PINK AND DUDE CHEFS:

A nutrition and culinary intervention for middle school students

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ABSTRACT

Pink and Dude Chefs: a nutrition and culinary intervention for middle school students

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The prevalence of obesity in US adolescents has more than tripled in the past 35 years, and the greatest impact has been among low-income and minority racial/ethnic populations. Adolescents report inadequate fruit and vegetable intake, an overconsumption of sweetened beverages, and a high reliance on fast food locations for meals or snacks; increasing the risk of adolescent obesity. Building knowledge and skills through culinary interventions may empower middle school students to create and also choose healthful foods.

Pink and Dude Chefs, a six-week nutrition and culinary intervention, aims to improve healthy eating behaviors by increasing nutrition knowledge and culinary ability. Trained research assistants from California Polytechnic State University (Cal Poly) led middle school boys and girls in lessons ranging on topics including macronutrients, real-world application of USDA MyPlate guidelines, and meal planning and budgeting. Cal Poly research assistants supported middle school participants in cooking recipes that were specifically chosen to highlight themes covered in the nutrition lesson and to progress in difficulty throughout the program.

The program consisted of 12 lessons that were each divided into 1 hour of classroom nutrition instruction and 1 hour of hands-on cooking practicum. The program took place in two locations, at Mesa Middle School in Arroyo Grande, California and Carpinteria Middle School in Carpinteria, California with 15-20 middle school volunteer participants who enrolled in each program. Questionnaires were used to measure fruit and vegetable preferences, dietary behavior, and barriers to healthy eating, culinary skill, culinary confidence, and basic nutrition knowledge pre- and post-intervention.

Participants' responses indicated an improved dietary profile as indicated by fruit and vegetable preferences, and fruit and vegetable intake. Responses also indicated increased culinary confidence and improved nutrition knowledge. More research is needed to test the long-term impact of participation in nutrition and culinary interventions.

Keywords: nutrition education, culinary intervention, after-school program, adolescents, obesity prevention, cooking program, culinary nutrition intervention

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TABLE OF CONTENTS

LIST OF TABLES	vii
LIST OF FIGURES	viii
CHAPTER 1: Introduction	1
Literature Review.....	1
Disparities of Adolescent Obesity Prevalence.....	12
Factors Influencing Adolescent Obesity.....	16
Interventions and Outcomes	30
Rationale	36
Research Questions and Hypotheses	37
Chapter 2: Methods.....	38
Pink and Dude Chefs Program.....	38
Program Implementation	42
Participant Recruitment	42
Procedures.....	42
Materials	49
Data Coding	54
Statistical Analysis.....	59
Institutional Review Board and Ethical Clearance	59
Chapter 3: Results	61
Chapter 4: Discussion	72
Strengths and Limitations	81
Chapter 5: Conclusions	85
Works Cited	86
Appendices.....	95
APPENDIX A: Online Training Volunteer Timeline.....	I
APPENDIX B: Participant Recruitment Flyer	V
APPENDIX C: Lesson Plan Example	VI
APPENDIX D: Recipe Example	XII
APPENDIX E: Lesson Evaluation Example	XIII
APPENDIX F: Survey Instrument.....	XV
APPENDIX G: Data Coding Table	XXV
APPENDIX H: Informed Consent Form	XXXIII
APPENDIX I: Informed Assent Form.....	XXXVI

LIST OF TABLES

<u>Table 1</u> Weight status category and percentile range for childhood BMI <i>adapted from</i> (National Center for Chronic Disease Prevention and Health Promotion: Division of Nutrition, Physical Activity and Obesity, 2011).	3
<u>Table 2</u> Adverse medical conditions associated with childhood obesity <i>adapted from</i> (Daniels, et al., 2005).	4
<u>Table 3</u> Lesson plans and objectives for Pink and Dude Chefs program.	44
<u>Table 4</u> Recipes for Pink and Dude Chefs program.	47
<u>Table 5</u> Pink and Dude Chefs survey instrument sections, corresponding research questions, and sample questions.	53
<u>Table 6</u> Confounding variables measured in the Pink and Dude Chefs survey instrument and sample questions.	54
<u>Table 7</u> Percent (number) of individual level characteristics of the sample from Arroyo Grande and Carpinteria.	62
<u>Table 8</u> Mean fruit preference score from pre- and post-survey and change in mean fruit preference score.	63
<u>Table 9</u> Mean vegetable preference score from pre- and post-survey and change in mean vegetable preference score.	64
<u>Table 10</u> Mean fruit and vegetable intake from pre- and post-survey and change in mean fruit and vegetable intake.	66
<u>Table 11</u> Mean culinary confidence score in pre- and post-survey and change in mean culinary confidence score.	67
<u>Table 12</u> Mean nutrition knowledge score from pre- and post-survey and change in mean nutrition score.	68
<u>Table 13</u> Influences on nutrition behavior in pre- and post-survey and change in influences on nutrition behavior.	70
<u>Table 14</u> Mean nutrition self-efficacy score in pre- and post-survey and change in mean nutrition self-efficacy score.	71

LIST OF FIGURES

<u>Figure 1 Increased probability of obesity in young adulthood (21-29 years) according to obesity status from 6-9, 10-14, and 15-17 years adapted from (Whitaker, Pepe, Sedel, & Dietz, 1997).</u>	<u>6</u>
<u>Figure 2 Odds ratios of overweight at 35 years for 13 year old boys and girl with BMI values in the 95th percentile compared to BMI values in the 75th and 50th percentiles adapted from (Guo, Roche, Chumlea, Gardner, & Siervogel, 1994).</u>	<u>7</u>
<u>Figure 3 Association between childhood BMI (kg/m2) and obesity in adulthood adapted from (Freedman D. S., Khan, Dietz, Srinivasan, & Berenson, 2001).</u>	<u>8</u>
<u>Figure 4 Risk of mortality associated with male increasing weight adapted from (Van Itallie, 1979).</u>	<u>9</u>
<u>Figure 5 Risk of mortality associated with female increasing weight adapted from (Van Itallie, 1979).</u>	<u>10</u>
<u>Figure 6 Projections of obesity-attributable medical savings based on obesity prevalence in 2030 compared to the projected estimate of 42.2% population prevalence, adapted from (Finkelstein, et al., 2012).</u>	<u>12</u>
<u>Figure 7 Prevalence of adolescent obesity in the US, 2005-2008: non-Hispanic black, Hispanic, and non-Hispanic White adapted from (Centers for Disease Control and Prevention. National Center for Health Statistics., 2005-2008).</u>	<u>13</u>
<u>Figure 8 Association between total family income and weight status of adolescents, 12-19 years adapted from (Peart, Mondragon, Rohm-Young, Bronner, & Hossain, 2011).</u>	<u>16</u>
<u>Figure 9 Mean percent correct nutrition knowledge scores by sex and ethnicity adapted from (Beech, Rice, Johnson, & Nicklas, 1999).</u>	<u>17</u>
<u>Figure 10 Trends in adolescent (12-18y) energy intake by meal pattern type adapted from (Nielsen, Siega-Riz, & Popkin, 2002).</u>	<u>20</u>
<u>Figure 11 Fat intake by meal type adapted from (Jahns, Siega-Riz, & Popkin, 2001).</u>	<u>21</u>
<u>Figure 12 Prevalence of fruit and vegetable intake in cohort of students from 3rd to 8th grade adapted from (Lytle, Seifert, Greenstein, & McGovern, 2000).</u>	<u>22</u>
<u>Figure 13 Percentage of adolescents meeting USDA recommendations for vegetable intake by race/ethnicity adapted from (Xie, Gilliland, Li, & Rockett, 2003).</u>	<u>23</u>
<u>Figure 14 Percentage of adolescents meeting USDA recommendations for fruit intake by race/ethnicity adapted from (Xie, Gilliland, Li, & Rockett, 2003).</u>	<u>24</u>
<u>Figure 15 Percentage of Kentucky middle school students that consumed at least one fruit or vegetable a day adapted from (Roseman, Yeung, & Nickelson, 2007).</u>	<u>25</u>
<u>Figure 16 Percentage of adolescent (12-18y) energy intake by source adapted from (Nielsen, Siega-Riz, & Popkin, 2002).</u>	<u>27</u>
<u>Figure 17 Male adolescent mean daily food intake by frequency of assisting in dinner food preparation per week adapted from (Larson, Eisenberg, & Neumark-Sztainer, 2006).</u>	<u>29</u>

<u>Figure 18 Female adolescent mean daily food intake by frequency of assisting in dinner food preparation per week adapted from (Larson, Eisenberg, & Neumark-Sztainer, 2006).</u>	<u>29</u>
<u>Figure 19 Fruit and vegetable preference scores from pre- and post-survey.....</u>	<u>65</u>

CHAPTER 1: Introduction

Literature Review

Adolescent Obesity Epidemic

The World Health Organization has characterized obesity as a condition of excess body fat with comorbidities of coronary heart disease, hypertension and stroke, certain types of cancer, non-insulin-dependent diabetes mellitus, gallbladder disease, dyslipidemia, osteoarthritis and gout, and pulmonary diseases (World Health Organization, 2000). In the United States, the prevalence of obesity in adolescents, defined as the age span between 13 and 18 years, tripled from 5% to 18% between 1976 and 2009 (Alberga, Sigal, Prud'homme, & Kenny, 2012). From 1976-1980 and 2003-2004, the prevalence of adolescent obesity increased at a rate of about 0.5% annually. The average Body Mass Index [BMI] increased by 2 kg/m^2 between the data collection period of 1971-1974 and the data collection period of 1999-2002. The rate of increasing BMI was slower than the rate of obesity prevalence. This indicates that the largest increase in BMI took place at the upper end of the distribution (Wang & Beydoun, 2007). Thus, a majority of the increase in BMI over the past 40 years occurred in the upper distribution of BMI ranges. The ever-increasing prevalence of adolescent obesity, coupled with the increasing weight status among those adolescents at the extreme end of the obesity spectrum, indicates a failure in adolescent obesity prevention and treatment efforts.

Measures of Obesity

'Overweight' and 'obese,' as used in the current study will refer to the Centers for Disease Control (CDC) standards of BMI assessment in children. BMI is a quantifiable

measurement of anthropometric indices that allows for interpretation of weight in the context of height (kg/m^2) (WHO Expert Committee, 1995). BMI does not directly measure body composition and so is not an exact indicator of obesity, which refers to excess body fat. The justification for using BMI as a proxy for obesity is that there is an association with greater weight status, adjusted for height, and increased body fat (Flegal, et al., 2009). The benefit of using BMI as an indicator of obesity is that it is easily calculated, fast, and inexpensive. Moreover, it is as reliable a method of determining fatness in populations as the triceps skinfold thickness test (Dietz, 1998). Body mass index is the most widely accepted tool for assessing nutritional status due to its simplicity, cost-effectiveness, and accuracy (Mei, et al., 2002). There have been misgivings that BMI cannot accurately predict fat mass in adolescents due to fluctuating growth periods. However, BMI has been shown to be associated with total body fat as measured by the gold standard method of dual-energy x-ray absorptiometry (DXA) for boys aged 5-19 years with a correlation coefficient of $R^2 = 0.85$, and girls aged 5-19 years, $R^2 = 0.89$ (Pietrobelli, et al., 1998).

In contrast to BMI assessment for adults, childhood BMI takes into account sex and age of the child. To obtain childhood BMI percentile values, BMI is placed in a sex specific CDC BMI-for-growth chart and a percentile ranking is given to show where the child's BMI falls in relation to a reference group of children of the same sex and age that meet normal growth expectations (National Center for Chronic Disease Prevention and Health Promotion: Division of Nutrition, Physical Activity and Obesity, 2011). Age- and sex-specific BMI screening has been validated by average skinfold thickness and fat mass measured by DXA to be more accurate at predicting overweight than the Rohrer Index

[RI; wt (kg) / ht³ (m)] and weight-for-height screening in children 2-19 years (Mei, et al., 2002). The BMI percentile can then be evaluated according to the different weight status categories of ‘underweight,’ ‘healthy weight,’ ‘overweight,’ and ‘obese’ as outlined in **Table 1** (National Center for Chronic Disease Prevention and Health Promotion: Division of Nutrition, Physical Activity and Obesity, 2011). The percentile evaluation method is widely used and accepted in clinical and research settings because it is easy to interpret and based on readily accessible height and weight anthropometric measurements (WHO Expert Committee, 1995). Childhood BMI percentile values based on age- and sex-specific growth charts will be used throughout the current study as a marker of adiposity.

Table 1. Weight status category and percentile range for childhood BMI *adapted from* (National Center for Chronic Disease Prevention and Health Promotion: Division of Nutrition, Physical Activity and Obesity, 2011).

Weight Status Category	Percentile Range
Underweight	< 5 th percentile
Healthy Weight	5 th percentile to < 85 th percentile
Overweight	85 th percentile to < 95 th percentile
Obese	≥95 th percentile

Consequences of Adolescent Obesity

As Adolescents

The physiological changes inherent to the adolescent period, coupled with significant behavioral changes that can impact health, put adolescents at a greater risk for becoming overweight or obese than younger children (Alberga, Sigal, Prud'homme, & Kenny, 2012). This increased risk of overweight and obesity is important because obesity in adolescence increases the risk of comorbidities including bone fractures, hypertension, cardiovascular disease, insulin resistance and psychological problems (World Health

Organization, 2011). The American Heart Association concluded that childhood obesity is associated with adverse metabolic, orthopedic, cardiovascular, psychological, neurological, hepatic, pulmonary, and renal conditions (**Table 2**) (Daniels, et al., 2005). These disorders are significant because they put overweight and obese adolescents at increased risk of significant morbidity and premature mortality.

Table 2 Adverse medical conditions associated with childhood obesity *adapted from* (Daniels, et al., 2005).

Metabolic	Type 2 diabetes mellitus
	Metabolic syndrome
Orthopedic	Slipped capital femoral epiphysis
	Blount's disease
Cardiovascular	Dyslipidemia
	Hypertension
	Left ventricular hypertrophy
	Atherosclerosis
Psychological	Depression
	Poor quality of life
Neurological	Pseudotumor cerebri
Hepatic	Nonalcoholic fatty liver disease
	Nonalcoholic steatohepatitis
Pulmonary	Obstructive sleep apnea
	Asthma (exacerbation)
Renal	Proteinuria

Into Adulthood

In 2010, the prevalence of adult obesity was estimated to be 35.7% of the US adult population (Ogden C. L., Carroll, Kit, & Flegal, 2012). By 2030 it is projected that this will increase to 42% of the overall adult population, with 11% being severely obese (Finkelstein, et al., 2012). Obese children and adolescents are at increased risk of remaining obese into adulthood. A cohort study of children tracked from birth showed that those who were obese at age 6-17 years had more than 50% chance of being obese in young adulthood, compared to a 10% chance for children at a healthy weight. Obese

children aged 6-9 years had a 10.3% increased risk, [95% Confidence Interval (CI) 6.2-17.3], of obesity in young adulthood; children aged 10-14 years had a 28.3% increased risk, [95% CI 15.0-53.5], of obesity in young adulthood; and adolescents aged 15-17 years had a 20.3% increased risk, [95% CI 10.4-39.6], of obesity in young adulthood. The probability of obesity in young adulthood was observed to be greater as the severity of measured childhood and adolescent obesity increased. Also, the probability of obesity in young adulthood increased with the age of observed obesity so that adolescents with more severe obesity had a greater risk of obesity in young adulthood than obese children. Very obese children aged 6-9 had an 18.5% increased chance, [95% CI 8.8-38.8], of obesity in young adulthood, children aged 10-14 years had a 44.3% increased chance, [95% CI 16.3-120], of obesity in young adulthood, and adolescents aged 15-17 years had a 32.5% increased chance, [95% CI 13.1-80.6], of obesity in young adulthood (**Figure 1**) (Whitaker, Pepe, Sedel, & Dietz, 1997). It should be noted that the measures of obesity in the Whitaker, Pepe, Sedel, and Dietz study differ from the CDC guidelines for categorizing childhood obesity (**Table 1**). In the study outlined above, ‘obesity’ was defined as BMI equal to or greater than the 85th percentile and ‘very obese’ was defined as BMI equal to or greater than the 95th percentile. According to these parameters, the classification of ‘obesity’ would be assigned to children or adolescents that would be categorized as ‘overweight’ by the CDC guidelines and the classification of ‘very obese’ would be assigned to children or adolescents that would be categorized as ‘obese’ by the CDC guidelines. The difference in classification of weight status in this study may have resulted in an underestimation of obesity risk. If the measures of obesity, used by the study outlined above, had aligned with the CDC guidelines, the results may have shown

that overweight and obese adolescents were at even greater risk for obesity in young adulthood than the analysis indicated.

Figure 1 Increased probability of obesity in young adulthood (21-29 years) according to obesity status from 6-9, 10-14, and 15-17 years *adapted from* (Whitaker, Pepe, Sedel, & Dietz, 1997).

According to Whitaker, Pepe, Sedel, & Dietz, the odds ratios for obesity in young adulthood were greatest if an adolescent was first determined to be obese between the ages of 10-14 years (Whitaker, Pepe, Sedel, & Dietz, 1997). This age range has also been observed in other studies to be an important indicator of adulthood obesity. A review of four longitudinal studies tracking the BMI of 555 white children into adulthood found that BMI at age 13 years was a good predictor of adulthood overweight, and had better sensitivity and specificity than BMI at younger ages (Guo, Roche, Chumlea, Gardner, & Siervogel, 1994). Boys aged 13 years with a BMI in the 95th percentile were 2.57 [95% CI 1.76-3.75] times more likely to be overweight at age 35 years than those with a BMI in the 75th percentile. Boys aged 13 years with a BMI in the 95th percentile were 8.39 [95% CI 3.59, 19.61] times more likely to be overweight at age 35 years compared to 13 year old boys with a BMI in the 50th percentile. Girls aged 13 years with

a BMI in the 95th percentile were 2.04 [95% CI 1.41, 2.96] times more likely to be overweight at age 35 compared to those with a BMI in the 75th percentile. Girls in the 95th percentile were 5.00 [95% CI 2.17, 11.52] times more likely to be overweight at age 35 years than those with a BMI in the 50th percentile (**Figure 2**).

Figure 2 Odds ratios of overweight at 35 years for 13 year old boys and girl with BMI values in the 95th percentile compared to BMI values in the 75th and 50th percentiles *adapted from* (Guo, Roche, Chumlea, Gardner, & Siervogel, 1994).

