris, K.M., & Gordon-Larsen, P. (2009). Life course perspectives on the link between poverty and obesity during the transition to young adulthood. *Population Research Policy Review, 28*(4): 505-532.

Lee, S.M. (2005). Physical activity among minority populations: What health practitioners should know-A commentary. *Health Promotion Practice, 6*(4):447-452.

Lorson, B.A., Melgar-Quinonez, H.R., & Taylor, C.A. (2009). Correlates of fruit and vegetable intakes in US children. *Journal of American Dietetic Association, 109*:474-478.

Maher, C. Olds, T.S., Eisenmann, J.C., & Dollman, J. (2012). Screen time is more strongly associated than physical activity with overweight and obesity in 9- to 16-year-old Australians. *Acta Paediatrica, 101*: 1170-1174.

Mascarenhas, L.P.G., Smolarek, A.C., Bozza, R., Boguszewski, M.C..S., Prati, F.S., Stabelini, N.A., Campos, W., Modesto, M.J…Elsangedy, H.M. (2011). Cutoff for body mass index in adolescents: comparison with national and international reference standards. *Journal of Human Growth Development, 21*

Mau, M.K., Wong, K.N., Efird, J., West, M., Saito, E.P., & Maddock, J. (2008). Environmental factors of obesity in communities with native Hawaiians. *Hawai'i Medical Journal, 67,* 233-236.

McElroy, K.R., Bibeau, D., Steckler, A., & Glanz, K. (1998). An ecological perspective on health promotion programs. *Health Education Quarterly, 15*(4): 351-377.

McGuire, M.T., Hannan, P.J., Neumark-Sztainer, D., et al. (2002) Parental correlates of pyscial activity in a racially/ethnically diverse adolescent sample. *Journal of Adolescent Health 30*:253-261.

McMullin, J. (2005). The call to life. *Social Science & Medicine,* 61: 809-820.

Molnar, B.E., Gortmaker, S.L., Bull, F.C., & Buka, S.L. (2004). Unsafe to play? Neighborhood disorder and lack of safety predict reduced physical activity among urban children and adolescents. *American Journal of Health Promotion, 18*(5):378-386.

Mota, J., Ribeiro, J.C., & Santos, M.P. (2009). Obese girls' differences in neighbourhood perceptions, screen time and socioeconomic status according to level of physical activity. *Health Education Research, 24*(1): 98-104.

Must, A. & Tybor D.J (2005). Physical activity and sedentary behavior: a review of longitudinal studies of weight and adiposity in youth. *International Journal of Obesity, 29*: S84-S96.

National Association for Sport and Physical Education. (2012). *The Shape of the Nation Report.*

Necheles, J.W., Chung, E.Q., Hawes-Dawson, J., Ryan, G.W., Williams, L.B., Holmes, H.N., Wells, K.,...Schuster, M.A. (2007). *Program Community Health Partnership, 1*(3): 221-229. doi:10.1353/cpr.2007.0027

Neuhouser, M.L., Thompson, B., Coronado, G.D., & Solomon, C.C. (2004). Higher fat intake and lower fruit and vegetables intakes are associated with greater acculturation among Mexicans living in Washington State. *Journal of American Dietetic Association, 104*: 51-57.

Neumaker-Sztainer, D., Wall, M., Perry, C., & Story, M. (2003). Correlates of fruit and vegetable intake among adolescents. Findings from Project EAT. *Preventive Medicine, 37*(3): 198-208.

Nigg, C., Shor, B., Tanaka, C.Y., & Hayes, D.K. (2011). Adolescent at-risk-weight (overweight and obesity) prevalence in Hawai‘i. *Hawai‘i Medical Journal, 70*:4-10.

Ogden, C.L., Lamb, M.M., Carroll, M.D., & Flegal, K.M. (2010). Obesity and socioeconomic status in children and adolescents: United States, 1988-1994 and 2005-2008. *NCHS Data Brief, 51.* Hyattsville, MD: National Center for Health Statistics.

Ogden, C.L., Carroll, M.D., Kit, B.K., & Flegal, K.M. (2012). Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *JAMA, 307*(5): 483-490. doi: 10.1001/jama.2012.40.

Olds, T.S., Ferrar, K.E., Schranz, N.K., & Maher, C.A. (2011). Obese adolescents are less active than their normal-weight peers, but wherein lies the difference? *Journal of Adolescent Health, 48*(2):189-195.

Oshlansky, S.J., Passaro, D.J., Hershow, R.C., Layden, J., Carnes, B.A., Brody, J., Hayflick, L…Ludwig, D.S. (2005) A potential decline in life expectancy in the United States in the 21st century. *The New England Journal of Medicine, 352*: 1138-1145.

O’Toole, T.P., S. Anderson, C. Miller, and J. Guthrie. 2007. Nutrition Services and Foods and Beverages Available at School: Results from the School Health Policies and Programs Study 2006. *Journal of School Health* 77(8):500–521.

Park, C. B., Braun, K. L., Horiuchi, B. Y., Tottori, C., & Onaka, A. T. (2009). Longevity disparities in multiethnic Hawai‘i: An analysis of 2000 life tables. Public Health Records, 124, 579-584. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2693172/

Patrick, K., Norman, G.J., Calfas, K.J., Sallis, J.F., Zabinski, M.F., Rupp, J. & Cella, J. (2004). Diet, physical activity, and sedentary behaviors as risk factors for overweight in adolescence. *Archives of Pediatric Adolescent Medicine, 158*: 385-390.

Pearson, N. & Biddle, S.J. (2011). Sedentary behavior and dietary intake in children, adolescents, and adults. A systematic review. *American Journal of Preventive Medicine, 41*(2): 178-188.

Peart, T., Mondragon, E.V., Rohm-Young, D., Bronner, Y., & Hossain, M.B. (2011). Weight status in US youth: The role of activity, diet, and sedentary behaviors. *American Journal of Health Behavior, 35*(6): 756-765.

Perna FM, Oh A, Chiriqui JF, Masse LC, Atienza AA. (2012). The Allocation of State Level PE Laws Positively Impact PE Time Allocation in US Public Schools. *American Journal of Public Health, 102*(8): 1595-1599.

Perez, A., Hoelscher, D.M., Springer, A.E., Brown, H.S., Barroso, C.S., Kelder, S.H., & Castrucci, B.C. (2011). Physical activity, watching television, and the risk of obesity in students, Texas, 2004-2004. *Preventing Chronic Disease, 8*(3):A61. http:www.cdc.gov/pcd/issues/2011/may/10_0007.htm.

Plontikoff, R., Bercovitz, K., Rhodes, R.E., Loucaides, C.A., & Karunamuni, N. (2007). Testing a conceptual model related to weight perceptions, physical activity and smoking in adolescents. *Health Education Research, 22*(2): 192-202.

Powell, L.M., Wada, R., Krauss, R.C., & Wang, Y. (2012). Ethnic disparities in adolescent body mass index in the United States: the role of parental socioeconomic status and economic contextual factors. *Social Science Medicine, 75*(3): 469-476.

Prochaska, J.J. Rodgers, M.W., & Sallis, J.F. (2002). Association of parent and peer support with adolescent physical activity. *Research Quarterly for Exercise and Sport, 73*(2): 206-210.

Puhl, R.M., Luedicke, J., & Heuer, C.H. (2011). Weight-based victimization toward overweight adolescents: Observations and reactions of peers. *Journal of School Health, 81*: 696-703.

Rahman, T., Cushing, R.A., & Jackson, R.J. (2011). Contributions of built environment to childhood obesity. *Mount Sinai Journal of Medicine, 78*:49-57. doi:10.1002/msj.20235.

Raitakari, O.T., Juonala, M., Rönnemaa, T., Keltikangas-Järvinen, L., Räsänen, L., Pietikäinen, M.,Viikari, J. SA. (2008). Cohort profile: The cardiovascular risk in young Finns study. *International Journal of Epidemiology, 37*, 1220-1226. doi:10.1093/ije/dym225

Ratcliff, M.B., Jenkins, T.M., Reiter-Purtill, J., Noll, J.G., & Zeller, M.H. (2010). Risk-taking behaviors of adolescents with extreme obesity: Normative or not? *Pediatrics, 127:* 827-834. doi: 10.1542/peds.2010.2742.

Richardson, A.S., Boone-Heinone, J., Popkin, B.M. & Gordon-Larsen, P. (2011). Neighborhood fast food restaurants and fast food consumption: A national survey. *BMC Public Health, 11*: 543-550/

Ries, A.V., Vorhees, C.C., Gittelsohn, J., Roche, K.M., & Astone, N.M. (2008). Adolescents' perceptions of environmental influences on physical activity. *American Journal of Health Behavior, 32*(1): 26-39.

Roark, R.A., Niederhauser, V.P. (2013). Fruit and vegetable intake: issues with definition and measurement. *Public Health Nutrition, 16*(1): 2-7. doi:10.1017/S1368980012000985.

Robert Wood Johnson Foundation. 2008. A Report on State Action to Promote Nutrition, Increase Physical Activity and Prevent Obesity. *Balance* (5, 2007 End of Year Report).

Robinson, S. (2006). Victimization of obese adolescents. *The Journal of School Nursing. 22*(4): 201-20.

Sallis, J.S., & Glanz, K. (2009). Physical activity and food environments: solutions to the obesity epidemic. *Milbank Quarterly, 87*(1): 123-154.

Sallis, J.S, Owen, N., & Fisher, E. (2008). Ecological Models of Health Behavior. *Health Behavior and Health Education: Theory, Research, and Practice, 4th Edition.* Josey-Bass

Sallis, J.S., Prochaska, J.J., & Taylor, W.C. (2000). A review of correlates of physical activity of children and adolescents. *Medicine & Science in Sports & Exercise, 32*(5): 963-975.

Santos, M.P., Page, A.S., Cooper, A.R., Ribeiro, J.C., & Mota, J. (2009). Perceptions of the built environment in relation to physical activity in Portuguese adolescents. *Health & Place, 15*: 548-552.

Salvy, S.J., Jarrin, D., Paluch, R., Irfan, N. & Pilner, P. (2007). Effects of social influence on eating in couples, friends and strangers. *Appetitie, 49*(1): 92-99.

Salvy, S.J., Bowker, J.C., Germeroth, L., & Barkley, J. (2012). Influence of peers and friends on overweight/obese youths' physical activity. *Exercise Sports Science Review, 40*(3): 127-132.

Sherry, B., Jeffereds, M.E., & Grummer-Strawn, L.M., (2007). Accuracy of adolescents self-reprot of height and weight in assessing overweight status: a literature review. *Archives of Pediatric and Adolescent Medicine. 161*(122): 1154-1161.

Singh, G.K., Kogan, M.D., van Dyck, P.C., & Siapush, M. (2008). Racial/ethnic, socioeconomic, and behavioral determinants of childhood and adolescents obesity in the United States: Analyzing independent and joint associations. *Annals of Epidemiology, 18*(9): 682-695.

Spiotta, R.T., & Luma, G.B. (2008). Evaluating obesity and cardiovascular risk factors in children and adolescents. *American Family Physician, 78*(9): 1052-1058.

Stannard, D.E. (1989). Before the Horror: The Population of Hawai'i on the Eve of Western Contact. University of Hawai'i : Honolulu, Hawai'i .

Story, M., Kaphingst, K.M., & S. French. 2006. The Role of Schools in Obesity Prevention. *Future Child* 16(1):109–42.

Story, M., Neumark-Sztainer, D., & French, S. (2002). Individual and environmental influences on adolescent eating behaviors. *Journal of the American Dietetic Association, Supplement 102*(2): S40-S51.

Story, M., Nanney, M.S., & Schwartz, M.B. (2009). Schools and obesity prevention: creating school environments and policies to promote healthy eating and physical activity. *The Milbank Quarterly, 87*(1): 71-100.

Sweeting, H.N. (2008). Gendered dimensions of obesity in childhood and adolescence. *Nutrition Journal, 7*(1).

Teranishi, K., Hayes, D., Iwaishi, L.K., & Fuddy, L.J. (2011). Poorer general health status in children is associated with being overweight or obese in Hawai'i: Findings from the 2007 National Survey of Children's Health. *Hawai'i Medical Journal, 70*: 16-20.

Troped, P.J., Wiecha, J.L., Fragala, M.S., Matthews, C.E., Finkelstein, D.M., Kim, J., & Peterson, K.E. (2007). Reliability and validity of YRBS physical activity items among middle school students. *Medicine and Science in Sports Exercise, 39*(3): 416-425.

Trost, S. G., Sallis, J. F., Pate, R. R., Freedson, P. S., Taylor, W. C., & Dowda, M. (2003). Evaluating a model of parental influence on youth physical activity. *American Journal of Preventative Medicine, 25*(4), 277-282.

U.S. Department of Agriculture and U.S. Department of Health and Human Services (2010). Dietary guidelines for Americans 2010. Retrieved July 7, 2012. www.dietaryguidelines.ogov

U.S. Department of Health and Human Service. (2012). Healthy People 2020 Nutrition and Weight Status Objectives. Retrieved from http://www.healthypeople.gov/2020/topicsobjectives2020/pdfs/NutritionandWeight.pdf

van der Horst, K., Oenema, A., Ferreira, I., Wendel-Vos, W., Giskes, K., van Lenthe, F., & Brug, J. (2007). A systematic review of environmental correlates of obesity-related dietary behaviors in youth. *Health Education Research, 22*(2), 203-226.

Vissers, D., Devoogdt, N., Gebruers, N., Mertens, I., Truien, S., & Van Gaal, L. (2008). Overweight in adolescents: Differences per type of education. Does one size fit all? *Journal of Nutrition Education, 40*: 65-71.

Wallerstein, N., & Bernstein, E. (1988). Empowerment Education: Freire's Ideas Adapted to Health Education. Health Education & Behavior, 15(4), 379-394. doi: 10.1177/109019818801500402

Wang, C.C. (1999). Photovoice: A participatory action research strategy applied to women's health. *Journal of Women's Health, 8*(2): 185-192.

Wang, C.C. & Burris, M.A. (1997). Photovoice; Concept, methodology, and use for participatory needs assessment. *Health Education & Behavior, 24*:369-387. doi: 10.1177/109019819702400309.

Wang, J., Iannotti, R.J., & Luk, J.W. (2010). Bullying victimization among underweight and overweight U.S. youth: Differential associations for boys and girls. *Journal of Adolescent Health, 47*(1): 99-101.

Ward DS, Dowda M, Felton GM, Trost SG, Dishman RK, and Pate RR. (2006). Physical activity correlates in adolescent girls who differ by weight status. *Obesity. 14*:97-105.

Wilson, A.N, & Dollman, J. (2007). Social influences on physical activity in Anglo-and Vietnamese-Australian adolescent males in a single sex school. *Journal of Science and Medicine in Sport, 10,* 147-155.

Wilson, D.K., Lawman, H.G., Segal, M., & Chappell, S. (2011). Neighborhood and parental supports for physical activity in minority adolescents. *American Journal of Preventive Medicine, 41*(4): 399-406.

Young, E.M., Fors, S.W., & Hayes, D.M. (2004). Associations between perceived parent behaviors and middle school student fruit and vegetable consumption. *Journal of Nutrition Education Behavior, 36,* 2-12.

Yousefian, A., Ziller, E., Swartz, J. & Hartley, D. (2009). Active living for rural youth: Addressing physical inactivity in rural communities. *Journal of Public Health Management Practice, 15*(3): 223-231.

Appendix

Appendix A Youth Risk Behavior Survey - Study 1and Study 2

2010-2011
Hawai‘i High School
Youth Risk Behavior Survey

This survey is about health behavior. It has been developed so you can tell us what you do that may affect your health. The information you give will be used to improve health education for young people like yourself.

DO NOT write your name on this survey. The answers you give will be kept private. No one will know what you write. Answer the questions based on what you really do.

Completing the survey is voluntary. Whether or not you answer the questions will not affect your grade in this class. If you are not comfortable answering a question, just leave it blank.

The questions that ask about your background will be used only to describe the types of students completing this survey. The information will not be used to find out your name. No names will ever be reported.

Make sure to read every question. Fill in the ovals completely. When you are finished, follow the instructions of the person giving you the survey.

Thank you very much for your help.

Directions

- **Use a #2 pencil only.**
- **Make dark marks.**
- **Fill in a response like this: A B ● D.**
- **If you change your answer, erase your old answer completely.**

1. How old are you?
   A. 12 years old or younger
   B. 13 years old
   C. 14 years old
   D. 15 years old E. 16 years old F. 17 years old
   G. 18 years old or older

2. What is your sex?
   A. Female
   B. Male

3. In what grade are you?
   A. 9th grade B. 10th grade
   C. 11th grade
   D. 12th grade
   E. Ungraded or other grade

4. Are you Hispanic or Latino?
   A. Yes
   B. No

5. What is your race? **(Select one or more responses.)**
   A. American Indian or Alaska Native
   B. Black or African American
   C. Filipino
   D. Japanese
   E. Native Hawaiian/Part Hawaiian
   F. Other Asian
   G. Other Pacific Islander
   H. White

6. How tall are you without your shoes on?
   Directions: Write your height in the shaded blank boxes. Fill in the matching oval below each number.

Example

Height	
Feet	Inches
5	7
	@
@)	
●	
®	
	@)
	®
	●
	®
	®
	11

7. How much do you weigh without your shoes on?
   Directions: Write your weight in the shaded blank boxes. Fill in the matching oval below each number.