The Bogalusa Heart Study followed over 2,500 Louisianan children into adulthood in order to determine if increased childhood BMI was associated with adult obesity.

Weight, lipid panels, blood pressure, and insulin levels were measured at age 10, 17, and 37 years. Approximately 77% of those who were obese in childhood remained obese into adulthood whereas only 7.0% of normal-weight children became obese adults. In addition to this, overweight children had higher BMI as adults compared to their counterparts that had become obese after childhood. Obese adults that had been overweight as children had, on average, 4.9 kg/m² greater BMI than obese adults that had

a normal weight during childhood (**Figure 3**) (Freedman D. S., Khan, Dietz, Srinivasan, & Berenson, 2001).

Figure 3 Association between childhood BMI (kg/m^2) and obesity in adulthood *adapted from* (Freedman D. S., Khan, Dietz, Srinivasan, & Berenson, 2001).

Greater BMI values are significant to health status because as weight increases above optimal levels, risk of mortality also increases and becomes even more pronounced as the level of overweight or obesity increases. Comprehensive studies, now classics in the field of obesity epidemiology, undertaken by three life insurance companies to evaluate the association between weight and mortality risk observed that overweight ($\text{BMI} \geq 27.8 \text{ kg/m}^2$ for men and $\text{BMI} \geq 27.3 \text{ kg/m}^2$ for women) was associated with increased mortality. The Build and Blood Pressure Studies tracked more than 4,500,000 men and women between 1954 and 1973 and the American Cancer Society's study tracked 1,000,000 men and women from 1959-1973 (Van Itallie, 1979). The risk of mortality increased by 50 percentage points from 107% to 167% when measured weight increased from '10% overweight' to '60% overweight' (**Figures 4 and 5**) (Van Itallie, 1979). It has been suggested that the risk of mortality may

have been underestimated in these studies because the data did not include persons diagnosed with diabetes, hypertension, or other significant cardiovascular diseases (Van Itallie, 1979). It has also been suggested that the Build and Blood Pressure Studies of 1959 and 1979 underestimated the risk of mortality in those who were overweight because it did not control for smokers, who tend to be underweight (Pi-Sunyer, 1991). Also, while the studies examined mortality, they did not examine the comorbidities common in overweight and obesity. It should be noted that these studies were conducted between 30 and 50 years ago. However, the Build and Blood Pressure Studies of 1959 and 1979 and the American Cancer Society's studies are valuable in the size of the study sample and the length of the study timeframe.

Figure 4 Risk of mortality associated with male increasing weight *adapted from* (Van Itallie, 1979).

Figure 5 Risk of mortality associated with female increasing weight *adapted from* (Van Itallie, 1979).

Economic Impact of Adolescent Obesity

The health consequences of adolescent obesity are forecast to result in 161 million life-years afflicted with obesity, diabetes, or coronary heart disease and 1.5 million life-years lost to premature mortality (Lightwood, et al., 2009). However, the impacts of adolescent obesity extend beyond the physiological ramifications and also result in profound economic consequences. Increased health care expenditures due to the comorbidities associated with childhood and adolescent obesity have resulted in an excess \$14.1 billion dollars in medical costs annually (Trasande & Chatterjee, 2009). Descriptive, bivariate, and multivariable analyses conducted on data from 6- to 19-year olds in the 2002-2005 Medical Expenditure Panel Survey (MEPS) found that children and adolescents who were obese during the two year data collection period had an increase of \$114 per person [97.5% CI: 34-182], $p < 0.025$, in prescription drug expenditures, \$194 per person [97.5% CI: 116-338], $p < 0.025$, in outpatient visit expenditures, and \$12 per person [97.5% CI: 3-32], $p < 0.025$, in emergency room expenditures. This equates to a national

increase of \$3.3 billion [97.5% CI: \$975 million-5.2 billion] in prescription drug expenditures, \$5.6 billion [97.5% CI: \$3.3-9.8 billion] in outpatient visit expenditures, and \$356 million [97.5% CI: \$78-910 million] in emergency room expenditures.

The future costs related to adolescent obesity have also been estimated. Between 2020 and 2050, adolescent obesity is projected to cost \$46 billion in increased medical bills and \$208 billion in lost wages and decreased productivity due to the obesity-related illness and/or premature death that is likely to afflict obese adolescents into adulthood (Lightwood, et al., 2009).

Significant savings in obesity-attributable medical expenditures can be attained with modestly successful obesity prevention strategies. Nonlinear regression models were constructed to estimate three different resulting scenarios from obesity prevention efforts, as would be seen in the year 2030. The prevalence of adult obesity is predicted to be 42.2% by the year 2030. However, if current day adolescent obesity prevention efforts result in a one percentage point reduction from the obesity prevalence prediction of the future, and the prevalence of adult obesity was instead 41.2% by the year 2030, obesity-attributable medical expenditures would decrease by \$84.9 (± 9.3) billion. If obesity prevalence were to remain at 2010 levels, 30.9%, obesity-attributable medical expenditures would be \$549.5 (± 60) billion lower than the 2030 estimate. More dramatically, if obesity prevalence in 2030 met the Healthy People 2010 target for obesity, 15%, the obesity-attributable medical expenditures would be \$1.9 trillion lower than the 2030 estimate of 42.4% (**Figure 6**) (Finkelstein, et al., 2012). In order to realize these medical savings, or even make progress towards them, adolescents today must be

targeted with obesity prevention efforts so that the forecast trends of future obese adult populations may be reduced.

Figure 6 Projections of obesity-attributable medical savings based on obesity prevalence in 2030 compared to the projected estimate of 42.2% population prevalence, *adapted from* (Finkelstein, et al., 2012).

Disparities of Adolescent Obesity Prevalence

The prevalence of adolescent obesity has dramatically increased over the past forty years, placing American youth at significantly increased risk for heart disease, diabetes, high blood pressure, and high cholesterol (Galson, 2008). However, the risk of obesity is not the same for all adolescents. There are marked disparities among adolescents of different race/ethnicity and socioeconomic status (SES) groups.

Race/ethnicity and SES in the United States are highly correlated. For example, individual-level and institutional racism within the United States has negatively impacted the health status of minority racial/ethnic groups by limiting the prospects for economic advancement and restricting housing prospects to poor neighborhoods. It is important to note that race/ethnicity remains an independent risk factor in most analyses even after

adjustment for SES (Williams, 2006). While it is difficult to tease apart the impact of SES from race/ethnicity, it is worthwhile to conduct stepwise statistical models that adjust for various socioeconomic and demographic factors separately in order to estimate the approximate impacts of each. Whereas it is not within the scope of the current project to comprehensively review these associations, other researchers have investigated this issue in depth (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010) (Williams & Mohammed, 2009).

Weight and Race/Ethnicity

Prevalence of adolescent obesity varies dramatically between racial/ethnic groups. According to the National Health and Nutrition Examination Survey (NHANES) 2005-2008, 24.2% of non-Hispanic black/African American and 23.8% of Hispanic/Latino adolescents were obese compared to 15.1% of non-Hispanic/Latino white adolescents (**Figure 7**) (Centers for Disease Control and Prevention. National Center for Health Statistics., 2005-2008).

Figure 7 Prevalence of adolescent obesity in the US, 2005-2008: non-Hispanic black, Hispanic, and non-Hispanic White *adapted from* (Centers for Disease Control and Prevention. National Center for Health Statistics., 2005-2008).

Between 1988 and 2008, the prevalence of obesity increased in all racial/ethnic categories: Hispanic, Non-Hispanic black, and Non-Hispanic white adolescents aged 12-19 years. However, the prevalence of obesity increased at a higher rate for Hispanic and Non-Hispanic black adolescents. The prevalence of obesity increased by 12.7% in Hispanic and by 9.1% in Non-Hispanic black male adolescents, compared to an increase of 5.1% in Non-Hispanic White male adolescents. The prevalence of obesity in female adolescents increased by 12.9% in Non-Hispanic black adolescents, compared to an increase of 5.6% in Hispanic and 4% in Non-Hispanic white adolescents (Ogden & Carroll, 2010).

The causes of the disparities observed in adolescent obesity among various racial/ethnic groups are not clear. They are, however, significant because they provide evidence that different factors contribute to increasing obesity rates between different races/ethnicities (Freedman D. S., Khan, Serdula, Ogden, & Dietz, 2006). The differences in obesity rates and disparities between obesity trends among white, Hispanic, and black adolescents highlight the need for culturally appropriate obesity prevention and treatment approaches (Wang & Beydoun, 2007). Obesity prevention programs should address sociocultural needs and differences among racial/ethnic groups by appealing to participants' culturally driven values and lifestyles (Kaufman & Karpoti, 2007). It is also important to improve access to affordable, healthful foods at the community-wide level and to increase exposure to different foods and flavor profiles.

Weight and Socioeconomic Status

Association Between Obesity and Socioeconomic Status

There are also disparities in obesity rates between adolescents in different socioeconomic groups. Adolescents from families with lower family income have been observed to have a higher prevalence of obesity. Between the years 2005-2008, adolescents from families with household incomes below 100% of the Federal Poverty Limit (FPL) had an obesity prevalence of 23.1% compared to 10.8% of adolescents in families with an income over 500% of the FPL (Centers for Disease Control and Prevention. National Center for Health Statistics., 2005-2008). Adolescents from families with a total family income of \$0-24,990 had an obesity prevalence of 20.3% compared to 13.3% of adolescents in families with a total family income above \$55,000 (**Figure 8**) (Peart, Mondragon, Rohm-Young, Bronner, & Hossain, 2011).

Disparities in the prevalence of adolescent obesity between different groups of family income levels may be partially explained by other socioeconomic factors. Parental education level is widely accepted as a reliable index of household socioeconomic status and has been inversely associated with lower levels of other health-related risk factors such as smoking (Winkleby, Jatulis, Frank, & Fortmann, 1992). Parental education level is hypothesized to influence adolescent weight status due through a general positive association between education and health conscious behavior (Xie, Gilliland, Li, & Rockett, 2003).

Figure 8 Association between total family income and weight status of adolescents, 12-19 years
adapted from (Peart, Mondragon, Rohm-Young, Bronner, & Hossain, 2011).

In sum, disparities in the prevalence of adolescent obesity according to race/ethnicity and SES are stark. Obesity prevention and treatment interventions should account for these differences in intervention design and strategies for implementation. Cultural and lifestyle factors related to SES must be considered in obesity prevention and treatment interventions, at both the individual and community-wide level, in order to properly address barriers to change and motivation to adopt new behaviors.

Factors Influencing Adolescent Obesity

It is necessary to fully understand modifiable factors that may act as barriers to obesity prevention in order to implement strategies for successful interventions.

Nutrition Knowledge

Across all ethnicities, high school students display poor basic nutrition knowledge. In a study conducted among more than 2,000 high school students in the New Orleans area,

participants were only able to correctly answer 39% of 22 questions designed to assess basic nutrition knowledge (Beech, Rice, Johnson, & Nicklas, 1999). Despite the widespread lack of nutrition knowledge observed among adolescents as a whole, disparities do exist and nutrition knowledge is lower among non-White groups. White male adolescents answered 37.0% of nutrition knowledge questions correctly while African-American male adolescents answered 30.7% correctly. White female adolescents answered 41.2% of nutrition knowledge questions correctly while African-American female adolescents answered 36.8% correctly (Figure 9).

Figure 9 Mean percent correct nutrition knowledge scores by sex and ethnicity *adapted from* (Beech, Rice, Johnson, & Nicklas, 1999).

Lack of nutrition knowledge is significant because understanding good nutrition increases the ability to adopt healthy nutrition habits and it has been cited as a reason for not improving dietary behavior (Gracey, Stanley, Burkey, Corti, & Beitlin, 1996). When surveyed as to what barriers prevented them from improving their dietary behaviors, 83.5% of adolescents responded that the main reason for not changing poor dietary habits

was because “[they didn’t] know which foods were best to reduce sugar and fat”.

Moreover, four of the top ten reasons given involved lack of nutrition knowledge; 81.5 % of participants did not know the fiber content in foods, 77.9% of participants did not know how many calories are in different foods, and 70.2% did not know how much they should be eating. It is therefore critical for obesity prevention strategies to increase nutrition knowledge in adolescent populations.

Nutrition knowledge has been observed to have a positive relationship with improved eating behavior in seventh and eighth grade students. In a study of 532 middle school students in Ohio, boys and girls were asked to complete a questionnaire measuring their nutrition knowledge and eating behaviors (Pirouznia, 2001). Using Pearson correlation coefficients, there was a positive correlation, $r = 0.20$ ($p = 0.006$), between nutrition knowledge and healthy food choices among seventh and eighth grade females. Nutrition knowledge may therefore be an important factor in adolescents’ healthful dietary decisions.

However, it is unlikely that nutrition knowledge alone is associated with an increased risk of overweight or obesity. A questionnaire administered to three urban high schools in Pennsylvania found general nutrition knowledge to be poor throughout the school population and no significant difference between obese and non-obese students’ nutrition knowledge. Of the items designed to test students’ understanding of the Food Guide Pyramid, food knowledge adapted from the National Health Interview Survey, and food-related behaviors, non-obese students answered a higher percentage of questions correctly than obese students except for one question regarding high-fiber foods.

Although not statistically significant, these findings may suggest a gap in nutrition knowledge between obese and non-obese adolescents.

There is limited research in the United States regarding the associations between nutrition knowledge and adolescent weight status but the relationship between the two has been observed internationally. Over 500 Brazilian schoolchildren were surveyed on nutrition knowledge and, while not statistically significant, there was an association between obesity and lack of nutrition knowledge (Triches & Giugliani, 2005). Questions were general and ranged from sources of specific nutrients to knowledge regarding which foods were healthier. Among non-obese children, 91.2% answered eight or more of the twelve questions correctly while only 8.8% of obese children answered eight or more questions correctly. Multiple logistic regression models were employed to ascertain the interactions between variables and it was observed that children with less nutrition knowledge and less healthy eating habits were 5.0 times more likely, [95% CI 1.1-24.9], to be obese than children with more nutrition knowledge and better eating habits. Regardless of whether nutrition knowledge is directly associated with overweight or obesity, there is a clear relationship between nutrition knowledge and dietary behaviors. In obesity prevention efforts, nutrition knowledge must be addressed as an essential first step in health promotion.

Dietary Behaviors

A systematic review of studies from the US and UK that focused on possible determinants of childhood obesity found behavioral risk factors to include high energy density diets, high consumption of sugar-sweetened beverages, large portion sizes of foods, and eating patterns (Rennie, Johnson, & Jebb, 2005). Average total caloric intake

by adolescents increased by 208 kcal/day between the years 1977 and 1996. The majority of the increased caloric consumption, 191 kcals (92%), was a result of increased snacking (**Figure 10**) (Nielsen, Siega-Riz, & Popkin, 2002). The pattern of food intake as meals or snacks is significant because increased food intake as snacks has been associated with an increased consumption of total calories and fat. The energy density of snacks is typically greater than foods eaten at meals (0.14-0.20 kcal/g of food) and fat density of snacks has increased since 1977 while fat density from foods eaten at meals has decreased. The grams of fat from foods eaten at meals decreased from 70.52g in 1977 to 65.52g in 1996 while grams of fat from snack foods increased from 15.48g in 1977 to 18.48g in 1996 (**Figure 11**) (Jahns, Siega-Riz, & Popkin, 2001).

Figure 10 Trends in adolescent (12-18y) energy intake by meal pattern type *adapted from* (Nielsen, Siega-Riz, & Popkin, 2002).

Figure 11 Fat intake by meal type *adapted from* (Jahns, Siega-Riz, & Popkin, 2001).

Fruit and Vegetable Intake

Vegetable and fruit consumption has been shown to decrease by 25% and 41%, respectively, as children enter adolescence. From third to eighth grade, the prevalence of students eating at least one quarter cup of vegetables and one quarter cup of fruit per day declined from 56.1% to 41.6% and 64.6% to 37.1%, respectively (**Figure 12**) (Lytle, Seifert, Greenstein, & McGovern, 2000). According to self-report on the Youth/Adolescent Questionnaire (YAQ) in the Children's Health Study, out of 3,201 adolescents, 6.5% met the USDA recommendations for ≥ 4 servings of vegetables and 18.5% met the USDA recommendations for ≥ 3 servings of fruit (Xie, Gilliland, Li, & Rockett, 2003). An analysis of 2003-2004 NHANES showed that less than 1% of adolescents met both fruit and vegetable serving recommendations with 6.2% of adolescents meeting fruit recommendations and 2.2% meeting vegetable recommendations, not counting fried potatoes (Kimmons, Gillespie, Seymour, Serdula, & Blanck, 2009).

Figure 12 Prevalence of fruit and vegetable intake in cohort of students from 3rd to 8th grade adapted from (Lytle, Seifert, Greenstein, & McGovern, 2000).

Disparities in Fruit and Vegetable Intake

There are disparities in fruit and vegetable intake among adolescents belonging to different racial/ethnic groups. Hispanic adolescents have reported significantly lower intakes of vegetables than other adolescent groups; 4.2% of Hispanic adolescents met the USDA recommendation of vegetable intake compared to 7.0% of non-Hispanic white, 10.1% black, and 9.5% Asian adolescents (**Figure 13**) (Xie, Gilliland, Li, & Rockett, 2003). In contrast, non-Hispanic white adolescents reported significantly lower fruit consumption than other adolescent race/ethnic groups; 16.1% of non-Hispanic white adolescents met the USDA recommendation of fruit intake compared to 22.5% of Asian, 22.4% of Hispanic, and 21.0% of black adolescents (**Figure 14**) (Xie, Gilliland, Li, & Rockett, 2003). The authors speculated that the variability in fruit and vegetable consumption between adolescents of different races/ethnicities may be due to cultural dietary habits. It is also possible that the correlation between SES and race/ethnicity

observed in this sample confounded the association with fruit and vegetable intake (Xie, Gilliland, Li, & Rockett, 2003). This is in agreement with a systematic review of 58 articles analyzing the role of environmental factors that may influence childhood and adolescent obesity-related dietary behaviors. In all of the studies using parental education as an indicator of childhood and adolescent fruit and vegetable intake, it was found that parental education was significantly positively associated with childhood and adolescent fruit and vegetable intake (van der Horst, et al., 2007). As such, it is difficult to overstate the impact of SES on obesity related outcomes in children.

Figure 13 Percentage of adolescents meeting USDA recommendations for vegetable intake by race/ethnicity *adapted from* (Xie, Gilliland, Li, & Rockett, 2003).