Example

Weight		
Pounds		
1	5	2
@	@	@
●		
		●
	@)	@)
	●	
	®	®
	®	®
	®	®

8. Which one of these groups **best** describes you? (**Select only one response.**)
   A. American Indian or Alaska Native
   B. Black or African American
   C. Filipino
   D. Japanese
   E. Native Hawaiian/Part Hawaiian
   F. Other Asian
   G. Other Pacific Islander
   H. White

9. During the past 12 months, how would you describe your grades in school?
   A. Mostly A's
   B. Mostly B's
   C. Mostly C's
   D. Mostly D's
   E. Mostly F's
   F. None of these grades
   G. Not sure

The next question asks about personal safety.

10. **When you rode a bicycle** during the past 12 months, how often did you wear a helmet?
   A. I did not ride a bicycle during the past 12 months
   B. Never wore a helmet
   C. Rarely wore a helmet
   D. Sometimes wore a helmet
   E. Most of the time wore a helmet
   F. Always wore a helmet

The next 9 questions ask about violence-related behaviors.

11. During the past 30 days, on how many days did you carry **a weapon** such as a gun, knife, or club?
   A. 0 days
   B. 1 day
   C. 2 or 3 days
   D. 4 or 5 days
   E. 6 or more days

12. During the past 30 days, on how many days did you carry a weapon such as a gun, knife, or club **on school property**? A. 0 days
   B. 1 day
   C. 2 or 3 days
   D. 4 or 5 days
   E. 6 or more days

13. During the past 30 days, on how many days did you **not** go to school because you felt you would be unsafe at school or on your way to or from school?
   A. 0 days
   B. 1 day
   C. 2 or 3 days
   D. 4 or 5 days
   E. 6 or more days

14. During the past 12 months, how many times has someone threatened or injured you with a weapon such as a gun, knife, or club **on school property**? A. 0 times
   B. 1 time
   C. 2 or 3 times
   D. 4 or 5 times
   E. 6 or 7 times F. 8 or 9 times
   G. 10 or 11 times
   H. 12 or more times

15. During the past 12 months, how many times were you in a physical fight?
   A. 0 times
   B. 1 time
   C. 2 or 3 times
   D. 4 or 5 times
   E. 6 or 7 times F. 8 or 9 times
   G. 10 or 11 times
   H. 12 or more times

16. During the past 12 months, how many times were you in a physical fight **on school property**?
   A. 0 times
   B. 1 time
   C. 2 or 3 times
   D. 4 or 5 times
   E. 6 or 7 times F. 8 or 9 times
   G. 10 or 11 times
   H. 12 or more times

17. During the past 12 months, did you have a boyfriend or girlfriend?
   A. Yes
   B. No

18. During the past 12 months, did your boyfriend or girlfriend ever hit, slap, or physically hurt you on purpose?
   A. Yes
   B. No

19. Have you ever been physically forced to have sexual intercourse when you did not want to?
   A. Yes
   B. No

The next 2 questions ask about bullying. Bullying is when 1 or more students tease, threaten, spread rumors about, hit, shove, or hurt another student over and over again. It is not bullying when 2 students of about the same strength or power argue or fight or tease each other in a friendly way.

20. During the past 12 months, have you ever been bullied **on school property**? A. Yes
B. No

21. During the past 12 months, have you ever been **electronically** bullied? (Include being bullied through e-mail, chat rooms, instant messaging, Web sites, or texting.)
A. Yes
B. No

The next 5 questions ask about sad feelings and attempted suicide. Sometimes people feel so depressed about the future that they may consider attempting suicide, that is, taking some action to end their own life.

22. During the past 12 months, did you ever feel so sad or hopeless almost every day for **two weeks or more in a row** that you stopped doing some usual activities?
A. Yes
B. No

23. During the past 12 months, did you ever **seriously** consider attempting suicide? A. Yes
B. No

24. During the past 12 months, did you make a plan about how you would attempt suicide?
A. Yes
B. No

25. During the past 12 months, how many times did you actually attempt suicide? A. 0 times
B. 1 time
C. 2 or 3 times
D. 4 or 5 times
E. 6 or more times

26. **If you attempted suicide** during the past 12 months, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?
A. **I did not attempt suicide** during the past 12 months
B. Yes
C. No

The next 11 questions ask about tobacco use.

27. Have you ever tried cigarette smoking, even one or two puffs?
A. Yes
B. No

28. How old were you when you smoked a whole cigarette for the first time?
A. I have never smoked a whole cigarette
B. 8 years old or younger
C. 9 or 10 years old D. 11 or 12 years old
E. 13 or 14 years old
F. 15 or 16 years old
G. 17 years old or older

29. During the past 30 days, on how many days did you smoke cigarettes?
A. 0 days
B. 1 or 2 days
C. 3 to 5 days
D. 6 to 9 days
E. 10 to 19 days F. 20 to 29 days G. All 30 days

30. During the past 30 days, on the days you smoked, how many cigarettes did you smoke **per day**?
A. I did not smoke cigarettes during the past 30 days
B. Less than 1 cigarette per day
C. 1 cigarette per day
D. 2 to 5 cigarettes per day E. 6 to 10 cigarettes per day F. 11 to 20 cigarettes per day
G. More than 20 cigarettes per day

31. During the past 30 days, how did you **usually** get your own cigarettes? (Select only **one** response.)
A. I did not smoke cigarettes during the past 30 days
B. I bought them in a store such as a convenience store, supermarket, discount store, or gas station
C. I bought them from a vending machine
D. I gave someone else money to buy them for me
E. I borrowed (or bummed) them from someone else
F. A person 18 years old or older gave them to me
G. I took them from a store or family member
H. I got them some other way

32. During the past 30 days, on how many days did you smoke cigarettes **on school property**?
A. 0 days
B. 1 or 2 days
C. 3 to 5 days
D. 6 to 9 days
E. 10 to 19 days F.
20 to 29 days G.
All 30 days

33. Have you ever smoked cigarettes daily, that is, at least one cigarette every day for 30 days?
A. Yes
B. No

34. During the past 12 months, did you ever try **to quit** smoking cigarettes?
A. I did not smoke during the past 12 months
B. Yes
C. No

35. During the past 30 days, on how many days did you use **chewing tobacco, snuff, or dip**, such as Redman, Levi Garrett, Beechnut, Skoal, Skoal Bandits, or Copenhagen?
A. 0 days
B. 1 or 2 days
C. 3 to 5 days
D. 6 to 9 days
E. 10 to 19 days F.
20 to 29 days G.
All 30 days

36. During the past 30 days, on how many days did you use **chewing tobacco, snuff, or dip on school property**?
A. 0 days
B. 1 or 2 days
C. 3 to 5 days
D. 6 to 9 days
E. 10 to 19 days F.
20 to 29 days G.
All 30 days

37. During the past 30 days, on how many days did you smoke **cigars, cigarillos, or little cigars**?
A. 0 days
B. 1 or 2 days
C. 3 to 5 days
D. 6 to 9 days
E. 10 to 19 days F.
20 to 29 days G.
All 30 days

The next 7 questions ask about drinking alcohol. This includes drinking beer, wine, wine coolers, and liquor such as rum, gin, vodka, or whiskey. For these questions, drinking alcohol does not include drinking a few sips of wine for religious purposes.

38. How old were you when you had your first drink of alcohol other than a few sips?
A. I have never had a drink of alcohol other than a few sips
B. 8 years old or younger
C. 9 or 10 years old D. 11 or 12 years old
E. 13 or 14 years old
F. 15 or 16 years old
G. 17 years old or older

39. During the past 30 days, on how many days did you have at least one drink of alcohol?
A. 0 days
B. 1 or 2 days
C. 3 to 5 days
D. 6 to 9 days
E. 10 to 19 days F.
20 to 29 days G.
All 30 days

40. During the past 30 days, on how many days did you have 5 or more drinks of alcohol in a row, that is, within a couple of hours?
A. 0 days
B. 1 day
C. 2 days
D. 3 to 5 days
E. 6 to 9 days
F. 10 to 19 days
G. 20 or more days

41. During the past 30 days, how did you **usually** get the alcohol you drank?
A. I did not drink alcohol during the past 30 days
B. I bought it in a store such as a liquor store, convenience store, supermarket, discount store, or gas station
C. I bought it at a restaurant, bar, or club
D. I bought it at a public event such as a concert or sporting event
E. I gave someone else money to buy it for me
F. Someone gave it to me
G. I took it from a store or family member
H. I got it some other way

42. During the past 30 days, on how many days did you have at least one drink of alcohol **on school property**?
A. 0 days
B. 1 or 2 days
C. 3 to 5 days
D. 6 to 9 days
E. 10 to 19 days F. 20 to 29 days G. All 30 days

43. During the past 12 months, how many of your 4 best friends have tried beer, wine, or hard liquor (such as rum, gin, vodka, or whiskey) when their parents did not know about it?
A. 0
B. 1
C. 2
D. 3
E. 4
F. Not sure

44. How wrong do your parents feel it would be for you to drink beer, wine, or hard liquor (such as rum, gin, vodka, or whiskey) regularly?
A. Very wrong
B. Wrong
C. A little bit wrong
D. Not at all wrong
E. Not sure

The next 3 questions ask about marijuana use. Marijuana also is called grass, pot or pakalōlō.

45. How old were you when you tried marijuana for the first time?
A. I have never tried marijuana
B. 8 years old or younger
C. 9 or 10 years old D. 11 or 12 years old
E. 13 or 14 years old
F. 15 or 16 years old
G. 17 years old or older

46. During the past 30 days, how many times did you use marijuana?
A. 0 times
B. 1 or 2 times
C. 3 to 9 times
D. 10 to 19 times
E. 20 to 39 times
F. 40 or more times

47. During the past 30 days, how many times did you use marijuana **on school property**?
A. 0 times
B. 1 or 2 times
C. 3 to 9 times
D. 10 to 19 times
E. 20 to 39 times
F. 40 or more times

The next 6 questions ask about other drugs.

48. During your life, how many times have you used **any** form of cocaine, including powder, crack, or freebase?
A. 0 times
B. 1 or 2 times
C. 3 to 9 times
D. 10 to 19 times
E. 20 to 39 times
F. 40 or more times

49. During your life, how many times have you sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high?
A. 0 times
B. 1 or 2 times
C. 3 to 9 times
D. 10 to 19 times
E. 20 to 39 times
F. 40 or more times

50. During your life, how many times have you used **methamphetamines** (also called speed, crystal, crank, or ice)?
A. 0 times
B. 1 or 2 times
C. 3 to 9 times
D. 10 to 19 times
E. 20 to 39 times
F. 40 or more times

51. During your life, how many times have you used **ecstasy** (also called MDMA)? A. 0 times
B. 1 or 2 times
C. 3 to 9 times
D. 10 to 19 times
E. 20 to 39 times
F. 40 or more times

52. During your life, how many times have you taken a **prescription drug** (such as OxyContin, Percocet, Vicodin, codeine, Adderall, Ritalin, or Xanax) without a doctor's prescription?
A. 0 times
B. 1 or 2 times
C. 3 to 9 times
D. 10 to 19 times
E. 20 to 39 times
F. 40 or more times

53. During the past 12 months, has anyone offered, sold, or given you an illegal drug **on school property**?
A. Yes
B. No

The next 8 questions ask about alcohol and drugs.

54. During the past 30 days, have you been in a vehicle driven by someone, including yourself, who had been using alcohol or other drugs?
A. Yes
B. No

55. Do you ever use alcohol or drugs to relax, feel better about yourself, or fit in? A. Yes
B. No

56. Do you ever use alcohol or drugs while you are alone?
A. Yes
B. No

57. Do you ever forget things you did while using alcohol or drugs?
A. Yes
B. No

58. Do your family or friends ever tell you that you should cut down on your drinking or drug use?
A. Yes
B. No

59. Have you ever gotten into trouble while you were using alcohol or drugs?
A. Yes
B. No

60. If you thought that your alcohol or drug use was causing you problems, would you seek help from a counselor or doctor?
A. Yes
B. No

61. How many adults do you know who got drunk or high during the past 12 months?
A. 0 adults
B. 1 adult
C. 2 adults
D. 3 adults
E. 4 adults
F. 5 or more adults

The next 11 questions ask about sexual behavior.

62. Have you ever had sexual intercourse?
A. Yes
B. No

63. How old were you when you had sexual intercourse for the first time?
A. I have never had sexual intercourse
B. 11 years old or younger
C. 12 years old
D. 13 years old E. 14 years old F. 15 years old G. 16 years old
H. 17 years old or older

64. During your life, with how many people have you had sexual intercourse?
A. I have never had sexual intercourse
B. 1 person
C. 2 people
D. 3 people
E. 4 people F. 5 people
G. 6 or more people

65. During the past 3 months, with how many people did you have sexual intercourse?
A. I have never had sexual intercourse
B. I have had sexual intercourse, but not during the past 3 months
C. 1 person
D. 2 people
E. 3 people F. 4 people G. 5 people
H. 6 or more people

66. Did you drink alcohol or use drugs before you had sexual intercourse the **last time**?
A. I have never had sexual intercourse
B. Yes
C. No

67. The **last time** you had sexual intercourse, did you or your partner use a condom?
A. I have never had sexual intercourse
B. Yes
C. No

68. The **last time** you had sexual intercourse, what **one** method did you or your partner use to **prevent pregnancy**? (Select only **one** response.)
A. I have never had sexual intercourse
B. No method was used to prevent pregnancy
C. Birth control pills
D. Condoms
E. Depo-Provera (or any injectable birth control), Nuva Ring (or any birth control ring), Implanon (or any implant), or any IUD
F. Withdrawal
G. Some other method
H. Not sure

69. Have you ever had oral sex?
A. Yes
B. No

70. Have you ever had anal sex?
A. Yes
B. No

71. During your life, with whom have you had sexual contact?
A. I have never had sexual contact
B. Females
C. Males
D. Females and males

72. Which of the following best describes you?
A. Heterosexual (straight) B. Gay or lesbian
C. Bisexual
D. Not sure

The next 5 questions ask about body weight.

73. How do **you** describe your weight?
A. Very underweight
B. Slightly underweight C. About the right weight
D. Slightly overweight
E. Very overweight

74. Which of the following are you trying to do about your weight?
A. **Lose** weight
B. **Gain** weight
C. **Stay** the same weight
D. I am **not trying to do anything** about my weight

75. During the past 30 days, did you **go without eating for 24 hours or more** (also called fasting) to lose weight or to keep from gaining weight?
A. Yes
B. No

76. During the past 30 days, did you **take any diet pills, powders, or liquids** without a doctor's advice to lose weight or to keep from gaining weight? (Do **not** include meal replacement products such as Slim Fast.)
A. Yes
B. No

77. During the past 30 days, did you **vomit or take laxatives** to lose weight or to keep from gaining weight?
A. Yes
B. No

The next 8 questions ask about food you ate or drank during the past 7 days. Think about all the meals and snacks you had from the time you got up until you went to bed. Be sure to include food you ate at home, at school, at restaurants, or anywhere else.

78. During the past 7 days, how many times did you drink **100% fruit juices** such as orange juice, apple juice, or grape juice? (Do **not** count punch, Kool-Aid, sports drinks, or other fruit-flavored drinks.)
A. I did not drink 100% fruit juice during the past 7 days
B. 1 to 3 times during the past 7 days
C. 4 to 6 times during the past 7 days
D. 1 time per day E. 2 times per day
F. 3 times per day
G. 4 or more times per day

79. During the past 7 days, how many times did you eat **fruit**? (Do **not** count fruit juice.)
A. I did not eat fruit during the past 7 days
B. 1 to 3 times during the past 7 days
C. 4 to 6 times during the past 7 days
D. 1 time per day E. 2 times per day
F. 3 times per day
G. 4 or more times per day

80. During the past 7 days, how many times did you eat **green salad**?
A. I did not eat green salad during the past 7 days
B. 1 to 3 times during the past 7 days
C. 4 to 6 times during the past 7 days
D. 1 time per day E. 2 times per day
F. 3 times per day
G. 4 or more times per day

81. During the past 7 days, how many times did you eat **potatoes**? (Do **not** count french fries, fried potatoes, or potato chips.)
A. I did not eat potatoes during the past 7 days
B. 1 to 3 times during the past 7 days
C. 4 to 6 times during the past 7 days
D. 1 time per day E. 2 times per day
F. 3 times per day
G. 4 or more times per day

82. During the past 7 days, how many times did you eat **carrots**?
A. I did not eat carrots during the past 7 days
B. 1 to 3 times during the past 7 days
C. 4 to 6 times during the past 7 days
D. 1 time per day E. 2 times per day
F. 3 times per day
G. 4 or more times per day

83. During the past 7 days, how many times did you eat **other vegetables**? (Do **not** count green salad, potatoes, or carrots.) A.I did not eat other vegetables during the past 7 days
B. 1 to 3 times during the past 7 days
C. 4 to 6 times during the past 7 days
D. 1 time per day E. 2 times per day
F. 3 times per day
G. 4 or more times per day

84. During the past 7 days, how many times did you drink a **can, bottle, or glass of soda or pop**, such as Coke, Pepsi, or Sprite? (Do **not** count diet soda or diet pop.)
A. I did not drink soda or pop during the past 7 days
B. 1 to 3 times during the past 7 days
C. 4 to 6 times during the past 7 days
D. 1 time per day E. 2 times per day
F. 3 times per day
G. 4 or more times per day

85. During the past 7 days, how many **glasses of milk** did you drink? (Count the milk you drank in a glass or cup, from a carton, or with cereal. Count the half pint of milk served at school as equal to one glass.)