Figure 14 Percentage of adolescents meeting USDA recommendations for fruit intake by race/ethnicity *adapted from* (Xie, Gilliland, Li, & Rockett, 2003).

Insufficient fruit and vegetable intake is significant because they are important sources of nutrient-dense foods and because healthy weight adolescents report eating more fruit and vegetables than those who are overweight or at risk of being overweight. Of healthy weight adolescents, 16.6% reported eating vegetables at least once a day, compared to 11.9% of adolescents at risk of being overweight and 10.2% of adolescents were overweight, $p < 0.001$ (**Figure 15**) (Roseman, Yeung, & Nickelson, 2007). A similar trend was observed with fruit consumption: 20.8% of healthy weight adolescents reported eating fruit at least once a day compared to 15.6% of adolescents at risk of being overweight and 15.0% of adolescents who were overweight, $p < 0.001$ (**Figure 15**) (Roseman, Yeung, & Nickelson, 2007).

Figure 15 Percentage of Kentucky middle school students that consumed at least one fruit or vegetable a day *adapted from* (Roseman, Yeung, & Nickelson, 2007).

Fruit and vegetable intake has also been shown to track into young adulthood, increasing the risk of adulthood obesity and associated comorbidities. Longitudinal tracking of over 2,000 students in 6th grade found that adolescents measuring in the lowest quintiles of healthy food preferences remained in the lowest quintiles into adulthood (Kelder, Perry, Klepp, & Lytle, 1994). In a 24-year longitudinal study, adolescents at age 13 who met the recommended fruit intake were found to be 6.02 times more likely, [95% CI 3.29, 11.0], to meet the recommended fruit intake at age 36 than those who did not meet the recommendations. Adolescents at age 13 who met the recommended vegetable intake were found to be 2.33 times more likely, [95% CI 1.40, 3.86], to meet the recommended vegetable intake at age 36 than those who did not meet the recommendations (te Velde, Twisk, & Brug, 2007). This indicates that interventions targeting dietary behavior should begin early in adolescence before habits are cemented and the potential for lifelong change is greater.

Source of Food

In the past 36 years, there have also been significant changes in the locations where adolescents obtain their food. Analysis of data from the Continuing Survey of Food Intakes by Individuals administered by the USDA in 1977-78 and 1994-96 using the 24-hour recall method showed a decrease in energy intake from foods prepared at home and an increase in energy intake from foods prepared outside the home. Between the years 1977 and 1996 males aged 12-17 years increased energy intake from foods prepared outside the home from 20%-35% and females aged 12-17 years increased energy intake from foods prepared outside the home from 22%-35% (Guthrie, Lin, & Frazao, 2002).

The increase in energy intake from foods prepared outside the home was primarily a result of increased intake from fast/food and restaurant locations. For children aged 2-17 years, the percentage of total calories from foods prepared at school decreased from 11%-9% between 1977 and 1996 while the percentage of total calories from foods prepared at fast food, restaurant, and other away-from-home locations increased from 9% to 22%, based on 24-hour recall (Guthrie, Lin, & Frazao, 2002). Of the foods sourced from locations outside of the home, energy intake was greatest from foods sourced at fast food locations; adolescent self-reporting showed an increase, from 6.5% to 19.3%, of total energy intake from restaurants or fast food locations between 1977 and 1996 (**Figure 16**) (Nielsen, Siega-Riz, & Popkin, 2002).

Figure 16 Percentage of adolescent (12-18y) energy intake by source *adapted from* (Nielsen, Siega-Riz, & Popkin, 2002).

The source of adolescent diet is significant because foods sourced away from home contain 6% more calories from fat, 2% more calories from saturated fat and are lower in vitamins, minerals, and fiber (Lin, Frazao, & Guthrie, 1999). The increased caloric density of these foods may have a detrimental impact on weight status as evidenced by the association between fast food consumption and BMI that has been observed in young adults. Cross-sectional associations in a 15 year study on young adults showed that an increase in the consumption of fast food by one time per week was associated with a 0.13 kg/m² increase in BMI, [95% CI: 0.04, 0.22], at year seven of the study and a 0.24 kg/m² increase in BMI, [95% CI: 0.13, 0.34] at year 10 of the study. It is thus necessary to address the source of foods in adolescents' diet in order to mitigate the potential effects on weight and BMI.

Culinary Skill

Involvement in food preparation and food shopping affects dietary patterns of young people. Adolescents that reported being involved in food preparation and food shopping showed a decreased intake of fat and fried foods, an increased intake of fruits and vegetables, and decreased soda consumption compared to peers that reported low levels of food preparation and food shopping involvement. Adolescents who reported assisting in food preparation for dinner seven times in the past week had about 0.8 more servings of fruit per day, $p < 0.01$, and 0.5 more servings of vegetables per day, $p = 0.05$, for males and 0.7 more servings of fruit per day, $p < 0.01$, and 0.6 more servings of vegetables per day, $p < 0.01$, for females than students who did not assist in food preparation for dinner in the past week (**Figures 17 and 18**) (Larson, Eisenberg, & Neumark-Sztainer, 2006). Participation in food preparation behaviors tracks over time and can influence dietary habits into adulthood. Adolescents who reported helping prepare dinner at least 1-2 times in the past week were 33.9% more likely to buy fresh vegetables, $p < 0.001$, and 52.4% more likely to prepare a dinner with lean protein and vegetables, $p = 0.01$, at age 20 years than those adolescents that did not help prepare dinner at least once in the past week (Laska, Larson, Neumark-Sztainer, & Story, 2011). The association between culinary behavior and healthy eating habits is important because young adults at age 20 reported 0.18 greater servings of fruit per day, $p < 0.001$, and 0.20 greater servings of vegetables, $p < 0.001$, as 26-year-olds if they helped prepare dinner at least 1-2 times a week as adolescents (Laska, Larson, Neumark-Sztainer, & Story, 2011). These studies indicate that adolescent culinary behavior is an important factor in obesity prevention and treatment and should be targeted in order to increase the likelihood of practicing healthy food preparation behaviors in adolescence and well into adulthood.

Figure 17 Male adolescent mean daily food intake by frequency of assisting in dinner food preparation per week *adapted from* (Larson, Eisenberg, & Neumark-Sztainer, 2006).

Figure 18 Female adolescent mean daily food intake by frequency of assisting in dinner food preparation per week *adapted from* (Larson, Eisenberg, & Neumark-Sztainer, 2006).

In summary, the prevalence of adolescent obesity is increasing, particularly among adolescents of non-white racial/ethnic groups and of lower socioeconomic status. The

causes of obesity are multifactorial with modifiable factors including adolescent nutrition knowledge, dietary behavior, and culinary skills. US adolescents' poor dietary habits and paucity of nutrition knowledge increases their risk of becoming overweight or obese and developing lifelong health consequences. Successful interventions have focused on improving dietary behaviors by increasing nutrition knowledge and/or improving culinary skills.

Interventions and Outcomes

Intervention strategies aimed at preventing adolescent obesity and treatment of already obese children are important as strategies for preventing adult obesity (Daniels, et al., 2005). Prevention of adolescent obesity can be implemented through population-based, environmental and policy change, or individual-level interventions. The most effective approaches are those that are designed to target children's specific needs and their barriers to change (Daniels, et al., 2005).

Many types of interventions have been undertaken with the goal of preventing and/or treating childhood and adolescent obesity. However, the specific goals of each vary between improving nutrition knowledge, improving culinary skill, or a combination of the two. The different interventions use varying tactics at reaching their goals, each with mixed results. A systematic review of interventions targeted toward 5- to 18- year old children and adolescents with the goal of increasing fruit and vegetable intake identified nine components common in successful nutrition behavior interventions: (1) attention to fruits and vegetables as culinary components rather than nutritional qualities, (2) hands-on exposure to fruits and vegetables, (3) teacher training, (4) peer leaders and/or fictional

cartoon characters, (5) active participation and encouragement by school food service staff, (6) active involvement of parents at school and at home, (7) creation of a school nutrition policy, (8) community involvement, (9) and an intervention duration of 12 months with at least a three month follow-up (Knai, Pomerleau, Lock, & McKee, 2006). In a review of the interventions outlined below, culinary ability was shown to improve more successfully than nutrition knowledge. Further, nutrition behavior change depends largely on adolescents' self-efficacy.

Focus on Nutrition Knowledge

Interventions focusing on improving adolescent nutrition knowledge include instructional lessons with the purpose of improving dietary behavior by providing participants with the reasons why they should be making healthy food choices and the knowledge necessary to frame those decisions.

Middle school participants in the program, *What's Food Got to Do With It*, attended an 8-week, twice weekly, hour-long nutrition class with a focus on food groups, Food Pyramid, food labels, food advertising, and body image (Fahlman, Dake, McCaughtry, & Martin, 2008). The goal of the class was to increase fruit, vegetable, and dairy consumption, as well as to provide the students with information enabling them to make healthy eating choices at restaurants. At the end of the intervention, participants in the intervention group increased their fruit consumption by 0.77 servings (2.48 to 3.25 servings) compared to a decrease of 0.11 servings (2.52 to 2.41 servings) in the control group. The increase in fruit consumption by the intervention group and the difference between fruit consumption by the intervention and control groups at the time of the post-intervention were statistically significant. The intervention group also increased their

vegetable consumption by 0.92 servings (1.11 to 2.03 servings) compared to a decrease of 0.16 servings (1.38 to 1.22 servings) in the control group. The increase in vegetable consumption by the intervention group and the difference between the intervention and control group's vegetable consumption at the time of the post-intervention were statistically significant. "Junk food" intake decreased in the intervention group by 1.6 servings (5.9 to 4.3 servings) compared to a decrease of only 0.2 servings (5.2 to 5.0 servings) in the control group. Both the decrease in "junk food" consumption by the intervention group and the difference between the "junk food" consumption by the intervention and control group at the time of the post-intervention were statistically significant. Self-efficacy expectancies regarding healthy eating behaviors also increased. Participants in the intervention group reported feeling more confident that they could eat more fruit and vegetables and more confident that they could make healthy food choices at a fast food restaurant compared to those in the control group.

This study indicates the importance of improving nutrition knowledge as a critical step in improving dietary behavior. However, adolescents must also be given the tools to improve their self-efficacy in making nutritious food choices through improvement of their culinary skills.

Focus on Culinary Skill

Improvement of culinary skills is a vital component of adolescent obesity prevention and treatment because adolescents must be taught how to choose nutritious food and prepare it in a healthy manner in order to make the best dietary choices available (Lichtenstein & Ludwig, 2012).

An Oklahoma-based fruit and vegetable centered cooking class program for 229 12-year-olds used produce to teach participants basic preparation skills, food safety, and nutrition. At the conclusion of the program, participants increased fruit consumption from 1.1 to 2.3 servings a day and vegetable consumption from 1.4 to 2.4 servings a day. At the end of the program, there was a 39% increase in the number of youth who ate the recommended 2 servings of fruit a day and a 25% increase in the number of youth that ate the recommended 3 servings of vegetables a day. The program was also successful in introducing novel produce and produce cooking methods; 69% of participants reported that they tried a new fruit or vegetable and 67% reported that they prepared a fruit or vegetable in a new way (Brown & Hermann, 2005).

Low-income 12-13 year-old participants in *Food Club* attended weekly, 2-hour after-school lessons (Hyland, Stacy, Adamson, & Moynihan, 2006). The goal of the program was to use food preparation lessons in order to promote fruit and vegetable consumption while discouraging fat, added sugars, and salt. At the conclusion of the program, participants and their parents believed that participation in the 20-week, 2-hour afterschool cooking program increased their culinary ability, as related by qualitative data from interviews. However, even though participants were aware that the program was putting forth a “healthy eating” message, only small dietary changes were reported, mainly in fruit intake. This illustrates that adolescent control over dietary choices is important in the sustainability of intervention success. However, despite some examples of Food Club dishes being cooked again in the home and students having some control on food purchases, overall it exerted little control over family’s dietary choices (Hyland, Stacy, Adamson, & Moynihan, 2006).

Cooking Up Fun, a 4-6 session 90-minute cooking class used recipes tailored toward 9- to 15-year-olds from low-income households with limited food skills and resources to promote self-efficacy in healthful eating (Thonney & Bisogni, 2006). Participants were assessed at the beginning, during, and end of the program and showed gains in food preparation skills.

These studies show that culinary instruction may positively impact culinary skills and behavior. These skills are essential in improving the likelihood of intervention success for adolescent obesity prevent and/or treatment.

Focus on Nutrition Knowledge and Culinary Skill

Interventions that focus both on nutrition knowledge and culinary skill attempt to increase participants' understanding of basic nutrition while simultaneously providing instruction on common cooking techniques. It has been suggested that these interventions have a higher probability of success in adolescent obesity prevention and/or treatment because they educate adolescents on why it is important to make healthy dietary choices and give them the skills they need to safely handle and prepare nutritious food (Lichtenstein & Ludwig, 2012). Studies assessing nutrition knowledge between obese and non-obese adolescents found that lack of nutrition knowledge was not associated with obesity. This suggests that lack of nutrition knowledge is not the only factor influencing adolescent obesity and that interventions solely focused on imparting nutrition information are unlikely to succeed in obesity prevention or treatment (Thakur & D'Amico, 1999). It is therefore vital to couple nutrition-related education with culinary education in order to increase the likelihood of intervention success.

Participants in *LA Sprouts*, a 12-week program that taught nutrition and cooking to 4th-5th graders, were given twelve 45-minute interactive cooking and nutrition education lessons. The nutrition lessons were primarily focused on increasing fruit and vegetable intake and purposefully included foods from the majority of the participant's Hispanic culture, such as cilantro, nopales, beans, corn, and squash. At the conclusion of the program, the intervention group improved some aspects of their diet as evidenced by the 22% increase in their dietary fiber intake compared to a 12% decrease in the control group, $p = 0.04$. In addition to this, overweight intervention group participants had a 1% decrease in BMI compared to a 1% increase in overweight control group participants, $p = 0.04$ (Davis, Ventura, Cook, Gyllenhammer, & Gatto, 2011).

California middle school participants in a garden-based nutrition and cooking class received lessons on seasonal cooking, targeted toward increasing fruit and vegetable consumption. At the conclusion of the program, intervention participants showed an increase of daily fruit and vegetable consumption by half a cup/day and an increase of nutrition knowledge scores by 0.74 points for those most exposed to the program compared to a 0.41 point increase by those less exposed, $p < 0.05$ (Wang, et al., 2010).

The American Culinary Federation Chef and Child Foundation Program taught students basic nutrition and culinary skills through 5-day, 2-hour classes and hands-on cooking lessons under the tutelage of professional chefs and nutritionists. Nutrition lessons were 15 minutes of instruction on topics ranging from MyPyramid, breakfast, sugars, and healthful snacks. The cooking lesson taught participants basic cooking skills such as measuring and knife safety. At the conclusion of the program, 97% of the participants

reported that they learned new cooking skills and 58% reported that they learned new nutritional information (Dougherty & Silver, 2007).

The success of these studies indicates the potential for obesity prevention and treatment through interventions that incorporate both nutritional education and culinary instruction.

Rationale

The increasing trend of adolescent obesity has wide ranging health and economic consequences. As adolescents make more of their own dietary choices, it is critical to provide nutritional education and practical culinary skills to enable healthy dietary choices and eating behaviors. In the past, interventions have focused on improving nutrition knowledge, improving culinary skill, or both. However, results have been mixed.

Pink and Dude Chefs, a nutrition and culinary intervention based in San Luis Obispo County with support from California Polytechnic University San Luis Obispo, aims to build upon past interventions. This program is different from others in that it incorporates nutritional instruction throughout hands-on cooking practicum, facilitates dietary behavior changes outside of the classroom and within the participants' home, and provides a framework for inclusion of parents and community members as a support system for change. It is the enhanced family and community network along with participants' ability to apply what they learn in the instructional lessons and cooking practicum to their everyday lives that makes Pink and Dude Chefs unique among existing interventions designed to address the burden of adolescent obesity.

Research Questions and Hypotheses

The current study was designed to answer three research questions: Does participation in the Pink and Dude Chefs program improve (1) nutrition behavior, (2) culinary confidence, and/or (3) nutrition knowledge among middle-school boys and girls enrolled in afterschool programs in Arroyo Grande, California and Carpinteria, California? Also measured were the degree to which changes were observed in the sample group between the time of the pre- and the post-survey.

Hypotheses were that participation in the Pink and Dude Chefs program would result in an observed improvement in nutrition behavior as evidenced by participants' self-reporting of increased preferences of fruits and vegetables and increased intake of fruits and vegetables. In addition to this, it was hypothesized that participants' self-reporting of culinary confidence would increase. Nutrition knowledge was hypothesized to improve, also, as demonstrated by correct responses to questions testing basic nutrition knowledge.

Chapter 2: Methods

Pink and Dude Chefs Program

Program Background

The California Polytechnic University San Luis Obispo (Cal Poly) Kinesiology Department founded the organization Science through Translational Research in Diet and Exercise (STRIDE) in 2007, with the original name of Center for Obesity Prevention and Education (COPE). The STRIDE mission is to promote healthy weight across the lifespan and does so through five key components: Research, Service Learning, Education and Outreach, Program Design and Evaluation, and Consulting. One method of translating current research into effective, accessible community-based health intervention is through the Pink and Dude Chefs program, a nutrition and culinary intervention that integrates classroom nutrition education with a hands-on cooking practicum.

Based on Social Cognitive Theory (SCT), Pink Chefs was developed and piloted in 2008 by a Nutrition graduate student (Chessen, 2008) in response to the Food Bank Coalition of San Luis Obispo's request to develop an approach to increase the selection of healthy foods offered at the Food Bank, including fresh produce. The key questions of interest of the pilot study were to determine whether teaching middle school-aged girls cooking skills, along with basic food and nutrition information would increase confidence for cooking and whether the increased confidence influenced food and nutrition related choices. Results from the pilot study suggested that the increased knowledge and skills did increase confidence but that many other factors also influenced a middle school-aged

child's food choices. We tested the impact this program had on nutrition knowledge, culinary efficacy, and nutritional choices made in and out of the home with an intervention that included middle school boys and girls. In addition, we were interested in determining social norms associated with cooking and consuming fruits and vegetables in this age group.

Program Development

Settings and Participants

Between October 2011 and April 2012, two Pink and Dude Chefs sessions were implemented.