A. I did not drink milk during the past 7 days
B. 1 to 3 glasses during the past 7 days
C. 4 to 6 glasses during the past 7 days
D. 1 glass per day
E. 2 glasses per day
F. 3 glasses per day
G. 4 or more glasses per day

The next 5 questions ask about physical activity.

86. During the past 7 days, on how many days were you physically active for a total of **at least 60 minutes per day**? (Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time.)

A. 0 days
B. 1 day
C. 2 days
D. 3 days
E. 4 days
F. 5 days
G. 6 days
H. 7 days

87. On an average school day, how many hours do you watch TV?

A. I do not watch TV on an average school day
B. Less than 1 hour per day
C. 1 hour per day D. 2 hours per day
E. 3 hours per day
F. 4 hours per day
G. 5 or more hours per day

88. On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work? (Include activities such as Xbox, PlayStation, Nintendo DS, iPod touch, Facebook, and the Internet.)

A. I do not play video or computer games or use a computer for something that is not school work
B. Less than 1 hour per day
C. 1 hour per day D. 2 hours per day
E. 3 hours per day
F. 4 hours per day
G. 5 or more hours per day

89. In an average week when you are in school, on how many days do you go to physical education (PE) classes?

A. 0 days
B. 1 day
C. 2 days
D. 3 days
E. 4 days
F. 5 days

90. During the past 12 months, on how many sports teams did you play? (Count any teams run by your school or community groups.)

A. 0 teams
B. 1 team
C. 2 teams
D. 3 or more teams

The next 9 questions ask about other health-related topics.

91. How many tattoos do you have?

A. 0 tattoos
B. 1 tattoo
C. 2 tattoos
D. 3 or more tattoos

92. How many of these tattoos were done outside of a licensed tattoo shop?

A. I do not have any tattoos
B. 0 tattoos
C. 1 tattoo
D. 2 tattoos
E. 3 or more tattoos
F. Not sure

93. Have you ever been taught about AIDS or HIV infection in school?
A. Yes
B. No
C. Not sure

94. Has a doctor or nurse ever discussed ways to prevent pregnancy, sexually transmitted diseases (STDs), and AIDS or HIV infection with you?
A. Yes
B. No
C. Not sure

95. Have your parents or other adults in your family ever talked with you about what they expect you to do or not to do when it comes to sex?
A. Yes
B. No
C. Not sure

96. Is there at least one teacher or other adult in this school that you can talk to if you have a problem?
A. Yes
B. No
C. Not sure

97. Outside of school, is there an adult you can talk to about things that are important to you?
A. Yes
B. No
C. Not sure

98. During the past 12 months, have you talked with at least one of your parents or another adult in your family about the dangers of tobacco, alcohol, or drug use?
A. Yes
B. No
C. Not sure

99. How likely is it that you will complete a post high school program such as a vocational training program, military service, community college, or 4-year college?
A. Definitely will not
B. Probably will not C. Probably will
D. Definitely will
E. Not sure

This is the end of the survey.
Thank you very much for your help.

Appendix

Appendix B Youth Risk Behavior Survey - Study 1and tudy 2

Appendix C Parent Consent Form – Study 2

University of Hawai‘i

Parental Consent Form for Child to Participate in Research Project

"Native Hawaiian Adolescents Weight Status, Physical Activity and Dietary behaviors"

Aloha. My name is Jackie Ng-Osorio, a doctoral student at the University of Hawai‘i , in the Office of Public Health Studies. One requirement for earning my Doctorate degree is to do a research project. The purpose of my research project is to understand if health behaviors such as physical activity, eating habits and weight status differs between Native Hawaiian adolescents who attend Kamehameha and those who attend public schools. Your child will take an anonymous 27-question survey.

All students enrolled in 9th grade physical education will have an opportunity to participate in this voluntary study. I am asking your permission for your child to participate in this project.

Project Description – Activities and Time Commitment: If your child participates in this project, listed below is what your child and I will do and how long it will take.

1. **The survey will take place within one regularly scheduled class time, and should not exceed 30 minutes.**

Benefits and Risks: I believe that your child may directly benefit by participating in this study. The direct benefits to students who participate in this research might be that: students begin to think about how often they engage in certain behaviors and how doing so may enable them to live a healthier life.

There are minimal risks to your child. There is a chance that your child may feel some emotional discomfort because some questions relate to how they perceive their weight, how active they are, and how many servings of fruits and vegetables they eat. These may cause some students uneasiness. Children will be informed and reminded that they may stop participating or decline to answer any questions that make them feel uncomfortable. A counselor will be available if the student would like to talk to one.

Confidentiality and Privacy: During this project, only my University of Hawai‘i advisor and I will have access to the data, although legally authorized agencies have the right to review research records. The information that is collected through the survey will be anonymous. The researcher or teachers will not know how individual students respond. All data shared with the teachers, PE department and reported in my dissertation and future articles will be done in summary. If you would like a summary of my final report, please contact me at the number listed near the end of this consent form.

Voluntary Participation: Your child's participation in this project is voluntary, and so is your decision about permitting or not permitting (him or her) to participate. Moreover, at any time, your child can stop participating in this project and you can withdraw your consent without any loss of benefits or rights.
I want to assure you that although the research study is taking place during class time, that the participation in the study will not have impact on your child's grade for the class, as I am not a teacher for your child or have any influence on your child's grade. If you opt not for your child to participate in the study then during the class time he/she will engage in assignments by his or her teacher such as engaging in physical activity, as it is a physical education class.
If you have any questions about this project, please contact me at (808) 392-5413 or jno@hawaii.edu. You can also contact my University of Hawai'i advisor, Dr. Kathryn Braun at kbraun@hawaii.edu. If you have any questions about your rights or the rights of your child in this research project, you can contact the University of Hawai‘i, Human Studies Program, by phone at (808) 956-5007 or by e-mail at uhirb@hawaii.edu

Please keep the above portion of this consent form for your records.

If you agree for your child to participate in this study, please sign the following signature page

Remember your child's participation is completely voluntary. Signing this consent form means that you have read this and that you want your child to participate in the research project. It is okay if you don't sign the paper or if you change your mind later.

Statement of Consent

I have read the above information, and have received answers to any questions I asked. I agree for my son/daughter to take part in the study.

You certify that you have read and understand the above, and that you have been given satisfactory answers to any questions. You have been told that you are free to withdraw your approval, that your child can stop taking further part in the study at any time, and that your decision will not in any way affect your child's grade for the class.

Your Signature_____ Date_____

Your Name (printed)_____

Print Child's Name: _____

Appendix D Student Assent Form – Study 2

University of Hawai‘i

Student Assent form to Participate in Research Project

"Native Hawaiian Adolescents Weight Status, Physical Activity and Dietary behaviors"

My name is Jackie Ng-Osorio I am a doctoral student at the University of Hawai‘i , in the Office of Public Health Studies. I am inviting you to take part in a research project. I am conducting this research project as part of my requirements for earning my doctoral degree. In addition to asking you if you will participate, I will ask permission from your parent/guardian before you or any other student participates in this research project.

One requirement for earning my Doctorate degree is to do a research project. The purpose of my research project is to understand if health behaviors such as physical activity, eating habits and weight status differs between Native Hawaiian adolescents who attend Kamehameha and those who attend public schools by asking the same questions public high school students are also asked. Your will take an anonymous 27-question survey.

All students enrolled in 9th grade physical education will have an opportunity to participate in this voluntary study. I am asking you to participate in this project.

Project Description – Activities and Time Commitment: If you participate in this project, listed below is what you do and how long it will take.

1. **The survey will take place within one regularly scheduled class time, and should not exceed 30 minutes.**

Benefits and Risks: I believe that you may directly benefit by participating in this study. The direct benefits to students who participate in this research might be that: students begin to think about how often they engage in certain behaviors and how doing so may enable them to live a healthier life.
There are minimal risks to your child. There is a chance that you may feel some emotional discomfort because some questions relate to how you perceive your weight, how active you are, and how many servings of fruits and vegetables you eat. These questions may cause some students uneasiness. You will be reminded that you may stop participating or decline to answer any questions that makes you feel uncomfortable. A counselor will be available if you would like to talk to one.

Confidentiality and Privacy: During this project, only my University of Hawai‘i advisor and I will have access to the data, although legally authorized agencies have the right to review research records. The information that is collected through the survey will be anonymous. The researcher or teachers will not know how individual students respond. All data shared with the teachers, PE department and reported in my dissertation and future articles will be done in summary. If you would like a summary of my final report, please contact me at the number listed near the end of this consent form.

Voluntary Participation: Your participation in this project is voluntary, and so is your decision about choosing to participate. Moreover, at any time, you can stop participating in this project and you can withdraw your consent without any loss of benefits or rights. I want to assure you that although the research study is taking place during class time, that the participation in the study will not have impact on your grade for the class, as I am not your teacher or have any influence on your grade. If you opt not to participate in the study then during the class time you will engage in assignments by your teacher such as engaging in physical activity, as it is a physical education class.