One project took place at Mesa Middle School in Arroyo Grande, California during the fall season. Participants were drawn from students who attended Mesa Middle School. Boys and girls aged 11-14 years were invited to join the program. Students were required to enroll in the YMCA Bright Futures free afterschool program in order to participate. The program was conducted with California Polytechnic San Luis Obispo (Cal Poly) research assistants who were trained to implement lesson plans and supervise the Pink & Dude Chef participants in recipe creation through their involvement in a one-unit Kinesiology course. This course provided instructions on how to maintain the attention of a middle school audience, discipline inappropriate behavior, and tailor nutrition and culinary messages according to the maturity, knowledge, and skill level of the middle school participants.

The second project took place in Santa Barbara County at Carpinteria Middle School in Carpinteria, California between the end of the winter season and the beginning of spring.

Subjects were drawn from students who attend the Carpinteria Afterschool Program.

Both boys and girls, aged 10-15 were welcome in the program. Students were required to enroll in the free Carpinteria Afterschool Program in order to participate. The program was conducted with volunteers from the Santa Barbara Food Bank that were trained via the online training course.

Online Training Course

An online training course was developed for interested parties located outside San Luis Obispo County to facilitate the implementation of the Pink and Dude Chefs program in other communities. The curriculum consisted of instructional videos, nutrition and culinary background information, and quizzes to assess understanding. The training course was designed to be used by anyone regardless of nutrition or culinary background. All instructional materials necessary to implementation were included in the course, including but not limited to lesson plans, recipes, and activity handouts.

The online training course was offered free of charge for use by the Santa Barbara Food Bank. Santa Barbara Food Bank volunteers viewed all videos, accessed all materials, and satisfactorily completed all quizzes. Volunteers were provided with a detailed timeline including the names and lengths of each instructional video (See Appendix A) that began 45 days before the start of the program to ensure volunteer preparation. Their progress was monitored by Cal Poly STRIDE Pink and Dude Chefs Program Coordinator, Tianna Sheehan. After the online training course was completed, Santa Barbara Food Bank volunteers implemented a Pink and Dude Chefs program in Carpinteria.

Program Support

Donations and Funding

Implementing the Pink and Dude Chefs pilot program required the acquisition of cookware, knives, measuring devices, and aprons and chef hats for the participants. These items were purchased through funding from a grant paid by the Maxwell foundation (Chessen, 2008).

The Pink and Dude Chefs program depended on funding for the purchase of recipe ingredients. For the Pink and Dude Chefs program located in Arroyo Grande, foods for recipe creation were donated by the Food Bank Coalition of San Luis Obispo County. Money for supplemental recipe ingredients was provided through a small grant from the Arroyo Grande Community Hospital. For the Pink and Dude Chefs programs located in Santa Barbara County, the Santa Barbara Food Bank donated foods for recipe creation and provided reimbursement for foods not provided through the Food Bank.

Staff

Cal Poly research assistants enrolled in KINE 471-03 Health Ambassadors and STRIDE volunteers were trained to teach, assist and supervise the cooking classes. There was at least one Cal Poly student per two to three afterschool Pink & Dude Chef participants. Cal Poly research assistants were supervised by Dr. Ann McDermott and Tianna Sheehan, the STRIDE Health Ambassador Program Coordinator.

Santa Barbara Food Bank volunteers were trained through the on-line *Train the Trainer* videos to teach, assist and supervise the cooking classes. Santa Barbara Food Bank volunteers were supervised by Dr. Ann McDermott and Tianna Sheehan, the STRIDE

Health Ambassador Program Coordinator. Santa Barbara Food Bank volunteers were also required to participate in weekly phone consultations with a STRIDE Pink and Dude Chefs research assistant and intern.

Program Implementation

Participant Recruitment

Participation in the Pink and Dude Chefs program at all locations was voluntary and solicited through fliers advertising the program's dates, activities, and goals (See Appendix B). A short cooking demonstration was conducted during the lunchtime hour at Mesa Middle School in Arroyo Grande to promote the program. Informational presentations were given to potential participants at Carpinteria Middle School in Carpinteria, California.

Procedures

The Pink and Dude Chef program consisted of two, two-hour classes a week for six weeks. The classes began with a classroom lesson that taught specific cooking skills with a focus on incorporating fruits and vegetables into recipes. Additional content areas included nutrition and web-based cooking resources, communication, time management and goal-setting skills. The majority of time in each class, one and half hours, was spent on learning and practicing the targeted cooking skills to create the recipes for the day. The classroom lessons were followed by a hands-on, practical component primarily focused on familiarizing middle school participants with basic cooking skills.

Classroom Lesson

Each of the twelve lessons in the Pink and Dude Chefs program had a specific theme and built on a foundation of nutrition knowledge, increasing in complexity during the 6-week program. Lesson themes began with recipe literacy, knife skills, and kitchen safety, progressed into an overview of macronutrients and MyPlate guidelines (USDA), and concluded with the importance of breakfast, menu planning, and shopping on a budget. A chronological list of weekly lessons and objectives is detailed in **Table 3** (See Appendix C for an example of a complete lessons used during the Pink and Dude Chefs Program).

The lessons began with a 45 minute classroom presentation, supplemented with PowerPoint and/or short videos. Lessons were outlined in detail and designed to achieve specific behavioral objectives that correlated with lesson themes. Nutritional concepts were reinforced through in-class activities, games, and/or handout completion.

Table 3 Lesson plans and objectives for Pink and Dude Chefs program.

Lesson 1	Introduction	- This lesson is the orientation to the “Pink and Dude Chefs” program. - This lesson will establish classroom norms and food safety norms, create the culinary community, and introduce nutrition through cooking skills.
Lesson 2	How to Read a Recipe	- This lesson teaches participants how to properly extinguish a kitchen fire, how to properly read and follow a recipe, how to correctly identify the measurement tools needed for the recipe, and how to execute a recipe while working in groups.
Lesson 3	Cutting Edge	- This lesson teaches participants the safety rules regarding knife responsibility, how to properly use a knife, and how to store the knife when not in use.
Lesson 4	Create Your Plate	- This lesson teaches participants how to build their “MyPlate” for healthy eating, with an emphasis on balance among food groups. - Participants will compare what they typically eat in one day to the MyPlate food guidance system and learn about the link between their eating habits and their physical and mental health.
Lesson 5	Get the Facts	- This lesson teaches participants how to read a Nutrition Facts Label, how to understand and use the Nutrition Facts Label, and how to make comparisons between two similar food products.
Lesson 6	Carbohydrates and Protein	- This lesson teaches participants how the body gets energy from carbohydrates and proteins. - It discusses the difference between simple and complex carbohydrates, refined and unrefined carbohydrates, and what makes a grain whole. - Also, it discusses the role protein plays in the body.
Lesson 7	What are Fats?	- This lesson teaches a student how fat is important in a healthy diet. - Participants are introduced to the different types of fats and learn how in baking, the fats and oils called for in a recipe can be substituted by using other less caloric and more nutritious ingredients while still creating the expected ‘standard’ baked product. - This lesson also teaches participants the alternative cooking methods to use to avoid excess fat in dishes.
Lesson 8	Calci-Yum!	- This lesson teaches participants about the nutrition benefits of calcium for strong bones. - Participants will practice reading and comparing the calcium percentages of different milk products using Nutrition Facts Labels. - Participants will write a meal plan that meets the daily 1300 mg calcium requirement using dairy and non-dairy sources.
Lesson 9	Breakfast of Champions!	- This lesson teaches participants the physiological, cognitive, and nutrition benefits of eating breakfast.
Lesson 10	Meal Planning and Budgeting	- This lesson teaches participants how to plan and purchase a healthy meal on a budget by relying on seasonal produce and grocery store sales.
Lesson 11	Nutrition Jeopardy	- This lesson quizzes the participants on information presented throughout the last 10 lessons through an interactive nutrition jeopardy game. - This lesson also teaches participants how to work together to assemble a family meal using culinary skills, proper timing, and cumulative nutrition information taught throughout the course.
Lesson 12	Family Fiesta	- This lesson teaches participants how to cater an event for their families by working together to assemble a meal using menu planning and time management.

Cooking Practicum

After the classroom instruction, participants walked to the kitchen and self-selected groups of three to five participants each. Each cooking session began with a skill demonstration by the program leader in order to introduce or reinforce culinary skills that would be utilized during the recipe creation. Each group was then assigned one of four cooking stations that were supplied with the day's recipe(s), measuring utensils, cutting boards, and mixing bowls. The recipe ingredients were organized at a central table so that the program leader could supervise ingredient collection and to facilitate cooperation among the different groups. Participants cooked each recipe "from scratch" and were responsible for the entire recipe creation from beginning to end. Group members took turns cutting fruits and vegetables, using the stove or oven, plating the finished product, washing dishes, and sanitizing work stations. The entire cooking process was supervised by program leaders to ensure safety and quality.

The finished product was packaged in to-go containers and the participants were strongly encouraged to share recipe creations with their family. The goal of this practice was to introduce healthy food to participants' family members and to enable more student self-efficacy in their own food choices. It was hypothesized that if guardians felt confident in participants' culinary ability, they would be more apt to allow participants more choice in grocery shopping and responsibility in meal preparation.

Pink and Dude Chefs recipes were chosen to highlight the themes of each lesson. The culinary skills required to successfully complete each recipe increased in difficulty as the program progressed so that participants could continually build upon their culinary foundation while decreasing risk of boredom in the kitchen. Recipes were formatted to

include simple, easy-to-read instructions, a nutrition facts label constructed through recipe analysis (Conde Nast Web sites, 2012), and key pieces of nutritional trivia that reinforced the lesson's theme or added supplemental nutritional information. For example, the tofu scramble recipe used in Lesson 6: *Carbohydrates and Protein*, noted that half a cup of tofu is considered one serving of protein. When more than one recipe was included during a cooking session, participants utilized time management skills in order to prioritize tasks and assign duties. Participants often came across unfamiliar ingredients or foods they did not prefer. However, they were encouraged to try every recipe and to expand their culinary comfort zone. A chronological list of weekly recipes is detailed in **Table 4** (See Appendix D for an example of a recipe used during Pink and Dude Chefs Program).

Table 4 Recipes for Pink and Dude Chefs program.

Lesson 1	Introduction	- Personality Pie
Lesson 2	How to Read a Recipe	- Blueberry Muffins
Lesson 3	Cutting Edge	- Taste the Rainbow Stir-fry
Lesson 4	Create Your Plate	- Bulgur Chickpea Salad - Kale Chips
Lesson 5	Get the Facts!	- Honey Gingered Fruit Salad - Macaroni and Cheese
Lesson 6	Carbohydrates and Protein	- Quinoa and Black Bean Salad - Tofu Scramble
Lesson 7	What are Fats?	- Baked Chicken Nuggets - Sweet Potato Baked French Fries - Homemade Ketchup
Lesson 8	Calci-Yum!	- Salmon Patties - Apple Coleslaw
Lesson 9	Breakfast of Champions	- Spinach and Corn Breakfast Casserole - Pink (beet enriched) Pancakes
Lesson 10	Meal Planning and Budgeting	- Low-fat Guacamole - Rice & Bean Burritos
Lesson 11	Nutrition Jeopardy	- Prepped food for Family Fiesta
Lesson 12	Family Fiesta	- Apple Cranberry Salad Toss - Homemade Vinaigrette - Mashed Sweet Potatoes - Gravy - Roasted Turkey - Old-fashioned Stuffing - Pumpkin Pie Squares

Family Fiesta

The Pink and Dude Chefs program concluded with a celebratory dinner hosted by the middle school participants for their extended family and friends. Participants utilized time-management skills and team work in order to plan, prepare, and host a multi-course menu. The meal was served by the participants, showcasing their creations and fostering a sense of pride in their achievements. The Family Fiesta included an awards ceremony where each student received a certificate of completion.

Program Evaluation

Each Pink and Dude Chefs lesson was evaluated by program leaders in order to assess the effectiveness of the lesson plan, participants' responses to lesson activities, and the success of the recipe creations (See Appendix E for an example of a lesson evaluation). In addition to written evaluations, offsite program leaders participated in weekly phone conversations with a Pink and Dude Chefs research assistant and sent in video recordings of each lesson being conducted for quality control. The research assistant reviewed each video and provided timely feedback to troubleshoot any problems or issues arising in the offsite programs' implementation of Pink and Dude Chefs.

Data Collection

Participants in the Pink and Dude Chefs program were provided with identical pre- and post-surveys with the goal of assessing change as a result of program participation. Data collection was completed at both the Arroyo Grande and Carpinteria locations. The protocol for survey administration was the same at both locations. The pre-survey was completed at the time of the first lesson and the post-survey was completed at the time of the last nutrition lesson. Since the Family Fiesta was held on the last meeting time of the program (Lesson 12), the post-survey was administered on the day of Lesson 11 after the participants played Nutrition Jeopardy. Instructions for the surveys were given by the program leaders and participants were informed of the confidentiality within the data collection procedures. Participants were instructed not to put their names on the survey so that only a unique identification code would be associated with their survey responses.

Immediately after completion, the surveys were returned to the program leaders.

Completed surveys from the Carpinteria location were sent via mail to STRIDE at Cal

Poly San Luis Obispo and kept in a secure location along with the completed surveys from the Arroyo Grande location. Data entry commenced soon after surveys were collected.

Materials

Instruments

The principal instrument for the current study was a survey constructed in eight sections with five sections designed to answer the three research questions, two sections designed to measure confounding variables, and one section to collect individual level characteristics. The five sections measuring the three research questions included: “fruit preference,” “vegetable preference,” “fruit and vegetable intake,” and “nutrition knowledge.” The two sections measuring confounding variables included: “potential influences on nutrition behavior” and “nutrition self-efficacy.” The survey was developed using previously validated assessment tools (See Appendix F for full survey). **Table 5** shows each section of the survey instrument, the research question it was designed to answer, and a sample question.

Research question #1: Does participation in the Pink and Dude Chefs program improve nutrition behavior?

Fruit and vegetable preference and fruit and vegetable intake were designed to answer research question #1. Preferences for specific fruits and vegetables were measured using an adapted survey instrument from the “5 A Day – Georgia” project (Cullen, et al., 2003). The survey contained a list of fruits and vegetables and participants were asked to check a box corresponding to levels of preference: “I do not like this,” “I like this a little,” “No opinion,” “I like this a lot,” “I don’t know what this is.” Participants had been exposed to

most of the fruits and vegetables in the preference list as ingredients for the recipe creation during the Pink and Dude Chefs cooking practicum. If a fruit or vegetable was not used in recipe creation, the fruit or vegetable was used in discussion during the program as an example of foods high in specific nutritional qualities or as possible ingredient substitutions for the recipes.

Participants' fruit and vegetable intake was measured using the Youth Risk Behavior Surveillance System 2005 State and Local Standard High School Questionnaire (Centers for Disease Control, 2005), the Food Stamp Program Food Behavior Checklist (Sylva, Townsend, Martin, & Metz, 2006), and the University of California Cooperative Extension (UCCE) Food Behavior Checklist (Sylva, Townsend, & Metz, UCCE Food Behavior Checklist, 2006). In the fruit and vegetable intake section, participants were asked to choose from different levels of frequencies to describe the number of times they ate a specified food in the past seven days: "Not at all," "1-3 times," "4-5 times," "1 time per day," "2 times per day," "3 times per day," "4 or more times per day."

Research question #2: Does participation in the Pink and Dude Chefs program improve culinary confidence?

The section on cooking skills was designed to answer research question #2. Participant's confidence in their cooking skills was measured using the United Kingdom Food Standards Agency's *CookWell* program survey instrument (Wrieden, et al., 2002). In the cooking skills section, participants were asked to rate their confidence in performing certain basic cooking skills. Levels of confidence were: "I don't think I can," "I'm not sure," "I'm sure I can." Each of the cooking skills listed in this section had been taught

and reinforced during the Pink and Dude Chefs cooking practicum. Fundamental knife skills were also taught during the classroom portion of Lesson 3: Cutting Edge.

Research question #3: Does participation in the Pink and Dude Chefs program improve nutrition knowledge?

The section on nutrition knowledge was designed to answer research question #3.

Participant's nutrition knowledge was measured using the Network for a Healthy California Harvest of the Month Survey (Research and Evaluation Unit of the Network for a Healthy California, 2007). Participants were asked to answer questions testing their knowledge of basic nutrition. All of the questions had been part of lesson plans or discussion topics throughout the Pink and Dude Chefs program.

Confounding Variables

The Pink and Dude Chefs program survey instrument was also designed to measure potentially confounding variables that may have been associated with change in participants' fruit and vegetable intake or culinary confidence. The two confounding variables measured were "potential influences on nutrition behavior" and "nutrition self-efficacy". **Table 6** shows the confounding variables that were measured and a sample question.

Potential influences on participant's nutrition behavior were measured using the survey instrument for the Pink Chef pilot program (Chessen, 2008). To measure the potential influences on nutrition behavior, participants were asked to rate their agreement to a list of statements that may impact their food choices. Potential influences included the importance the participants placed on their peer's opinion of their food choices and the

time they had available to prepare food. Options for each statement included: “Agree strongly,” “Agree,” “Neither agree nor disagree,” “Disagree,” “Disagree strongly.”

Nutrition self-efficacy was defined as the ability of the participants to control their own food choices. Participant’s ability to ask for and shop for fruits and vegetables was measured using survey instruments from the Network for a Healthy California *Five a Day Power Play!* Pre-Post Impact Survey (Network for a Healthy California, 2005) (Baranowski, et al., 2000) (Saunders, et al., 1997) and survey instruments used in research in mediating variables in school-based nutrition intervention programs (Reynolds, Yaroch, Franklin, & Maloy, 2002). Participants’ ability to shop for and prepare dinner was measured using the University of California Cooperative Extension (UCCE) Fruit and Vegetable Inventory (Townsend & Kaiser, 2006). Participants were asked to rate their confidence in their level of control over their food choices. Options for each level of confidence were, “I don’t think I can,” “I’m not sure,” and “I’m sure I can.”

Table 5 Pink and Dude Chefs survey instrument sections, corresponding research questions, and sample questions.