If you have any questions about this project, please contact me at (808) 392-5413 or jno@hawaii.edu. You can also contact my University of Hawai’i advisor, Dr. Kathryn Braun at kbraun@hawaii.edu. If you

have any questions about your rights or the rights of your child in this research project, you can contact the University of Hawai‘i, Human Studies Program, by phone at (808) 956-5007 or by e-mail at uhirb@hawaii.edu

Please keep the above portion of this consent form for your records.

If you agree for your child to participate in this study, please sign the following signature page

Remember your participation is completely voluntary. Signing this consent form means that you have read this and that you want to participate in the research project. It is okay if you don't sign the paper or if you change your mind later.

Statement of Consent

I have read the above information, and have received answers to any questions I asked. I agree to take part in the study.

You certify that you have read and understand the above, and that you have been given satisfactory answers to any questions. You have been told that you are free to stop taking further part in the study at any time, and that your decision will not in any way affect your grade for the class.

Your Signature_____ Date_____

Your Name (printed)_____

Appendix E Student Survey – Study 2

Native Hawaiian Adolescent Health Behavior Survey

This survey asks about your physical activity, dietary behaviors, and body weight. It was developed to understand what health behaviors you engage in and how those behaviors may affect your body weight. The information you provide will be used to create appropriate health education programs for young people like yourself.

This survey is anonymous. DO NOT write your name or KS ID number on this survey. Answer the questions based on what you really do. The PE teachers will not know how individual students responded to the survey, and all surveys will be returned to the researcher.

Completing the survey is voluntary. Whether or not you answer the questions will not affect your grade in this class. If you are not comfortable answering a question, just leave it blank.

The last section, demographics, includes questions about your background. This information will be used to describe the students completing the survey. This information will not be used to find out your name. No names will ever be reported.

Make sure to read every question. Circle each answer completely. When you are finished, follow the instructions of the person giving you the survey.

If you have any questions during the survey, please raise your hand and someone will assist you. Mahalo.

The following four questions ask about your engagement in physical activities. Please mark one response per question.

1) During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spend in any kind of physical activity that increases your heart rate and makes you breathe hard some of the time.)
   a. 0 days
   b. 1 day
   c. 2 days
   d. 3 days
   e. 4 days
   f. 5 days
   g. 6 days
   h. 7 days

2) On an average school day, how many hours do you watch TV?
   a. I do not watch TV on an average school day
   b. Less than 1 hour per day
   c. 1 hour per day
   d. 2 hours per day
   e. 3 hours per day
   f. 4 hours per day
   g. 5 or more hours per day

3) On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work (Include activities such as Nintendo DS, iPod touch, Facebook, PlayStation, Xbox, and the internet)?
   a. I do not play video or computer games or use a computer for something that is not school work on
   b. Less than 1 hour per day
   c. 1 hour per day
   d. 2 hours per day
   e. 3 hours per day
   f. 4 hours per day
   g. 5 or more hours per day

4) On an average school day, how many hours do you use the computer for school work?
   a. I do not use a computer for school work on an average school day
   b. Less than 1 hour per day
   c. 1 hour per day
   d. 2 hours per day
   e. 3 hours per day
   f. 4 hours per day
   g. 5 or more hours per day

5) In an average week when you are in school, on how many days do you go to physical education (PE) classes?
   a. 0 days
   b. 1 day
   c. 2 days
   d. 3 days
   e. 4 days
   f. 5 days

6) During the past 12 months, on how many sports teams did you play? (Count any teams run by your school or community groups.)
   a. 0 teams
   b. 1 team
   c. 2 teams
   d. 3 or more teams

The next 10 questions ask about food you ate or drank in the past 7 days. Think about all the meals and snacks you had from the time you got up until you went to bed. Be sure to include food you ate at home, at school, at restaurants, or anywhere else. Please mark one response per question.

7) During the past 7 days, how many times did you drink 100% fruit juices such as orange juice, apple juice or grape juice (do not include Kool-Aid, sports drinks or other fruit-flavored drinks)
   a. I did not drink 100% fruit juice during the past 7 days
   b. 1 to 3 times during the past 7 days
   c. 4 to 6 times during the past 7 days
   d. 1 time per day
   e. 2 times per day
   f. 3 times per day
   g. 4 or more times per day

8) During the past 7 days, how many times did you eat fruit. Do **not** count fruit juice.)
   a. I did not eat fruit during the past 7 days
   b. 1 to 3 times during the past 7 days
   c. 4 to 6 times during the past 7 days
   d. 1 time per day
   e. 2 times per day
   f. 3 times per day
   g. 4 or more times per day

9) During the past 7 days, how many times did you eat green salad ?
   a. I did not eat green salad during the past 7 days
   b. 1 to 3 times during the past 7 days

c. 4 to 6 times during the past 7 days
d. 1 time per day
e. 2 times per day
f. 3 times per day
g. 4 or more times per day

10) During the past 7 days, how many times did you eat potatoes? (Do **not** count French fries, fried potatoes, or potato chips)?
a. I did not eat potatoes during the past 7 days
b. 1 to 3 times during the past 7 days
c. 4 to 6 times during the past 7 days
d. 1 time per day
e. 2 times per day
f. 3 times per day
g. 4 or more times per day

11) During the past 7 days, how many times did you eat carrots?
a. I did not eat carrots during the past 7 days
b. 1 to 3 times during the past 7 days
c. 4 to 6 times during the past 7 days
d. 1 time per day
e. 2 times per day
f. 3 times per day
g. 4 or more times per day

12) During the past 7 days, how many times did you eat other vegetables? (Do **not** count carrots, potatoes, or green salad)
a. I did not eat other vegetables during the past 7 days
b. 1 to 3 times during the past 7 days
c. 4 to 6 times during the past 7 days
d. 1 time per day
e. 2 times per day
f. 3 times per day
g. 4 or more times per day

13) During the past 7 days, how many times did you drink a can, bottle or glass of soda or pop, such as Coke, Pepsi or Sprite ? (Do **not** include diet soda or diet pop)
a. I did not drink soda or pop during the past 7 days
b. 1 to 3 times during the past 7 days
c. 4 to 6 times during the past 7 days
d. 1 time per day
e. 2 times per day
f. 3 times per day
g. 4 or more times per day

14) During the past 7 days, how many glasses of milk did you drink? (Include the milk you drank in a glass or cup, from a carton or with cereal.)
    a. I did not drink milk during the past 7 days
    b. 1 to 3 times during the past 7 days
    c. 4 to 6 times during the past 7 days
    d. 1 time per day
    e. 2 times per day
    f. 3 times per day
    g. 4 or more times per day

The next 2 questions ask about body weight. Please mark one response per question.

15) How do you describe your weight?
    a. Very underweight
    b. Slightly underweight
    c. About the right weight
    d. Slightly overweight
    e. Very overweight

16) Which of the following are you trying to do about your weight?
    a. **Lose** weight
    b. **Gain** weight
    c. **Stay** the same weight
    d. I am **not trying to do anything** about my weight

Demographics

The next 14 questions ask demographic information about you. As a reminder the information included is confidential. Please mark one response per question.

17) What is your sex?
    a. Female
    b. Male

18) How old are you?
    a. 14 years old
    b. 15 years old
    c. 16 years old
    d. Other (please specify) _____

19) What grade are you in?
    a. 9^{th}
    b. 10^{th}
    c. Other (please specify)_____

20) Are you a boarder?
   a. Yes
   b. No

21) Zip code of where you live (if you are a boarder please list the zip code of your home)? _____

22) During the past 12 months, how would you describe your grades in school?
   a. Mostly A's
   b. Mostly B's
   c. Mostly C's
   d. Mostly D's
   e. Mostly F's
   f. None of these grades
   g. Not sure

23) What grade did you first enter Kamehameha Schools Kapālama?
   a. Kindergarten
   b. 4th grade
   c. 7th grade
   d. 9th grade
   e. Other (please specify)_____

24) Highest educational level completed by primary caregiver(s) (i.e. mother, father, grandparent). Please check one mark for each caregiver

Caregiver	Less than high school	High school diploma/ GED	Some college	Trade certificate	2-year college (AA,AS)	4-year college (BA,BS)	Graduate degree (MA, MS, MPH, MSW, MD, PhD, etc.)
Mother/ Step mother							
Father/ Step father							
Other (please specify)							
Other (please specify)							

25) Who do you live with? If you are a *boarder*, please mark the corresponding answer to when you are home.

X	Please mark all that apply
	Mother/Step-mother
	Father/Step-father

	Grandparents
	Uncles/Aunties
	Siblings
	Other (please specify_____)

26) How tall are you without your shoes on? _____feet _____inches

27) How much do you weigh without your shoes on? _____pounds

Appendix F Demographic Survey – Study 3
Photovoice Study Demographic Survey

This demographic survey includes questions about your background. This information will be used to describe the students completing the survey and participating in the Photovoice study. This information will not be used to find out your name. No names will ever be reported.

This survey is anonymous. DO NOT write your name or KS ID number on this survey. The PE teachers will not know how individual students responded to the survey, and all surveys will be returned to the researcher.

Completing the survey is voluntary. Whether or not you answer the questions will not affect your grade in this class. If you are not comfortable answering a question, just leave it blank.

Make sure to read every question. Circle each answer completely. When you are finished, follow the instructions of the person giving you the survey.

If you have any questions during the survey, please raise your hand and someone will assist you. Mahalo.

Demographics

The following 11 questions ask demographic information about you. As a reminder the information included is confidential. Please mark one response per question.

1) What is your sex?
    c. Female
    d. Male

2) How old are you?
    e. 14 years old
    f. 15 years old
    g. 16 years old
    h. 17 years old
    i. 18 years old
    j. Other (please specify) _____

3) What grade are you in?
    a. 9th
    b. 10th
    c. 11th
    d. 12th

4) Are you a boarder?
    a. Yes
    b. No

5) Zip code of where you live (if you are a boarder please list the zip code of your home)? _____

6) During the past 12 months, how would you describe your grades in school?
    h. Mostly A's
    i. Mostly B's
    j. Mostly C's
    k. Mostly D's
    l. Mostly F's
    m. None of these grades
    n. Not sure

7) What grade did you first enter Kamehameha Schools Kapālama?
    f. Kindergarten
    g. 4th grade
    h. 7th grade
    i. 9th grade
    j. Other (please specify)_____

8) Highest educational level completed by primary caregiver(s) (i.e. mother, father, grandparent). Please check one mark for each caregiver

Caregiver	Less than high school	High school diploma/ GED	Some college	Trade certificate	2-year college (AA,AS)	4-year college (BA,BS)	Graduate degree (MA, MS, MPH, MSW, MD, PhD, etc.)
Mother/ Step mother							
Father/ Step father							
Other (please specify)							
Other (please specify)							

9) Who do you live with? If you are a *boarder*, please mark the corresponding answer to when you are home.

X	Please mark all that apply
	Mother/Step-mother
	Father/Step-father
	Grandparents
	Uncles/Aunties
	Siblings
	Other (please specify_____)

10) How tall are you without your shoes on? _____feet _____inches

11) How much do you weigh without your shoes on? _____pounds

Appendix G Student Assent – Study 3

University of Hawai‘i

Student Assent form to Participate in Research Project

“Engaging Indigenous Adolescents through Photovoice in Understanding Community Challenges and Opportunities for Physical Activity and Healthy Eating”

My name is Jackie Ng-Osorio I am a doctoral student at the University of Hawai‘i , in the Office of Public Health Studies. I am inviting you to take part in a research project. I am conducting this research project as part of my requirements for earning my doctoral degree. In addition to asking you if you will participate, I will ask permission from your parent/guardian before you or any other student participates in this research project.

One requirement for earning my Doctorate degree is to do a research project. The purpose of my research project is to understand how adolescents feel about how where they live influences their nutrition and physical activity habits by either providing opportunities or challenges for the adolescent’s engagement of these behaviors. You will be using the PhotoVoice method. The PhotoVoice method is when participants take photographs and write a related narrative to the photograph to answer the research question of the study.

I am asking you to participate in this project as you are enrolled in the Health Promotion Education (HPE) course taught by Ms. Theone Chock. Students from both sessions of HPE will be invited to participate in this voluntary study.

Project Description – Activities and Time Commitment: If you participate in this project, here is what you and I will do and how long it will take.

1. The project will take place over six sessions during the semester you are enrolled in HPE. The sessions may not be consecutive due to holidays and breaks. I will spend the 80 minutes of the class time with you and the other students who have volunteered to participate in the study.
2. During session 1, for those students participating in the study, they will sign a student assent form. In session 1, I will provide you with an orientation of the study and what will be expected of your participation. Afterwards, you will receive a demographic survey that asks questions regarding family, community and time at Kamehameha Schools. The second part of the class time will be devoted to spending time discussing the use of the camera, what types of photographs to take and guidelines for your participation in the study.
3. These photos will show how you perceive the neighborhood where you live and how engagement in eating well and physical activity are supported or challenged. You will take responsibility for keeping the camera until it is due to the researcher for the pictures to be developed. The researcher will develop the pictures and provide the pictures back to you. If you lose your camera you may use a personal camera (such as a cell-phone or digital camera) if one is unavailable the researcher may provide up to 1 additional disposable camera to each student.
4. For the following sessions, sessions two to five, I will spend the 80 minutes of class time working with you and other students as you select the photographs to use in creating your story board to represent how you see the community you live in and writing the narratives that go with the selected pictures. The photos will be used to prompt discussion about your community in the group discussions in addition to creating the story boards to share with the class. The discussions will help to understand what the participating students felt were the challenges and supports within the communities to engage in healthy behaviors. The discussion sessions will be audio taped and notes will be taken.
5. In session six students will present their story boards will have an opportunity. The audience will include the physical education department, Ms. Chock and myself. Invited guests will include interested school and community members (such as Kamehameha Schools high school principal).

6. In addition, to the class time that you will use to participate in this study there is the additional time needed to take the photographs of your community. The amount of time used to take the photographs can range from approximately 1 hour to a few hours. These photographs will need to answer the questions "what in your community *supports* you to engage in physical activity and healthy eating?" and "what in your community *challenges* you to engage in physical activity and healthy eating?"

Benefits and Risks: I believe that you may directly benefit by participating in this study. Direct benefits might include: you **become more engaged in your community by gaining an additional perspective through the use of** the photographs, better understand what in your surroundings may enable you to live a healthier life and how you can use media in expressing your thoughts. More generally, when I report the results of this research study, the results could contribute to research findings that relate to Native Hawaiian adolescents and adolescents engagement in healthy behaviors.

I believe there is little to no risk in your participating in this research study. You might, however, be a little uncomfortable with expressing the ideas of why pictures were taken, or sharing of thoughts and perspectives. To minimize this risk, I will ensure that you feel comfortable in the classroom environment, by prior to starting the study having the participating students agree on guidelines and ensuring that respect of each other is a high priority. Furthermore, if you were to become too stressed or uncomfortable, I will ask if you would like to take a break from participating, or if you would like to talk to someone, if so counselors will be made available. If stress persists, then you will be able to stop participating in the research project with no penalty.

Confidentiality and Privacy: During this project, only my University of Hawai'i advisor and I will have access to the data, although legally authorized agencies have the right to review research records. When I report the results of my research project, I will not use your name or any other personally identifying

information. The information that is shared among the class is to be treated as confidential. If you would like a summary of my final report, please contact me at the number listed near the end of this consent form.

Some photos may be included in presentations or publications, if you agree. You need only share what you feel is appropriate and comfortable. You have full ownership of the photos and have the right to decide which ones will be used for public display, if any.

If at a later date, you choose to not share the photos with others or participate in discussion, you or you parent/guardian may contact me at my information below. Photos and all accompanying information will immediately be removed from the project data. You or your parent/guardian do not need to provide information as to why you are withdrawing. There is no penalty for withdrawing and participation does not influence your grade for the class.

Voluntary Participation: Your participation in this project is voluntary, and so is your decision to participate. Moreover, at any time, you can stop participating in this project and you can withdraw your consent without any loss of benefits or rights.

For your participation, you will receive a gift worth of $20 (e.g. 2 movie tickets). The compensation will be provided to you even if you withdraw prior to the conclusion of the project.
I want to assure that although the research study is taking place during the HPE class time, that the participation in the study will not have impact on your grade for the class, as I am not a teacher for you or have any influence on your grade. If you opt not to participate in the study then during the class time you will engage in assignments by Ms. Chock such as engaging in physical activity, as it is a physical education class.

If you have any questions about this project, please contact me at (808) 392-5413 or jno@hawaii.edu. You can also contact my University of Hawai'i advisor, Dr. Kathryn Braun at kbraun@hawaii.edu. If you have any questions about your rights or the rights of your in this research project, you can contact the University of Hawai'i, Human Studies Program, by phone at (808) 956-5007 or by e-mail at uhirb@hawaii.edu

Remember your child's participation is completely voluntary. Signing this consent form means that you have read this and that you want your child to participate in the research project. It is okay if you don't sign the paper or if you change your mind later.

Statement of Consent

I have read the above information, and have received answers to any questions I asked. I agree to take part in the study.

You certify that you have read and understand the above, and that you have been given satisfactory answers to any questions. You have been told that you are free to withdraw from the study at any time, and that your decision will not in any way affect your grade for the class.

Please initial next to the appropriate line.

Do you give your consent to be audio taped during the PhotoVoice discussion session? Yes ___ No ___

Do you give your consent to have your photographs used in the final version of the principal researcher's dissertation and potentially future articles? At any time you can select not to have your photos used.