Section	Research Question	Sample Question
Fruit Preference	Does participation in the Pink and Dude Chefs Program improve nutrition behavior?	How much do you like these fruits and vegetables? Please check the box for your answer Cherries I do not like this I like this a little No opinion I like this a lot I don't know what this is
Vegetable Preference	Does participation in the Pink and Dude Chefs Program improve nutrition behavior?	How much do you like ... Acorn Squash I do not like this I like this a little No opinion I like this a lot I don't know what this is
Fruit and Vegetable Intake	Does participation in the Pink and Dude Chefs Program improve nutrition behavior?	During the past 7 days, how many times did you ... Eat fruit? <i>Do NOT count fruit juice</i> Not at all 1-3 times 4-5 times 1 time per day 2 times per day 3 times per day 4 or more times per day
Cooking Skills	Does participation in the Pink and Dude Chefs Program improve culinary confidence?	I think I can ... Cook from basic, raw ingredients, from scratch I don't think I can I'm not sure I'm sure I can
Nutrition Knowledge	Does participation in the Pink and Dude Chefs program improve nutrition knowledge?	Fruits and vegetables that are high in Vitamin A are ____ in color. a) Red and white b) Blue and light brown c) Yellow-orange and dark green d) Brown & purple e) I don't know

Table 6 Confounding variables measured in the Pink and Dude Chefs survey instrument and sample questions.

Confounding variable	Sample question
Influences on nutrition behavior	I think cooking for my family is cool & fun ... Agree strongly Agree Neither agree nor disagree Disagree Disagree strongly
Nutrition self-efficacy	I think I can ... Ask someone in my family to buy my favorite fruit or vegetable I don't think I can I'm not sure I'm sure I can

Statistical Analysis

Data Coding

Data entry was completed by research assistants. Survey instruments underwent double data entry and comparison for quality control purposes. The hardcopy survey was used as a final reference to reconcile any differences between duplicate entries. All data were transferred into individual Microsoft Excel spreadsheets and all data was coded for statistical analysis. The database was organized according to each of the three research questions: (1) Does participation in the Pink and Dude Chefs Program improve nutrition behavior? (2) Does participation in the Pink and Dude Chefs Program improve culinary confidence? (3) Does participation in the Pink and Dude Chefs program improve nutrition knowledge? The section for each research question included a database with data from the corresponding section of the survey instrument. Databases included individual level characteristics, fruit preferences, vegetable preferences, fruit and vegetable intake, culinary confidence, nutrition knowledge, potential influences on nutrition behavior, and nutrition self-efficacy.

Individual Level Characteristics

Individual level characteristics were collected for all participants at the Arroyo Grande and Carpinteria locations. The individual level characteristics of the participants from the Arroyo Grande and Carpinteria sessions were analyzed separately. Values were assigned for the participant's grade level and sex. Values were assigned for the number of people the participants identified as living in their household, including themselves. Participants self-selected their race/ethnicity and values were assigned ("American Indian or Alaska Native" = 1, "Asian" = 2, "Black or African American" = 3, "Hispanic or Latino Mexican (of any race)" = 4, "Native Hawaiian or Other Pacific Islander" = 5, "White/Caucasian" = 6, and "Other" = 7). The values for grade level, age, sex, number of people living in the household, and race/ethnicity were merged for Arroyo Grande and Carpinteria, as well as for the combined total participants. The mean (SD) of individual level characteristics were computed for the total participants and for the Arroyo Grande and Carpinteria sessions separately.

Fruit and Vegetable Preference

Fruit and vegetable preference scores were assigned according to responses given on the pre- and post-surveys. Selection of the option "I like this a lot" was represented with the highest score of 2. Selection of the option "I like this a little" was represented with the score of 1. Selection of the option "No opinion" was represented with the score of 0. Selection of the option "I don't know what this is" was represented with the score of -1. Selection of the option "I do not like this" was represented with the score of -2. These scores were summed as individual and total fruit preference scores and individual and total vegetable preference scores. The range of possible fruit or vegetable preference

scores was -2 to 2. The range of possible total fruit preference scores was -14 to 14. The range of possible total vegetable preference scores was -40 to 40. The mean of the individual and total fruit preference scores and individual and total vegetable preference scores were computed, along with standard deviation, median, and minimum and maximum scores from both the pre- and post-surveys.

Fruit and Vegetable Intake

Numerical scores were assigned to each fruit and vegetable intake response. Selection of the option “Not at all” was represented with the score of 0. Selection of the option “1-3 times” was represented with a score of 2 to represent an average value for the option range. Selection of the option “4-6 times” was represented with the score of 5. Selection of the option “1 time per day” was represented with the score of 7 because it was assumed the participant would have consumed the specified food once a day for seven days. Selection of the option “2 times per day” was represented with the score of 14. Selection of the option “3 times per day” was represented with the score of 21. Selection of the option of “4 or more times per day” was represented with the score of 28. These scores were summed as individual and total fruit and vegetable intake scores. The range of possible individual fruit and vegetable intake scores was 0 to 28. The range of possible total fruit and vegetable intake scores was 0 to 168. The mean of the individual and total fruit and vegetable intake scores were computed, along with standard deviation, median, and minimum and maximum scores from both the pre- and post-surveys.

Culinary Confidence

Numerical scores were assigned to each response associated with participant’s culinary confidence. Selection of the option, “I don’t think I can” was represented with a score of

-1. Selection of the option, “I’m not sure” was represented with a score of 0. Selection of the option, “I’m sure I can” was represented with a score of 1. These scores were summed as individual values for each culinary skill and as a total culinary confidence score. The range of possible individual culinary confidence scores was -1 to 1. The maximum possible total culinary confidence score was -6 to 6. The mean of the individual scores and the total culinary confidence score were computed, along with standard deviation, median, and minimum and maximum scores from both the pre- and post-surveys.

Nutrition Knowledge

Nutrition knowledge scores were assigned to each response according to accuracy. Selection of a correct response was represented with a score of 1. Selection of an incorrect response or the option “Don’t know” was represented with a score of 0. These scores were summed as individual values for each question that tested nutrition knowledge and as a total nutrition knowledge score. The range of possible individual nutrition knowledge scores was 0 to 1. The range of possible total nutrition knowledge scores was 0 to 9. The mean of the individual scores and the total nutrition knowledge score were computed, along with the standard deviation, median, and minimum and maximum scores from both the pre- and post-surveys.

Potential Influences on Participant’s Nutrition Behavior

Numerical scores were assigned to each of the responses associated with potential influences on participants’ nutrition behavior. Selection of a response that indicated the factor of interest was influencing nutrition behavior in an unhealthy direction was given a lower score. If participants selected the option “Agree strongly” to the statement that

“Other foods taste better for snacks than fruits & vegetables,” the response was represented with a score of -2. Selection of the response “Agree” was represented with a score of -1. Selection of the response “Neither agree nor disagree” was represented with a score of 0. Selection of the response “Disagree” was represented with a score of 1. Selection of the response “Disagree strongly” was represented with a score of 2. These scores were summed as individual values representing each potential influential factor in nutrition behavior and as a total influence on nutrition behavior score. The mean of the individual scores and the total score were computed, along with the standard deviation, median, and minimum and maximum scores from both the pre- and post-surveys.

Nutrition Self-Efficacy

Numerical scores were assigned to each of the responses associated with nutrition self-efficacy. A response that showed a greater degree of control over food choices was represented with a higher score. Selection of the option “I don’t think I can” was represented with a score of -1. Selection of the option “I’m not sure” was represented with a score of 0. Selection of the option “I’m sure I can” was represented with a score of 1. The scores were summed as individual values and as a total nutrition self-efficacy score. The mean of the individual scores and the total score were computed, along with the standard deviation, median, and minimum and maximum scores from both the pre- and post-surveys.

For a comprehensive list of the coding associated with each instrument question and response option, see Appendix G.

Statistical Analysis

Each participant was assigned a unique code from one to 23. Participants' unique codes were used for each database section: individual level characteristics, fruit preferences, vegetable preferences, fruit and vegetable intake, culinary confidence, nutrition knowledge, influences on nutrition behavior, and nutrition self-efficacy. For each database section, only pre- and post-questionnaires with complete data were included in analyses.

For each response variable, the total score of all participants was summed and the mean was calculated. Paired t-tests were used to compare the mean of each response variable from the pre- and post-survey instruments. Excel 2010 (Redmond, WA) and STATA 10 (College Station, USA) were used for statistical analysis.

Institutional Review Board and Ethical Clearance

Program leaders of Arroyo Grande YMCA Bright Futures, Boys and Girls Club of Santa Maria Valley, and the Carpinteria Afterschool Program were provided with informed consent forms to be completed by participant's guardians. Informed consent forms were translated from English to Spanish by an undergraduate Pink and Dude Chefs intern and were approved by the Cal Poly Institutional Review Board (See Appendix H). Informed consent forms outlined the program details, described the potential risks and benefits of participation, and included contact information for researchers in the event of questions or concerns. All guardians of participants in the Pink and Dude Chefs program provided written informed consent.

Program leaders of Arroyo Grande YMCA Bright Futures, Boys and Girls Club of Santa Maria Valley, and the Carpinteria Afterschool Program were also provided with informed assent forms to be completed by participants. Informed assent forms were translated from English to Spanish by an undergraduate Pink and Dude Chefs intern and were approved by the Cal Poly Institutional Review Board (See Appendix I). Informed assent forms outlined the program details and described the potential risks and benefits of participation. All participants in PDC at all sites provided written informed assent.

All elements of the current study (consent forms, testing materials and program design) were approved by the California Polytechnic University San Luis Obispo Institutional Review Board (IRB) prior to program implementation.

Chapter 3: Results

Results

Individual Level Characteristics

A total of 23 pairs of pre- and post-surveys contained complete data; 13 pairs of pre- and post-surveys were collected from the session in Arroyo Grande and 10 pairs of pre- and post-surveys were collected from the session in Carpinteria.

Individual level characteristics of the participants from Arroyo Grande and Carpinteria locations were obtained and analyzed separately as well as combined for the total participants. See **Table 7** for the complete individual level characteristics. The average age of participants was 13 years old and most participants were in the 8th grade (69.6%). Most participants were girls (60.9%). A majority of the participants were Hispanic/Latino (60.9%). Most of the participants were living in households with 5+ people (47.8%).

Table 7 Percent (number) of individual level characteristics of the sample from Arroyo Grande and Carpinteria.

Variable	Total Participants % (n) ^a	Arroyo Grande % (n) ^b	Carpinteria % (n) ^c
Age in years			
11	13.0 (3)	7.7 (1)	20.0 (2)
12	26.1 (6)	15.4 (2)	40.0 (4)
13	43.5 (10)	69.2 (9)	10.0 (1)
14	17.4 (4)	7.7 (1)	30.0 (3)
Grade			
6 th	21.7 (5)	--	50.0 (5)
7 th	8.7 (2)	15.4 (2)	--
8 th	69.6 (16)	84.6 (11)	50.0 (5)
Sex			
Boy	39.1 (9)	38.5 (5)	40.0 (4)
Girl	60.9 (14)	61.5 (8)	60.0 (6)
Race/Ethnicity			
Hispanic/Latino	60.9 (14)	38.5 (5)	90.0 (9)
White/Caucasian	21.7 (5)	38.5 (5)	--
Asian	8.7 (2)	15.4 (2)	--
Black or African American	4.3 (1)	--	10.0 (1)
Other	4.3 (1)	7.7 (1)	--
How many people live in your household (including yourself?)			
2	4.3 (1)	7.7 (1)	--
3	13.0 (3)	7.7 (1)	20.0 (2)
4	34.8 (8)	46.2 (6)	20.0 (2)
5+	47.8 (11)	38.5 (5)	60.0 (6)

^a n=23

^b n=13

^c n=10

Research Question #1: Does participation in the Pink and Dude Chefs Program improve nutrition behavior?

Fruit Preference

Table 8 shows the mean fruit preference scores and the change in the mean fruit preference scores. The overall mean fruit preference score increased from 2.82 (SD 6.71) to 5.82 (SD 6.65), $p = 0.01$. The mean preference for every fruit variable increased between the pre- and post-surveys. The greatest increase in preference was for cherries

with an observed increase in the mean preference score of 0.68, from 0.91 (SD 1.54) to 1.59 (SD 1.05), $p = 0.03$. The least increase in preference was for persimmons with an observed increase in the mean preference score of 0.14, from -0.55 (SD 1.26) to -0.41 (SD 1.37), $p = 0.5$.

Table 8 Mean fruit preference score from pre- and post-survey and change in mean fruit preference score.

Variable	Mean Pre Score	Mean Post Score	Change in Mean	P-value ^b
Cherry	0.91	1.59	0.68	0.03
Dried Plum	-0.50	0.05	0.55	0.2
Grapefruit	0.50	0.86	0.36	0.3
Tangerines	1.09	1.59	0.50	0.02
Melons	1.00	1.23	0.23	0.2
Persimmon	-0.55	-0.41	0.14	0.5
Plums	0.36	0.91	0.55	0.1
Overall ^a	2.82	5.82	3.00	0.01

^a n=22, one participant excluded due to missing 'Fruit Preference' scores in pre- or post-surveys

^b p-value by paired t-test

Vegetable Preference

Table 9 shows the mean vegetable preference scores and the change in the mean vegetable scores. The overall mean vegetable preference score increased from 2.24 (SD 18.84) to 4.71 (SD 20.17), $p = 0.5$. The mean preference score for 14 of the 20 vegetable variables increased between the pre- and post-survey. The greatest increase in preference was for radishes with an observed increase in the preference score of 0.71, from -0.48 (SD 1.57) to 0.57 (SD 1.57), $p = 0.1$. The least increase in preference was for asparagus, cooked greens, and salad greens with an observed increase in preference score of 0.05. The mean preference for asparagus increased from -0.10 (SD 1.55) to -0.05 (SD 1.40), $p = 0.8$. The mean preference for cooked greens increased from 0.14 (SD 1.68) to 0.19 (SD 1.75), $p = 0.9$. The mean preference for salad greens increased from 0.52 (SD 1.54) to 0.57 (SD 1.57), $p = 0.9$. The mean preference for green beans and sweet potatoes did not

change between the pre- and the post-surveys. The mean preference for four of the 20 vegetable variables decreased. The greatest decrease in preference was for beets with an observed decrease in preference of -0.57, from -0.29 (SD 1.27) to -0.86 (SD 1.06), $p = 0.1$. The least decrease in preference was an observed decrease in the preference score of -0.10 for carrots and peas. The mean preference for carrots decreased from 1.00 (SD 1.30) to 0.90 (SD 1.48), $p = 0.8$. The mean preference for peas decreased from -0.10 (SD 1.64) to -0.19 (SD 1.66), $p = 0.8$.

Table 9 Mean vegetable preference score from pre- and post-survey and change in mean vegetable preference score.

Variable	Mean Pre Score	Mean Post Score	Change in Mean	P-value ^b
Acorn Squash	-1.05	-0.81	0.24	0.5
Asparagus	-0.10	-0.85	0.05	0.8
Avocado	0.43	0.29	-0.14	0.6
Beets	-0.29	-0.86	-0.57	0.1
Broccoli	0.52	0.86	0.33	0.2
Cabbage	0.00	0.38	0.38	0.2
Carrots	1.00	0.90	-0.10	0.8
Cooked Greens	0.14	0.19	0.05	0.9
Corn	0.95	1.48	0.52	0.1
Green Beans	0.24	0.24	0.00	>0.9
Mushroom	-0.57	-0.43	0.14	0.7
Peas	-0.10	-0.19	-0.10	0.8
Peppers	0.33	0.48	0.14	0.6
Pumpkin	0.05	0.33	0.29	0.5
Radish	-0.48	0.24	0.71	0.1
Salad Greens	0.52	0.57	0.05	0.9
Spinach	-0.19	-0.10	0.10	0.8
Sweet Potato	0.43	0.43	0.00	>0.9
Tomato	0.38	0.67	0.29	0.2
Zucchini	0.00	0.10	0.10	0.8
Overall ^a	2.24	4.71	2.48	0.5

^a n=21, two participants excluded due to missing 'Vegetable Preference' scores in pre- or post-surveys

^b p-value by paired t-test

Figure 19 compares the fruit and vegetable preference scores and the change in the fruit and vegetable preference scores between the pre- and the post-survey.

Figure 19 Fruit and vegetable preference scores from pre- and post-survey.

Fruit and Vegetable Intake

Table 10 shows the mean fruit and vegetable intake scores and the change in the mean fruit and vegetable intake scores. The overall mean fruit and vegetable intake score increased from 37.67 (SD 34.47) to 40.27 (SD 32.29), $p = 0.6$. The mean preference score increased for three of the six fruit and vegetable intake variables between the pre- and the post-survey. The greatest increase in fruit and vegetable intake was for green salad with an observed increase in intake score of 4.00, from 2.87 (SD 2.90) to 6.87 (SD 7.41), $p = 0.1$. The least increase in fruit and vegetable intake was for vegetables, not including green salad, potatoes, or carrots. The observed increase in intake score was 0.40, from 6.33 (SD 9.10) to 6.73 (SD 7.74), $p = 0.7$. The greatest decrease in fruit and vegetable intake was for potatoes and the consumption of fruits or vegetables as snacks with an observed decrease in intake score of -1.47. The mean intake of potatoes decreased from 4.60 (SD 6.02) to 3.13 (SD 2.42), $p = 0.4$. The mean intake of fruits or

vegetables as snacks decreased from 8.93 (SD 9.45) to 7.47 (SD 7.03), $p = 0.5$. The least decrease in fruit and vegetable intake was for carrots with an observed decrease in intake score of -0.47, from 4.93 (SD 6.97) to 4.47 (SD 5.37), $p = 0.8$.

Table 10 Mean fruit and vegetable intake from pre- and post-survey and change in mean fruit and vegetable intake.

Variable	Mean Pre Intake	Mean Post Intake	Change in Mean Intake	P-value ^b
Fruit; not fruit juice	10.00	11.60	1.60	0.6
Green salad	2.87	6.87	4.00	0.1
Potatoes	4.60	3.13	-1.47	0.4
Carrots	4.93	4.47	-0.47	0.8
Other vegetables; not green salad, potatoes, carrots	6.33	6.73	0.40	0.7
Fruits or vegetables as snacks	8.93	7.47	-1.47	0.5
Overall ^a	37.67	40.27	2.60	0.6

^a n=15, eight participants excluded due to missing 'Fruit and Vegetable Intake' scores in pre- or post-surveys

^b p-value by paired t-test

Research Question #2: Does participation in the Pink and Dude Chefs program improve culinary confidence?