Yes ___ No ___

Your Signature_____ Date_____

Your Name (printed)_____

Appendix H Parental Consent – Study 3

University of Hawai‘i

Parental/Guardian’s Consent Form for Child to Participate in Research Project

“Engaging Indigenous Adolescents through Photovoice in Understanding Community Challenges and Opportunities for Physical Activity and Healthy Eating”

Aloha. My name is Jackie Ng-Osorio, a doctoral student at the University of Hawai‘i , in the Office of Public Health Studies. One requirement for earning my Doctorate degree is to do a research project. The purpose of my research project is to understand how adolescents feel about how where they live influences their nutrition and physical activity habits by either providing opportunities or challenges for the adolescent’s engagement of these behaviors. Your child will be using the PhotoVoice method. The PhotoVoice method is when participants take photographs and write a related narrative to the photograph to answer the research question of the study.

I am asking your permission for your child to participate in this project as your child is enrolled in the Health Promotion Education (HPE) course taught by Ms. Theone Chock. Students from both sessions of HPE will be invited to participate in this voluntary study.

Project Description – Activities and Time Commitment: If your child participates in this project, listed below is what your child and I will do and how long it will take.

2. The project will take place over six sessions during the semester your child is enrolled in HPE. The sessions may not be consecutive due to holidays and breaks. I will spend the 80 minutes of the class time with your child and the other students who have volunteered to participate in the study.
3. During session 1, for those students participating in the study, they will sign a student assent form. In session 1, I will provide your child with an orientation of the study and what will be

expected of his or her participation. Afterwards, they will be given a demographic survey that asks questions regarding family, community and time at Kamehameha Schools. The second part of the class time will be devoted to spending time discussing the use of the camera, what types of photographs to take and guidelines for student participation in the study.

4. These photos will show how your child perceives the neighborhood where your child lives and how engagement in eating well and physical activity are supported or challenged. Your child will take responsibility for keeping the camera until it is due to the researcher for the pictures to be developed. The researcher will develop the pictures and provide the pictures back to you. If your child loses the camera he/she may use a personal camera (such as a cell-phone or digital camera) if one is unavailable the researcher may provide up to 1 additional disposable camera to each student.
5. For the following sessions, sessions two to five, I will spend the 80 minutes of class time working with the students as they select the photographs to use in creating his/her story board to represent how he/she sees the community he/she lives in and writing the narratives that go with the selected pictures. The photos will be used to prompt discussion about his/her community in the group discussions in addition to creating the story boards to share with the class. The discussions will help to understand what the participating students felt were the challenges and supports within the communities to engage in healthy behaviors. The discussion sessions will be audio taped and notes will be taken.
6. In session six those students who would like to present their story boards will have an opportunity. The audience will include the physical education department, Ms. Chock and myself. With permission from the students invited guests may include interested school and community (such as Kamehameha Schools high school principal).
7. In addition, to the class time that your child will participate in this study there is the additional time needed to take the photographs of his or her community. These photographs will need to answer the questions “what in your community supports you to engage in physical activity and

healthy eating?" and "what in your community challenges you to engage in physical activity and healthy eating?" The additional time will be approximately 1 hour to a few hours of your child's time.

Benefits and Risks: I believe that your child may directly benefit by participating in this study. The direct benefits to students who participate in this research might be that: students become more engaged in their community by gaining an additional perspective through the use of the photographs. They may gain understanding about how their surroundings may enable them to live a healthier life. Findings also can inform the future development of community-based interventions.

I believe there is little to no risk in your child participating in this research study. However, they may feel some psychological discomfort by sharing their pictures and feelings to the larger group. They also may be distressed by a loss of privacy. In session 1, ground rules will be agreed upon by all participants to ensure that everyone has a right to refuse to answer questions during the discussion, protect each other's privacy by not sharing information outside of class, and demonstrate appropriate behaviors. The research leader and the classroom teacher will monitor students for signs of distress and try to address them in a one-on-one session with the student. School counselors also are available to talk with students experiencing distress. If stress persists, then your child will be able to stop participating in the research project with no penalty.

Confidentiality and Privacy: During this project, only my University of Hawai'i advisor and I will have access to the data, although legally authorized agencies have the right to review research records. The information that is shared among the classmates is to be treated as confidential. When I report the results of my research project, I will not use your child's name or any other personally identifying information. If you would like a summary of my final report, please contact me at the number listed near the end of this consent form.

Some photos may be included in presentations or publications, if you and your child agree. He/she need only share what they feel is appropriate and comfortable. Your child has full ownership of the photos and has the right to decide which ones, if any will be used for public display.

If at a later date, you or your child chooses to not share the photos with others or participate in discussion, they may contact me at my information below. Photos and all accompanying information will immediately be removed from the project data. You or your child does not need to provide information as to why he/she is withdrawing. There is no penalty for withdrawing and participation does not influence your child's grade for the class.

Voluntary Participation: Your child's participation in this project is voluntary, and so is your decision about permitting or not permitting (him or her) to participate. Moreover, at any time, your child can stop participating in this project and you can withdraw your consent without any loss of benefits or rights. For your child's participation, he/she will receive a gift worth of $20 (e.g. 2 movie tickets). The compensation will be provided to the student even if the student withdraws prior to the conclusion of the project.

I want to assure that although the research study is taking place during the HPE class time, that the participation in the study will not have impact on your child's grade for the class, as I am not a teacher for your child or have any influence on your child's grade. If you opt not for your child to participate in the study then during the class time he/she will engage in assignments by Ms. Chock such as engaging in physical activity, as it is a physical education class.

If you have any questions about this project, please contact me at (808) 392-5413 or jno@hawaii.edu. You can also contact my University of Hawai'i advisor, Dr. Kathryn Braun at kbraun@hawaii.edu. If you have any questions about your rights or the rights of your child in this research project, you can contact

the University of Hawai‘i, Human Studies Program, by phone at (808) 956-5007 or by e-mail at uhirb@hawaii.edu

Please keep the prior portion of this consent form for your records.

If you agree for your child to participate in this study, please sign the following signature page of this

Remember your child's participation is completely voluntary. Signing this consent form means that you have read this and that you want your child to participate in the research project. It is okay if you don't sign the paper or if you change your mind later.

Statement of Consent

I have read the above information, and have received answers to any questions I asked. I agree for my son/daughter to take part in the study.

You certify that you have read and understand the above, and that you have been given satisfactory answers to any questions. You have been told that you are free to withdraw your approval, that your child can stop taking further part in the study at any time, and that your decision will not in any way affect your child's grade for the class.

Please initial next to the appropriate line.

Do you give your consent for your child to be audio taped the PhotoVoice discussion session?

Yes ___ No ___

Do you give your consent to have your child's photographs used in final version of the principal researcher's dissertation and potentially future articles? At any time you can select not to have your photos used.

Yes ___ No ___

Your Signature_____ Date_____

Your Name (printed)_____

Print Child's Name: _____

Appendix I Timeline - Study 3

Revised Schedule for Kamehameha Schools PE Photovoice Study (as of 11/16/12)

Session	Date	What are we going to do?
Drop off cameras to Ms. Chock	By Monday, November 19th	• Jackie is going to pick up all cameras on Monday to develop. • Please remember to put your name on cameras.
#3	Thursday, November 29th	• Create storyboards with pictures and narratives. • The journal entries can help you with writing your narratives • Jackie will bring poster board and supplies. • Jackie will have your pictures for you to look and select. The pictures that are selected will be reprinted.
#4	Monday, December 3rd	Discuss what you found during the picture taking – Use SHOWED method.
#5	Wednesday, December 5th	Group discussion continued and next steps
#6	Friday, December 7th	Presentation of storyboards

Notes: Session 4 is a regular schedule day, so please come to class on time since it is a shortened period. Session 5, is a continuation of session 4 with additional questions asked during the discussion. Additional time will be provided in session 5 to finish the story boards. Currently, the study is scheduled to end on Friday, December 7th with the presentation of the storyboards, the goal is to try to finish it by then so it is done before finals.

Again, if you have any questions feel free to contact me at 392-5413 or jno@hawaii.edu or jngosorio@gmail.com

Appendix J SHOWED Method Worksheet – Study 3

SHOWED

Name of Photographer _____

Title of Picture _____ Date _____

"What is Seen here?" (Describe what the eyes see)

S

"What is really Happening?" (The unseen "story" behind the image)

H

"How does this relate to Our lives?" (or My life personally)

O

“WHY does this situation, concern, or strength exist”

W

“How could this image Educate people?”

E

What can we DO to improve the situation, or to enhance these strengths?

D

Appendix K Session 5 group discussion questions – Study 3

1) How do they feel they are provided opportunities to engage in the healthy behaviors of physical activity and healthy eating?

2) How do they feel they are challenged to engage in the healthy behaviors of physical activity and healthy eating?

3) What do they feel they can do to change their communities to reduce the challenges and increase the opportunities?

4) Does being Native Hawaiian relate to any of these challenges or opportunities?