Table 11 shows the mean culinary confidence scores and the change in the mean culinary confidence scores. The overall mean culinary confidence score increased from 2.95 (SD 2.34) to 3.00 (SD 2.94), $p = 0.9$. The mean culinary confidence score increased for three of the six culinary confidence variables between the pre- and the post-survey. The greatest increase in confidence was in the ability to create meals using new ingredients with an observed increase in the confidence score of 0.21, from 0.21 (SD 0.79) to 0.42 (SD 0.77), $p = 0.3$. The least increase in preference was in the ability to use coupons and/or store fliers to plan a meal with an observed increase in the confidence score of 0.11, from 0.37 (SD 0.60) to 0.47 (SD 0.70), $p = 0.5$. There was no observed change in the confidence score related to the ability to cook from scratch, $p > 0.99$. The mean preference score of two of two of the six culinary confidence variables decreased

between the pre- and the post-survey. The greatest decrease in confidence was in the ability to safely use a culinary knife with an observed decrease in the confidence score of -0.26, from 0.89 (0.32) to 0.63 (SD 0.68), $p = 0.2$. The least decrease in confidence was in the ability to follow a simple recipe with an observed decrease in the confidence score of -0.16, from 0.79 (SD 0.54) to 0.63 (SD 0.68), $p = 0.4$.

Table 11 Mean culinary confidence score in pre- and post-survey and change in mean culinary confidence score.

Variable	Mean Pre Score	Mean Post Score	Change in Mean	P-value ^b
Cook from scratch	0.47	0.47	0.00	>0.9
Create meals using new ingredients	0.21	0.42	0.21	0.3
Follow a simple recipe	0.79	0.63	-0.16	0.4
Safely use a culinary knife	0.89	0.63	-0.26	0.2
Use coupons and/or store fliers to plan a meal	0.37	0.47	0.11	0.5
Use leftovers to create a new meal	0.21	0.37	0.16	0.4
Overall ^a	2.95	3.00	0.05	0.9

^a n=19, four participants excluded due to missing 'Culinary Confidence' scores in pre- or post-surveys

^b p-value by paired t-test

Research Question #3: Does participation in the Pink and Dude Chefs program improve nutrition knowledge?

Table 12 shows the mean nutrition knowledge scores and the change in mean nutrition knowledge scores. The overall mean nutrition knowledge score increased from 4.60 (SD 1.70) to 5.40 (SD 2.21), $p = 0.1$. The mean nutrition knowledge score increased in seven of the nine nutrition knowledge variables between the pre- and the post-survey. The question asking participants to choose what color of fruits and vegetables are highest in Vitamin A showed the greatest observed increase in correct responses between the pre- and the post-survey of all the questions in the nutrition knowledge section. This increase in the nutrition knowledge score was 0.25, from 0.20 (SD 0.41) to 0.45 (SD 0.51), $p = 0.1$. The least increase in nutrition knowledge score was in the question asking

participants to choose from a list which food was the healthiest snack. The increase in the nutrition knowledge score was 0.05, from 0.90 (SD 0.31) to 0.95 (SD 0.22), $p = 0.6$. The mean nutrition knowledge score decreased in two of the nine nutrition knowledge variables between the pre- and the post-survey. There was an observed decrease in nutrition knowledge score of -0.10 for both the question asking participants if fruits and vegetables are best eaten with the peel to preserve fiber and the question asking if fruits and vegetables are high in fat and sugar. The mean correct response for the peel and fiber question decreased from 0.70 (SD 0.47) to 0.60 (SD 0.50), $p = 0.5$. The mean correct response for the fat and sugar question decreased from 0.85 (SD 0.37) to 0.75 (SD 0.44), $p = 0.4$.

Table 12 Mean nutrition knowledge score from pre- and post-survey and change in mean nutrition score.

Question	Mean Pre Score	Mean Post Score	Change in Mean	P-value ^b
Eating fruits and vegetables can help lower your chances of getting diseases like high blood sugar (diabetes) or heart disease.	0.75	0.85	0.10	0.4
Fruits and vegetables that are high in Vitamin A are ____ in color.	0.20	0.45	0.25	0.1
Most of the Vitamin C we get comes from fruits and vegetables.	0.60	0.70	0.10	0.2
A fruit salad will be higher in Vitamin C if you add ____ to it.	0.35	0.45	0.10	0.3
Almost all fruits and vegetables contain a lot of vitamins and ____.	0.20	0.40	0.20	0.1
Fruits and vegetables like apples and pears are best when eaten with the peel because that is where most of the fiber and antioxidants are.	0.70	0.60	-0.10	0.5
Fruits and vegetables are high in fat and sugar.	0.85	0.75	-0.10	0.4
Which <u>ONE</u> of these foods is a healthy snack?	0.90	0.95	0.05	0.6
How many cups of fruits and vegetable do you think health experts recommend eating every day?	0.05	0.25	0.20	0.04
Overall^a	4.60	5.40	0.80	0.1

^a n=20, three participants excluded due to missing 'nutrition knowledge' scores in pre- or post-surveys

^b p-value by paired t-test

Confounding Variables

Influences on Nutrition Behavior

Table 13 shows the mean score for potential influences on nutrition behavior and the change in the mean score. The mean score of six of the nine variables increased between the pre- and the post-survey. The greatest increase in the mean score was for participant's agreement that what their family thought about cooking was important to them with an observed increase in mean score of 0.40, from 0.40 (SD 1.67) to 0.80 (SD 1.11), $p = 0.2$. The least increase in the mean score was for participant's opinion on whether they had enough time to prepare fruits and vegetables with an observed increase in mean score of 0.05, from 0.70 (SD 0.92) to 0.75 (SD 1.21), $p = 0.9$. The mean score of three of the six variables decreased between the pre- and the post-survey. The greatest decrease in the mean score was in the participant's agreement that there were a lot of fruit and vegetables at their house with an observed decrease in the mean score of -0.70, from 1.25 (SD 0.79) to 0.55 (SD 1.36), $p = 0.02$. The smallest decrease in the mean score was in the participant's agreement that they thought cooking for their family was cool and fun with an observed decrease of -0.40, from 1.35 (SD 0.88) to 0.95 (SD 1.43), $p = 0.1$.

Table 13 Influences on nutrition behavior in pre- and post-survey and change in influences on nutrition behavior.

Statement	Mean Pre Score	Mean Post Score	Change in Mean	P-value ^b
Other foods taste better for snacks than fruits & vegetables	-0.40	-0.20	0.20	0.5
There are not a lot of fruit & vegetables at my house	1.25	0.55	-0.70	0.02
I don't have time to fix foods like fruits & vegetables.	0.70	0.75	0.05	0.9
I don't know how to fix foods like fruits & vegetables.	0.65	0.95	0.30	0.3
My parents/guardian won't let me cook.	0.90	1.10	0.20	0.5
I think cooking for my family is cool & fun.	1.35	0.95	-0.40	0.1
What my family thinks about cooking is important to me.	0.40	0.80	0.40	0.2
My friends think cooking is cool and fun.	0.75	0.85	0.10	0.8
What my friends think about cooking is important to me.	0.10	-0.35	-0.45	0.2
Overall ^a	5.70	5.40	-0.30	0.8

^a n=20, three participants excluded due to missing 'Influences on Nutrition Behavior' scores in pre- or post-surveys

^b p-value by paired t-test

Nutrition Self-Efficacy

Table 14 shows the mean score for participant's nutrition self-efficacy and the change in the mean score for participant's nutrition self-efficacy. The mean score of one of the six variables increased between the pre- and the post-survey. The mean score for the participant's ability to independently fix a fruit or vegetable increased by 0.05, from 0.68 (SD 0.65) to 0.73 (SD 0.63), $p = 0.8$. The mean score for the participant's ability to help a family member fix fruit or vegetables did not change between the pre- and the post-survey. The mean score of four of the six variables decreased between the pre- and the post-survey. The mean score for the participant's ability to ask family members to buy fruits or vegetables, cook vegetables, or have physical access to fruits all decreased by -0.23. The mean score for the participant's ability to ask a family member to buy fruits or

vegetables decreased from 0.82 (SD 0.39) to 0.59 (SD 0.80), $p = 0.1$. The mean score for the participant's ability to ask a family member to cook vegetables decreased from 0.73 (SD 0.46) to 0.50 (SD 0.80), $p = 0.2$. The mean score for the participant's ability to have physical access to fruits decreased from 0.91 (SD 0.29) to 0.68 (SD 0.65), $p = 0.1$.

Table 14 Mean nutrition self-efficacy score in pre- and post-survey and change in mean nutrition self-efficacy score.

Variable	Mean Pre Score	Mean Post Score	Change in Mean	P-value ^b
Ask family member to buy fruit or vegetables	0.82	0.59	-0.23	0.1
Ask family member to cook vegetables	0.73	0.50	-0.23	0.2
Physical access to fruits	0.91	0.68	-0.23	0.1
Physical access to vegetables	0.68	0.55	-0.14	0.5
Help family fix fruit or vegetables	0.77	0.77	0.00	>0.99
Fix fruit or vegetables alone	0.68	0.73	0.05	0.8
Overall^a	4.59	3.82	-0.77	0.3

^a n=22, one participant excluded due to missing 'Nutrition Self-Efficacy' scores in pre- or post-surveys

^b p-value by paired t-test

Chapter 4: Discussion

This study assessed the impact of a six-week nutrition and culinary intervention targeted toward middle school participants of the Pink and Dude Chefs program in Arroyo Grande and Carpinteria, California. Key questions of interest were whether participation in the program improved nutrition behavior, improved culinary confidence, or improved nutrition knowledge. Results indicate that nutrition behavior, as measured by fruit and vegetable preference and fruit and vegetable intake, culinary confidence, and nutrition knowledge all increased within the timeframe of program participation. Small sample size ($n=23$) limited statistical power to detect statistically significant associations.

Past adolescent obesity prevention efforts have focused on improving nutrition knowledge, culinary skill, or both. Pink and Dude Chefs is different from other intervention efforts in that it incorporates nutrition instruction with a hands-on cooking practicum. The program aimed to improve participants' eating behaviors through education on the importance of a healthy diet and the fundamentals of nutrition while also empowering them with the culinary skillset needed to realize nutrition changes.

Higher preference for all fruits and most vegetables (70%) increased after participation in the Pink and Dude Chefs program. The disparity between the increase in preference between fruits and vegetables is not surprising due to children's heightened level of sensory predisposition towards sweet tastes (Drewnowski, 1989). It is important to note that not all of the fruits and vegetables that increased in preference were incorporated into recipes throughout the program. For example, there was a statistically significant increase in preference for cherries (0.91 to 1.59, $p = 0.03$) and for tangerines (1.09 to

1.59, $p = 0.02$) and yet neither cherries nor tangerines were used in any of the recipes.

This indicates that an increase in preference for specific fruits and vegetables was not due to exposure or introduction to those fruits and vegetables within the lessons but may also have been due to an increased predisposition towards fruits and vegetables in general.

The increase in fruit and vegetable preferences is significant because preferences have been shown to track into young adulthood, impacting the risk of adulthood obesity and associated comorbidities (Kelder, Perry, Klepp, & Lytle, 1994). It has been shown that preference for fruits and vegetables in youth is important because it is a predictor of higher intake of fruits and vegetables as adolescents (Neumark-Sztainer, Wall, Perry, & Story, 2003), high school students (Larson, et al., 2008), and into adulthood (Larson, Laska, Story, & Neumark-Sztainer, 2012). If preference for fruits and vegetables tracks into adulthood and preference correlates with intake, interventions targeting dietary behavior should begin early in adolescence before habits are cemented and the potential for lifelong change is greater.

The mean fruit and vegetable intake scores increased over the course of the intervention, although not to a statistically significant degree (pre-fruit and vegetable score of 37.7 to post-fruit and vegetable score of 40.2, $p = 0.6$). There are numerous plausible explanations for this. It is possible that intake increased because many of the recipes created in the lessons focused on fruits and/or vegetables. In that case, the increase in intake would have been solely due to the consumption of each recipe. However, given the increase in preferences for fruit and vegetables, it is conceivable that intake increased due to fruit and vegetable consumption outside of the lesson plan (Birch & Fisher, Development of Eating Behaviors Among Children and Adolescents, 1998). There was a

corresponding increase in both preference and intake of green salad. It is also likely that a shift in the influences on nutrition behavior, measured as part of the confounding variables, played a role in the increased intake. For example, agreement for the statements that “other foods taste better for snacks than fruits and vegetables” and that “there [were] not a lot of fruit and vegetables” at home decreased between the pre- and the post-survey. The increased likelihood that participants ate fruits and vegetables as snacks along with the increased access to fruits and vegetables within the home would be consistent with the finding of increased fruit and vegetable intake. If this increased fruit and vegetable intake is sustained into young adulthood and thereafter, it may serve an important role as a protective factor against metabolic syndrome in later life (Yoo, et al., 2004).

It is possible that the increase in preference and/or intake of fruits and vegetables may have been due to increased exposure to fruits and vegetables in the home or through school lunches. However, the largest increase in preference for specific fruits was for cherries (0.91 to 1.59, $p = 0.03$), tangerines (1.09 to 1.59, $p = 0.02$), and plums (0.36 to 0.91, $p = 0.1$) and, from these, only tangerines would have been seasonally available during the Pink and Dude Chef sessions in Arroyo Grande and Carpinteria. The largest increase in preference for specific vegetables was for corn (0.95 to 1.48, $p = 0.1$) and radishes (-0.48 to 0.24, $p = 0.1$). According to a California seasonality chart published by the California Certified Farmer’s Markets, both of these would have been seasonally available during the sessions in Arroyo Grande and Carpinteria but would have been at the end of their peak harvest times (Certified Farmer's Markets). It is possible that participants were exposed to these fruits or vegetables outside of their seasonality making

it unlikely that the full range of exposure to fruits and vegetables can be documented within the parameters of this survey instrument. To address this, future research could include collection of the school lunch menus that participants were served and access to fruits and vegetables outside the program. Also, inclusion of a control group in the study design would assist in evaluating whether the differences in preference or intake between the pre- and the post-survey were due to program participation, changes in seasonal availability, and/or changes in the school lunch menu.

The decrease in potato consumption may be seen as an improvement in dietary behavior. It is true that some studies have shown that potato consumption, even in fried form, can act as important sources of dietary fiber, B vitamins, Vitamin E, Vitamin C, and Vitamin K as well as other minerals (Freedman & Keast, 2011). However, high glycemic index foods, including potatoes, can contribute to increased hunger and increased insulin levels, which promote weight gain (Ludwig, 2000). Potatoes have been shown to make up a very large proportion of adolescents' food intake. So much so, that when vegetable consumption without fried potatoes was measured, the median intake of vegetables decreased from 1.21 cups (0.04) to 0.72 cups (0.04) per day and the proportion of adolescents meeting the vegetable recommendations decreased from 5.8% (0.7) to 2.2% (0.3) (Kimmons, Gillespie, Seymour, Serdula, & Blanck, 2009).

Participants' increase in dark green vegetables, through the increased intake of green salads, is also important to note. Dark green vegetables, including green salads, have been shown to make up the smallest portion of adolescent vegetable intake with a median consumption of only 0.06 cups (0.02) per day and only 3.6% (0.8) of adolescents meeting the recommendations for intake (Kimmons, Gillespie, Seymour, Serdula, & Blanck,

2009). Participants' increase in green salad intake is especially important because consumption of low-energy-dense salads has been shown to decrease energy intake during a meal (Rolls, 2009). If potato consumption decreased as a result of participation in the Pink and Dude Chefs program and consumption of green salad and other vegetables increased, it is possible that the nutrient density of the diet correspondingly increased, decreasing the dietary glycemic load, contributing to an overall improved the dietary profile.

It is not clear why the mean intake of fruits or vegetables *as snacks* decreased between the pre- and the post-survey since agreement for the statement that "other foods taste better for snacks than fruits & vegetables" decreased during the same time frame. It is possible that, as intake of fruits and vegetables during mealtimes increased, intake of fruits and vegetables as snacks decreased.

There were fewer positive influences on nutrition behavior between the pre- and the post-survey (Table 7). Participants reported a stronger agreement with the statement that their parents/guardian would not let them cook at the time of the post-survey compared to the pre-survey. This is somewhat contradictory to reports from parents at the Family Fiesta stating that their children had taken on more food preparation responsibilities as a result of program participation. A decrease in permission to cook at home would be a negative influence on nutrition behavior if it resulted in a decline in cooking skills because it is these skills that enable application of sound nutrition principles (Condrasky & Hegler, 2010). Also, participants reported that they agreed strongly with the statement that they did not have a lot of time to fix foods like fruits and vegetables. This is not surprising because previous studies have suggested that lack of time and inconvenience are major

barriers for adolescents in healthy eating (Story & Resnick, Adolescents' views on food and nutrition, 1986) (Story, Neumark-Sztainer, & French, 2002). Although, it is not clear why agreement with the statement that a lack of time was a barrier to fixing fruits and vegetables would have increased between the pre- and the post-survey. It is possible that, as the school semester progressed, studying for tests and extracurricular activities acted as time constraints. It is unclear why participants would agree more strongly with the statement that they did not know how to fix foods like fruits and vegetables given that culinary confidence increased, as did confidence that they could fix a fruit or vegetable by themselves.

Potentially due to the hands-on cooking practicum, confidence in the ability to carry out basic culinary endeavors increased slightly, albeit not to a statistically significant degree (2.95 to 3.00, $p = 0.9$). It is likely that the observed increase in the ability to create meals using new ingredients was a result of the significant effort to utilize unfamiliar ingredients in each of the recipes, such as quinoa and kale. This introduced participants to methods of cooking with new ingredients and may have contributed to their ability to do so outside of the lessons. The decrease in confidence in the ability to safely use a knife may be due to an overconfidence displayed at the time of the pre-survey.

Participants spoke of being very confident in their knife skills at the outset of the program. However, they were actually unfamiliar with safe knife protocols and correct cutting techniques. The decrease in confidence may have been due to the increased stress program leaders placed on skills they did not possess and on constant corrections they received during each cooking period. Despite the small degree to which the culinary confidence increased in the survey, participants expressed many anecdotal accounts of

their success in utilizing culinary techniques learned throughout the program in their homes outside of the lessons.

There were conflicting patterns observed regarding familial and peer influences on nutrition behaviors. There was a decrease in the degree to which the participants thought cooking for their family was “cool and fun” and yet there was an increase in the degree to which the participants felt that what their family thought about cooking was important to them. There was an increase in the degree to which the participants felt their friends thought cooking was “cool and fun” and yet there was a decrease in the degree to which the participants felt that what their friends thought about cooking was important to them. Put simply, between the pre- and the post-survey, participants felt more strongly that what their family thought about cooking was important and less strongly that what their friends thought about cooking was important to them. This may signal a positive influence on participants’ nutrition behavior. In a previous study on motivators of adolescent food choice, it was observed that peer interactions influenced adolescent lunch choices and that those decisions were primarily based on taste while familial interactions influenced adolescent’s dinner and that health was of primary concern in those food choices (Contento, Williams, Michela, & Franklin, 2006). If the peer group’s taste preferences were driven towards high-fat, high-sodium, and calorically-dense foods, as this study indicated, it would be a positive shift in nutrition behavior for the participants of the Pink and Dude Chefs program to rely less on peer and more on familial influences.

Positive changes in the influences on participants’ nutrition behaviors included a statistically significant increase in the presence of fruits and vegetables in the home. This was a likely contributor to the increased intake of fruits and vegetables during the

program duration since availability of fruits and vegetables within the home is a strong indicator of adolescent fruit and vegetable intake (Hanson, Neumark-Sztainer, Eisenberg, Story, & Wall, 2005). If the increase in fruits and vegetables within the home replaced calorie-dense foods, it is likely that the participants would decrease their at-home consumption of high-calorie and high-fat foods (Dietz & Gortmaker, Preventing Obesity in Children and Adolescents, 2001).

In contrast to an increased overall preference and intake of fruit and vegetables along with a slight increase in culinary confidence, there was a decrease in the self-efficacy participants had for their own nutrition choices. The decrease in physical access to fruits and vegetables is difficult to explain given that post-survey responses indicated a stronger disagreement with the statement that there were not a lot of fruits and vegetables at participants' houses than in pre-survey responses. It is possible that, home availability of fruits and vegetables increased without a corresponding increase in accessibility to those fruits and vegetables. A lack of access to fruits and vegetables within the home is potentially detrimental to participants' dietary profile since past research has positively associated fruit and vegetable accessibility and intake among adolescents (Rasmussen, et al., 2006). The decrease in nutrition self-efficacy is worrisome because low levels of self-efficacy in making healthy food choices has been associated with higher consumption of high-fat and high-sugar foods among male and female high school students (Cusatis & Shannon, 1996).

Participants' overall nutrition knowledge increased between the pre- and the post-survey (4.60 to 5.40, $p = 0.07$). It makes sense that the questions answered correctly with the greatest frequency were those that were directly covered as lesson topics. Correct

response to the question regarding how many cups of fruits and vegetables health experts recommend eating daily increased to a statistically significant degree. The USDA MyPlate guidelines and individual nutrition requirements for fruits and vegetables were discussed extensively within the program and were the topic of Lesson 4: Create Your Plate. Correct response to the question regarding what color fruits and vegetables are high in Vitamin A also increased between the pre- and the post-survey. It is interesting to note that this topic was not directly covered in a particular lesson. However, the vitamin and mineral content of fruits and vegetables were often explained to the participants by way of their color indicators; fruits and vegetables that are red in color are high in Vitamin A versus fruits and vegetables that are blue/purple in color are high in anthocyanin. The increase in correct responses to this question, despite a direct lesson covering the information, indicates the success in informal nutritional education by way of program leader-to-participant conversation throughout the program. It is not clear whether the improved nutrition knowledge contributed to the participant's increased fruit and vegetable intake and is a positive indicator of an improved dietary profile. There is contradictory evidence regarding the association between nutrition knowledge and healthy food choices. In previous research, correlations between nutrition knowledge and healthful eating have been weak (Axelson, Federline, & Brinberg, 1985) and it has been shown that knowledge per se does not predict healthy food choices (Story, Neumark-Sztainer, & French, Individual and Environmental Influences on Adolescent Eating Behaviors, 2002). However, a foundation of nutrition knowledge is important for making informed decisions regarding food intake and in other research, positive correlations have

been observed between nutrition knowledge a fruit and/or vegetable intake (Rasmussen, et al., 2006).

It is possible that there were differences in the changes observed between the sessions held in Arroyo Grande and Carpinteria. Efforts were made to create very similar learning environments between the two programs. The same lesson plans and recipes were used by both programs and the extensive online and video training served to instruct the Carpinteria program leaders in the methods of program implementation used for the session in Arroyo Grande. Also, the weekly phone consultations with the STRIDE Pink & Dude Chef intern ensured that any differences in the way the program in Carpinteria was run were identified and standardized with the Arroyo Grande site. Limited sample size made it unfeasible to compare differences between the two programs.

It is also possible that class attendance impacted the individual results of program participants. It is plausible that nutrition behavior, culinary confidence, and nutrition knowledge would be positively associated with a higher rate of program attendance. However, this may not have been the case, as results from *Pink Chefs*, showed weak associations between attendance and nutrition knowledge (Chessen, 2008).

Strengths and Limitations

One strength of this study was the hands-on culinary lessons that introduced novel fruits and vegetables while also giving the opportunity to try fruits and vegetables in new preparation methods. The observed outcome was an expansion of participants' palates and an increase in preference for common fruits and vegetables that they had previously discounted. Indeed, overall preference for fruits increased to a statistically significant

degree ($p = 0.01$) even with our limited sample size ($n = 23$). Statistical power may have hampered the ability to detect significant differences in preferences for vegetables. Notwithstanding, overall fruit and vegetable scores, in addition to all individual fruit and most individual vegetable preferences, increased.

Encouraging family participation with the Pink and Dude Chefs program was also a strength of this intervention. Participants were given copies of every recipe and were provided with to-go containers to take home samples of every recipe for their family members to sample. Indeed, participants reported that their families enjoyed the foods created and were often introduced to new foods or preparation methods. This may have increased the trust parents had in participants to make their own healthy dietary choices, increased support for program participation, and may have increased parental involvement in a healthful dietary profile. This unique aspect of Pink and Dude Chefs supported family-based approaches to improved nutrition and cooking.

One limitation of the survey instrument was that the list of fruit and vegetable variables on the survey was not exhaustive and may not have been culturally precise for the largely Hispanic/Latino participant sample. However, the goal of the program was to increase exposure to novel fruits and vegetables and to expand participants' palate. Also, it contained a large range of fruits and vegetables and all of the variables were brought up in discussions with the participants throughout the program as possible recipe substitutions or as examples of other fruits or vegetables possessing similar nutritional attributes. Still, it is possible that preferences for fruits and vegetables not listed on the survey may have changed between the beginning and end of the intervention but remain unobserved due to their absence on the survey instrument.

Another limitation of the program was that the recipes were not all culturally relevant to the largely Hispanic/Latino participants. However, efforts were made to strike a balance between a focus on foods from the Hispanic/Latino culture and foods from other cultures, thus providing familiar recipes such as guacamole while also introducing novel recipes such as bulgur chickpea salad. The introduction of new fruits and vegetables during the intervention may have increased the likelihood that participants would be open to trying more new fruits and vegetables outside of the program (Birch, Development of Food Preferences, 1999).

Although efforts were made to format the survey instrument in an age-appropriate manner, it is possible that the middle school participants did not fully understand all of the questions or the response options. Future research based on this survey instrument should determine the reliability of the survey by testing it among students of similar demographic profiles to the program participants.

It is important to note that the program was six weeks in length; it is possible that a longer intervention may have an even greater effect on participants' preference for fruits and vegetables because the effectiveness of interventions has been shown to increase with the number of hours participants spend in the interventions. However, the Pink and Dude Chefs program was designed based on feedback from afterschool program leaders as to the optimum program duration for participants' focus, interest, and likelihood of completing the program. Also, the program was designed to be led by university research assistants enrolled in a 10-week academic quarter and the intervention was designed with this in mind when the six-lesson, two classes per week duration was designed.

Future research should include larger numbers of program participants, keeping in mind that complex classroom-based interventions may require small group settings. Merging data across studies, study sites, or study periods may provide for better statistical power. More research is needed to test the duration of time an increased preference and intake of fruits and vegetables is maintained post-intervention, whether improved culinary confidence influences adolescent obesity, and if nutrition knowledge improves nutrition behavior. Study designs could also test the efficacy of interventions on parental behavior and attitudes on children's culinary skill or nutrition knowledge, and the impact of children's participation on nutrition and cooking in the home.

Chapter 5: Conclusions

Despite the increasing prevalence of adolescent obesity (Alberga, Sigal, Prud'homme, & Kenny, 2012), there have been some successful models for interventions in adolescent obesity prevention (Dietz & Gortmaker, Preventing Obesity in Children and Adolescents, 2001). Variations in study designs makes comparisons between programs difficult (Campbell, Waters, O'Meara, & Summerbell, 2001) and it may be that conventional randomized-controlled-trial interventions are almost impossible to implement in a real world scenario due to the multi-factorial nature of adolescent obesity (Batch & Baur, 2005). The six-week Pink and Dude Chefs nutrition and culinary intervention was successful in increasing preferences for fruits and in keeping middle school participants interested and engaged in a novel afterschool program.

Increasing availability and access to this and similar programs designed for young people may be one way of mitigating the impending consequences of the obesity problem. Efforts should be made to design family-level and culturally relevant programs and interventions. The public health impact of such programs, if causally associated with improving long-term dietary profiles, could prove to be highly beneficial in terms of population health status and national health care economics, especially over the long-term.

Works Cited

- Alberga, A. S., Sigal, R. J., Prud'homme, D., & Kenny, G. P. (2012). Overweight and obese teenagers: Why is adolescence a critical period? *Pediatric Obesity*, 1-13. doi:10.1111/j.2047-6310.2011.00046x
- Axelsson, M. L., Federline, T. L., & Brinberg, D. (1985). A meta-analysis of food- and nutrition-related research. *Journal of Nutrition Education*, 17(2), 51-54.
- Baranowski, T., Davis, M., Resnicow, K., Baranowski, J., Doyle, C., Smith, M., Wang, D. (2000). Gimme 5 fruit and vegetables for fun and health: Outcome evaluation. *Health Education & Behavior*, 27(1), 96-111.
- Batch, J. A., & Baur, L. A. (2005, February 7). Management and prevention of obesity and its complications in children and adolescents. *Medical Journal of Australia*, 182(3), 130-135.
- Beech, B. M., Rice, R., Johnson, C., & Nicklas, T. A. (1999). Knowledge, attitudes, and practices related to fruit and vegetable consumption of high school students. *Journal of Adolescent Health*, 24, 244-250.
- Birch, L. L. (1999). Development of food preferences. *Annual Review of Nutrition*, 19, 41-62.
- Birch, L. L., & Fisher, J. O. (1998, March). Development of eating behaviors among children and adolescents. *Journal of Pediatrics*, 101(3), 539-549.
- Braveman, P. A., Cubbin, C., Egerter, S., Williams, D. R., & Pamuk, E. (2010, April). Socioeconomic disparities in health in the United States: What the patterns tell us. *American Journal of Public Health*, 100(S1), S186-S196. doi:10.2105/AJPH.2009.166082
- Brown, B. J., & Hermann, J. R. (2005). Cooking classes increase fruit and vegetable intake and food safety behaviors in youth and adults. *J Nutr Educ Behav*, 37, 104-105.
- Campbell, K., Waters, E., O'Meara, S., & Summerbell, C. (2001, August). Interventions for preventing obesity in childhood. A systematic review. *Obesity Reviews*, 2(3), 149-157.
- Centers for Disease Control. (2005). *Youth Risk Behavior Survey*. Retrieved 2011, from www.cdc.gov/yrbs
- Centers for Disease Control and Prevention. National Center for Health Statistics. (2005-2008). *National Health and Nutrition Examination Data*. Hyattsville, MD: U.S.

Department of Health and Human Services, Centers for Disease Control and Prevention. Retrieved from http://www.healthindicators.gov/Indicators/Obesityinadolescentsaged12-19years_1215/Profile/Data

Certified Farmer's Markets. (n.d.). *California Fresh Produce Seasons*. Retrieved from <http://www.california-grown.com/PDFs/Whats-In-Season.pdf>

Chessen, J. A. (2008). *The development and pilot of a culinary intervention designed using the social cognitive theory to teach nutrition to adolescent girls*. San Luis Obispo, California: California Polytechnic State University.

Clark, L., & Foote, R. A. (2004, June). Building basic living skills in youth -- Kid's Chef School. *Journal of Extension*, 42(3).

Conde Nast Web sites. (2012). *Create / Edit Recipe*. Retrieved from Nutrition Data: <http://www.nutritiondata.self.com/mynd/myrecipes/edit-recipe>

Condrasky, M. D., & Hegler, M. (2010, April). How culinary nutrition can save the health of a nation. *Journal of Extension*, 48(2), 1-6.

Contento, I. R., Williams, S. S., Michela, J. L., & Franklin, A. B. (2006, May). Understanding the food choice process of adolescents in the context of family and friends. *Journal of Adolescent Health*, 38(5), 575-582. doi:10.1016/j.jadohealth.2005.05.025

Cullen, K. W., Baranowski, T., Owens, E., Marsh, T., Rittenberry, L., & de Moor, C. (2003). Availability, accessibility, and preferences for fruit, 100% fruit juice, and vegetables influence children's dietary behavior. *Health Education Behavior*, 30(5), 615-626. doi:10.1177/1090198103257254

Cusatis, D. C., & Shannon, B. M. (1996). Influences on adolescent eating behavior. *Journal of Adolescent Health*, 18, 37-34.

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. *Journal of American Heart Association*, 111, 1999-2012. doi:10.1161/01

Davis, J. N., Ventura, E. E., Cook, L. T., Gyllenhammer, L. E., & Gatto, N. M. (2011). LA Sprouts: A gardening, nutrition, and cooking intervention for Latino youth improves diet and reduces obesity. *American Dietetic Association*, 1224-1230.

Dietz, W. H. (1998, February). Use of the body mass index (BMI) as a measure of overweight in children and adolescents. *The Journal of Pediatrics*, 132(2), 191-193.

- Dietz, W. H., & Gortmaker, S. L. (2001, April 30). Preventing obesity in children and adolescents. *Annual Review of Public Health*, 22(1), 337-353.
- Dougherty, K., & Silver, C. (2007). Chef-nutritionist teams spark enjoyment and learning in cooking education series for 8- to 12-year-olds. *Journal of Nutrition Education and Behavior*, 39, 237-238. doi:10.1016/j.neb.2007.01.005
- Drewnowski, A. (1989). Sensory preferences for fat and sugar in adolescence and adult life. *Annals of the New York Academy of Sciences*, 561(1), 243-250.
- Fahlman, M. M., Dake, J. A., McCaughtry, N., & Martin, J. (2008, April). A pilot study to examine the effects of a nutrition intervention on nutrition knowledge, behaviors, and efficacy expectations in middle school children. *Journal of School Health*, 78(4), 216-222.
- Finkelstein, E. A., Khavjou, O. A., Thompson, H., Trogdon, J. G., Pan, L., Sherry, B., & Dietz, W. (2012, June). Obesity and severe obesity forecasts through 2030. *American Journal of Preventative Medicine*, 42(6), 563-570. doi:10.1016/j.amepre.2011.10.026
- Flegal, K. M., Shepherd, J. A., Looker, A. C., Graubard, B. I., Borrud, L. G., Ogden, C. L., Schenker, N. (2009). Comparisons of percentage body fat, body mass index, waist circumference, and waist-stature ratio in adults. *American Journal of Clinical Nutrition*, 89, 500-508. doi:10.3945/ajcn.2008.26847
- Freedman, D. S., Khan, K. L., Dietz, W. H., Srinivasan, S., & Berenson, G. S. (2001). Relationship of childhood obesity to coronary heart disease risk factors in adulthood: The Bogalusa Heart Study. *Pediatrics*, 108(3), 712-718.
- Freedman, D. S., Khan, L. K., Serdula, M. K., Ogden, C. L., & Dietz, W. H. (2006). Racial and ethnic differences in secular trends for childhood BMI, weight, and height. *Obesity*, 14, 301-308.
- Freedman, M. R., & Keast, D. R. (2011, April). White potatoes, including french fries, contribute shortfall nutrients to children's and adolescents' diets. *Journal of Nutrition Research*, 31(4), 270-277. doi:10.1016/j.nutres.2011.03.006
- Galson, S. K. (2008). *Surgeon General's Perspectives*. Public Health Reports, U.S. Public Health Service, United States Surgeon General . Retrieved from Surgeon General.
- Gracey, D., Stanley, N., Burkey, V., Corti, B., & Beitlin, L. (1996). Nutritional knowledge, beliefs and behaviors in teenage school students. *Health Education Research*, 11(2), 187-204.

- Guo, S. S., Roche, A. F., Chumlea, W. C., Gardner, J. D., & Siervogel, R. M. (1994). The predictive value of childhood body mass index values for overweight at age 35 y. *The American Journal of Clinical Nutrition*, 59, 810-819.
- Guthrie, J. F., Lin, B.-H., & Frazao, E. (2002, May-June). Role of food prepared away from home in the American diet, 1977-78 versus 1994-96: Changes and consequences. *Journal of Nutrition Education Behavior*, 34(3), 140-150.
- Hanson, N. I., Neumark-Sztainer, D., Eisenberg, M. E., Story, M., & Wall, M. (2005). Associations between parental report of the home food environment and adolescent intakes of fruits, vegetables and dairy foods. *Public Health Nutrition*, 8(1), 77-85.
- Hyland, R., Stacy, R., Adamson, A., & Moynihan, P. (2006). Nutrition-related health promotion through an after-school project: The responses of children and their families. *Social Science & Medicine*, 62, 758-768.
- Jahns, L., Siega-Riz, A., & Popkin, B. M. (2001). The increasing prevalence of snacking among US children from 1977 to 1996. *The Journal of Pediatrics*, 138(4), 493-8. doi:10.1067/mpd.2001.112162
- Kaufman, L., & Karpati, A. (2007). Understanding the sociocultural roots of childhood obesity: Food practices among Latino families of Bushwick, Brooklyn. *Social Science & Medicine*, 64, 2177-2188.
- Kelder, S. H., Perry, C. L., Klepp, K.-I., & Lytle, L. L. (1994, July). Longitudinal tracking of adolescent smoking, physical activity, and food choice behaviors. *American Journal of Public Health*, 84(7), 1121-1126.
- Kimmons, J., Gillespie, C., Seymour, J., Serdula, M., & Blanck, H. M. (2009, January 26). Fruit and vegetable intake among adolescents and adults in the United States: Percentage meeting individualized recommendations. *The Medscape Journal of Medicine*, 11(1), 1-15.
- Knai, C., Pomerleau, J., Lock, K., & McKee, M. (2006). Getting children to eat more fruit and vegetables: A systematic review. *Preventive Medicine*, 42, 85-95. doi:10.1016/j.ypmed.2005.11.012
- Larson, N. I., Eisenberg, M. E., & Neumark-Sztainer, D. (2006). Food preparation and purchasing roles among adolescents: Associations with sociodemographic characteristics and diet quality. *Journal of the American Dietetic Association*, 106(2), 211-218. doi:10.1016/j.jada.2005.10.029
- Larson, N., Laska, M. N., Story, M., & Neumark-Sztainer, D. (2012). Predictors of fruit and vegetable intake in young adulthood. *Journal of the Academy of Nutrition and Dietetics*, 112(8), 1216-1222. doi:10.1016/j.jand.2012.03.035

- Larson, N., Neumark-Sztainer, D. R., Harnack, L. J., Wall, M. M., Story, M. T., & Eisenberg, M. E. (2008, July). Fruit and vegetable intake correlates during the transition to young adulthood. *American Journal of Preventative Medicine*, 35(1), 33-37. doi:10.1016/j.amepre.2008.03.019
- Laska, M. N., Larson, N. I., Neumark-Sztainer, D., & Story, M. (2011). Does involvement in food preparation track from adolescence to young adulthood and is it associated with better dietary quality? Findings from a 10-year longitudinal study. *Public Health Nutrition*, 1-9. doi:10.1017/S1368980011003004
- Lichtenstein, A. H., & Ludwig, D. S. (2012). Bring back home economics education. *Journal of American Medical Association*, 303(18), 1857-1858. doi:10.1001.jama.2010.592
- Lightwood, J., Bibbins-Domingo, K., Coxson, P., Wang, C., Williams, L., & Goldman, L. (2009). Forecasting the future economic burden of current adolescent overweight: An estimate of the Coronary Heart Disease Policy Model. *American Journal of Public Health*, 99(12), 2230-2237.
- Lin, B.-H., Frazao, E., & Guthrie, J. (1999). Away-from-home foods increasingly important to quality of American diet. Economic Research Service. Washington DC: USDA.
- Ludwig, D. S. (2000). Dietary glycemic index and obesity. *The Journal of Nutrition*, 130, 280S-283S.
- Lytle, L., Seifert, S., Greenstein, J., & McGovern, P. (2000, March-April). How do children's eating patterns change over time? Results from a cohort study. *American Journal of Health Promotion*, 14(4), 222-228.
- Mei, Z., Grummer-Strawn, L. M., Pietrobelli, A., Goulding, A., Goran, M. I., & Dietz, W. H. (2002). Validity of body mass index compared with other body-composition screening indexes for the assessment of body fatness in children and adolescents. *American Journal of Clinical Nutrition*, 75, 978-985.
- National Center for Chronic Disease Prevention and Health Promotion: Division of Nutrition, Physical Activity and Obesity. (2011, September 13). *Healthy weight - it's not a diet, it's a lifestyle!* Retrieved from Centers for Disease Control and Prevention: http://www.cdc.gov/healthyweight/assessing/bmi/childrens_BMI/about_childrens_BMI.html
- Network for a Healthy California. (2005). *Five a Day Power Play! Pre-Post Impact Survey*. Unpublished.

- Neumark-Sztainer, D., Wall, M., Perry, C., & Story, M. (2003, September). Correlates of fruit and vegetable intake among adolescents: Findings from Project EAT. *Preventive Medicine, 37*(3), 198-208. doi:10.1016/S0091-7453(03)00114-2
- Nielsen, S. J., Siega-Riz, A. M., & Popkin, B. M. (2002). Trends in food locations and sources among adolescents and young adults. *Preventative Medicine, 35*, 107-113. doi:10.1006/pmed2002.1037
- Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2012). *Prevalence of obesity in the United States, 2009-2010*. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Hyattsville, MD: National Center for Health Statistics.
- Ogden, C., & Carroll, M. (2010). *Prevalence of obesity among children and adolescents: United States, trends 1963-1965 through 2007-2008*. Division of Health and Nutrition Examination Surveys.
- Peart, T., Mondragon, E. V., Rohm-Young, D., Bronner, Y., & Hossain, M. (2011). Weight status in US youth: The role of activity, diet, and sedentary behaviors. *American Journal of Health and Behavior, 35*(6), 756-765.
- Pietrobelli, A., Faith, M. S., Allison, D. B., Gallagher, D., Chiumello, G., & Heynsfield, S. B. (1998). Body mass index as a measure of adiposity among children and adolescents: A validation study. *The Journal of Pediatrics, 132*(2), 201-210.
- Pirouznia, M. (2001). The association between nutrition knowledge and eating behavior in male and female adolescents in the US. *International Journal of Food Sciences and Nutrition, 52*, 127-132. doi:10.1080/09637480020027000
- Pi-Sunyer, F. X. (1991). Health implications of obesity. *American Journal of Clinical Nutrition, 53*, 1595S-1603S.
- Rasmussen, M., Krolner, R., Klepp, K.-I., Lytle, L., Brug, J., Bere, E., & Due, P. (2006, August 11). Determinants of fruit and vegetable consumption among children and adolescents: A review of the literature. *International Journal of Behavioral Nutrition and Physical Activity, 1*-19. doi:10.1186/1479-5868-3-22
- Rennie, K. L., Johnson, L., & Jebb, S. A. (2005). Behavioural determinants of obesity. *Best Practice & Research Clinical Endocrinology & Metabolism, 19*(3), 343-358. doi:10.1016/j.beem.2005.04.003
- Research and Evaluation Unit of the Network for a Healthy California. (2007). *Nutrition Education Survey*. California Department of Public Health.

- Reynolds, K. D., Yaroch, A. L., Franklin, F. A., & Maloy, J. (2002). Testing mediating variables in a school-based nutrition intervention program. *Health Psychology, 21*(1), 51-60.
- Rolls, B. J. (2009, July). The relationship between dietary energy density and energy intake. *Journal of Physiology & Behavior, 97*(5), 609-615. doi:10.1016/j.physbeh.2009.03.011
- Roseman, M. G., Yeung, W. K., & Nickelson, J. (2007). Examination of weight status and dietary behaviors of middle school students in Kentucky. *Journal of American Dietetic Association, 107*, 1139-1145.
- Saunders, R. P., Pate, R., Felton, G., Dowda, M., Weinrich, M., Ward, D., Baranowski, T. (1997). Development of questionnaires to measure psychosocial influences on children's physical activity. *Preventative Medicine, 26*, 241-247.
- Story, M., & Resnick, M. D. (1986). Adolescents' views on food and nutrition. *Journal of Nutrition Education, 18*(4), 188-192. doi:10.1016/S0022-3182(86)80015-2
- Story, M., Neumark-Sztainer, D., & French, S. (2002, March). Individual and environmental influences on adolescent eating behaviors. *Journal of the American Dietetic Association, 102*(3), S40-S51. doi:10.1016/S0002-8223(02)90421-9
- Sylva, K., Townsend, M., & Metz, D. (2006). *UCCE Food Behavior Checklist*. University of California Cooperative Extension.
- Sylva, K., Townsend, M., Martin, A., & Metz, D. (2006). *Food Stamp Program Food Behavior Checklist*. Public Health Institute, California Department of Health.
- te Velde, S. J., Twisk, J. W., & Brug, J. (2007, August). Tracking of fruit and vegetable consumption from adolescence into adulthood and its longitudinal association with overweight. *British Journal of Nutrition, 98*(2), 431-438. doi:10.1017/S0007114507721451
- Thakur, N., & D'Amico, F. (1999, February). Relationship of nutrition knowledge and obesity in adolescence. *Family Medicine, 31*(2), 122-127.
- Thonney, P. F., & Bisogni, C. A. (2006). Cooking Up Fun! A youth development strategy that promotes independent food skills. *Journal of Nutrition Education and Behavior, 28*, 321-323. doi:10.1016/j.jneb.2006.03.007
- Townsend, M., & Kaiser, L. (2006). *University of California Fruit and Vegetable Inventory*. University of California Cooperative Extension.
- Trasande, L., & Chatterjee, S. (2009). The impact of obesity on health service utilization and costs in childhood. *Obesity, 17*, 1749-1754. doi:10.1038/oby.2009.67

- Triches, R. M., & Giugliani, E. R. (2005). Obesity, eating habits and nutritional knowledge among school children. *Rev Saude Publica*, 39(4), 1-7.
- USDA. (n.d.). *MyPlate Topics*. Retrieved from Choose MyPlate: www.choosemyplate.gov
- 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 Oxford Journals*, 22(2), 203-226. doi:10.1093/her/cy1069
- Van Itallie, T. B. (1979, December). Obesity: Adverse effects on health and longevity. *The American Journal of Clinical Nutrition*, 32, 2723-2733.
- Wang, M. C., Rauzon, S., Studer, N., Martin, A. C., Craig, L., Merlo, C., Crawford, P. (2010). Exposure to a comprehensive school intervention increases vegetable consumption. *Journal of Adolescent Health*, 47, 74-82.
- Wang, Y., & Beydoun, M. A. (2007). The Obesity epidemic in the United States - gender, age, socioeconomic, racial/ethnic, and geographic characteristics: A systematic review and meta-regression analysis. *Epidemiologic Reviews*, 29, 6-28. doi:10.1093/epirev/mxm007
- Wang, Y., & Zhang, Q. (2006). Are American children and adolescents of low socioeconomic status at increased risk of obesity? Changes in the association between overweight and family income between 1971 and 2002. *American Journal of Clinical Nutrition*, 84, 707-716.
- Whitaker, R. C., Pepe, M. S., Sedel, K. D., & Dietz, W. H. (1997, September 25). Predicting obesity in young adulthood from childhood and parental obesity. *The New England Journal of Medicine*, 337(13), 869-873.
- WHO Expert Committee. (1995). *Physical Status: The use and interpretation of anthropometry*. WHO Technical Report Series. Geneva: World Health Organization.
- Williams, D. R. (2006). Race, SES, and Health: The added effects of racism and discrimination. *Annals New York Academy of Sciences*, 173-188.
- Williams, D. R., & Mohammed, S. A. (2009). Discrimination and racial disparities in health: Evidence and needed research. *Journal of Behavioral Medicine*, 32(1), 20-47. doi:10.1007/s10865-008-9185-0
- Winkleby, M. A., Jatulis, D. E., Frank, E., & Fortmann, S. P. (1992, June). Socioeconomic status and health: How education, income, and occupation

contribute to risk factors for cardiovascular disease. *American Journal of Public Health*, 816-820.

World Health Organization. (2000). *Obesity: Preventing and managing the global epidemic: Report of a WHO Consultation*. Technical Report Series no. 894, Geneva.

World Health Organization. (2011, March). *Media centre: Obesity and overweight fact sheet N311*. Retrieved from World Health Organization: <http://www.who.int/mediacentre/factsheets/fs311/en/>

Wrieden, W., Anderson, A., Longbottom, P., Valentine, K., Stead, M., Caraher, M., & Dowler, E. (2002). Assisting dietary change in low income communities; Assessing the impact of a community-based practical food skills intervention (*CookWell*). London: Food Standards Agency.

Xie, B., Gilliland, F. D., Li, Y.-F., & Rockett, H. R. (2003). Effects of ethnicity, family income, and education on dietary intake among adolescents. *Preventive Medicine*, 36, 30-40. doi:10.1006/pmed.2002.1131

Yoo, S., Nicklas, T., Baranowski, T., Zakeri, I. F., Yang, S.-J., Srivivasan, S. R., & Berenson, G. S. (2004). Comparison of dietary intakes associated with metabolic syndrome risk factors in young adults: The Bogalusa Heart Study. *American Journal of Clinical Nutrition*, 80, 841-848.

Appendices

APPENDIX A: Online Training Volunteer Timeline

45 days before the start of the program:

1. Read the following on the Train the Trainers, CHI Campus website

"Recommended System Requirements"
"About Pink and Dude Chefs"
"About STRIDE"
"Essentials of the Online Course"

2. View "Ingredients for Success" video presentations

Video Name	Time
<i>Ingredients for Success</i>	
Finances	2:38
Personnel	3:45
Other Expenses	4:17
Establishing Partnership and Finding a Site	6:34
Learning the Phases	5:15
Ingredients for Success	1:22
Total:	23:51

3. Complete quizzes associated with presentations above and receive a minimum score of 95%
(est. 10 min)

1 month prior to the start of the program:

1. View "Learn the Phases" video presentations

Video Name	Time
Lesson 1: Introduction	
Lesson 2: How to Read a Recipe	1:58
Lesson 3: Cutting Edge	2:26
Lesson 4: Create My Plate (<i>Build Your Pyramid</i>)	2:47
Lesson 5: Get the Facts	1:49
Lesson 6: Carbohydrates and Proteins	2:44
Lesson 7: What are Fats?	1:55
Lesson 8: Dair-y You to Try 3 a Day	3:37
Lesson 9: Breakfast of Champions	3:32
Lesson 10: Meal Planning and Budgeting	2:14
Lesson 11: Nutrition Jeopardy	2:01
Lesson 12: Family Fiesta	3:26
Total:	28:29

3 weeks prior to the start of the program:

1. View “Preparing for the Lesson” video presentations

Video Name	Time
<i>Train the Trainers: Preparing for the Lesson</i>	
Introduction	1:07
Gathering Supplies	1:43
Food Shopping and Pantry Organization	1:39
New Recruits	0:53
Day Before Lesson Protocol	1:56
Total:	7:18

2. View “Day of Lesson and Classroom Control” video presentations

Video Name	Time
<i>Day of Lesson and Classroom Control</i>	
Day of Lesson	1:08
Classroom Control/ Rules and Norms	0:59
Communication With Your Students	1:50
Ways to Gain Attention	1:35
Total:	5:32

3. Complete quizzes associated with presentations above and receive a minimum score of 95%
(est. 10 min)

2 weeks prior to the start of the program:

1. View “Day of Lesson and Kitchen Control” video presentations

Video Name	Time
<i>Day of Lesson and Kitchen Control</i>	
Day of Kitchen Set- Up	1:56
Sharing in the Kitchen	0:33
Dangers in the Kitchen	0:57
Cooking Demonstration	2:21
Clean-Up and Closure	1:17
End of Lesson and Evaluation	0:45
Total:	7:49

2. View “Culinary Terms and Skills” video presentations

Video Name	Time
<i>Culinary Terms and Skills</i>	
Kitchen Stand Mixer	2:01
Food Processor	2:15
Food Processor Assembly and Attachments	2:32
Blender	3:02
Gas vs. Electric Ranges	1:43
Knives	2:09
Total:	13:42

3. View “Fundamentals of Cooking” video presentations

Video Name	Time
<i>Fundamentals of Cooking</i>	
Proper Meat Storage and Cooking Temperatures	1:49
Storage, Cooking Temperatures of Fish and Poultry; Cross Contamination	2:24
Proper Hand Washing	1:39
Fire Safety	2:11
Total:	8:03

4. Complete quizzes associated with presentations above and receive a minimum score of 95%
(est. 10 min)

1 week prior to EACH lesson:

1. View recommended video presentations for specific lesson you will be teaching
2. Complete quizzes associated with presentations and receive a score of 100% (est. 10 min)

Video Name	Time
Lesson 1: Introduction	
Day of Kitchen Set Up (“Day of Lesson and Kitchen Control”)	1:56
Proper Hand washing (“Fundamentals of Cooking”)	1:39
Clean-up and Closure (“Day of Lesson and Kitchen Control”)	1:17
End of Lesson and Evaluation (“Day of Lesson and Kitchen Control”)	0:45
Total:	

Video Name	Time
Lesson 2: How to Read a Recipe	1:58
Proper Meat Storage & Cooking Temperatures (“Fundamentals of Cooking”)	1:49
Storage and Cooking Temperatures of Fish and Poultry and Cross Contamination (“Fundamentals of Cooking”)	2:24
Fire Safety (“Fundamentals of Cooking”)	2:11
Total:	8:22

Video Name	Time
Lesson 3: Cutting Edge	2:26

Knives (<i>"Culinary Terms and Skills"</i>)	1:49
Total:	4:15

Video Name	Time
Lesson 4: Create My Plate	2:47
Total:	2:47

Video Name	Time
Lesson 5: Get the Facts	1:49
Total:	1:49

Video Name	Time
Lesson 6: Carbohydrates and Proteins	2:44
Total:	2:44

Video Name	Time
Lesson 7: What are Fats?	1:55
Total:	1:55

Video Name	Time
Lesson 8: Dair-y You to Try 3-a-Day	3:37
Total:	3:37

Video Name	Time
Lesson 9: Breakfast of Champions	3:32
Total:	3:32

Video Name	Time
Lesson 10: Meal Planning and Budgeting	2:14
Total:	2:14

Video Name	Time
Lesson 11: Nutrition Jeopardy	2:01
Total:	2:01

10-14 days prior to Family Fiesta:

1. View recommended video presentations for "Family Fiesta"

Video Name	Time
Lesson 12: Family Fiesta	3:26
Personnel (<i>"Ingredients for Success"</i>)	3:45
Total:	7:11

2 days after EACH lesson:

1. Complete and submit all evaluations associated with EACH lesson.

APPENDIX B: Participant Recruitment Flyer

Get excited for Pink & Dude Chefs!!!

Scheduled Classes:

Tuesday & Thursday, 2:30-4:30pm
at Mesa Middle School

From Tuesday, October 4 until
Thursday, November 10!!!

Want to learn ...

- how to cook?
- how to eat a healthy diet?
- how to get strong for sports & exercise?

JOIN Pink & Dude Chefs!!!

Pink & Dude Chefs is a research project that uses nutrition and cooking classes to expand student's culinary knowledge.

We want to:

- Combat childhood obesity
- Build knowledge, skills, & confidence to make healthy choices
- Create a passion for food, cooking, & nutrition

Questions? Contact:

Tianna Sheehan, Program Coordinator
805 756 2195
STRIDEPDChefs@calpoly.edu

STRIDE
CULTIVATING
HEALTHY HABITS
FOR HEALTHY FUTURES

APPENDIX C: Lesson Plan Example

Lesson 1: Personality Pie

Age of learners: 12-14 years

Time allotted: 2 hours

General Goal(s):

- This lesson is the orientation to the “Pink and Dude Chefs” program. This lesson will establish classroom norms and food safety norms, create the culinary community, and introduce nutrition through cooking skills.

Specific Objectives:

- The students will state the importance of hand washing and will demonstrate food safety through proper hand washing methods.
- The students will state the dangers of cross-contamination, and how to avoid getting themselves or others sick due to cross-contamination through lecture and group discussion.
- The students will demonstrate how to work cooperatively within a group through the pie decorating activity.

Required Materials:

Instructor needs:	Students need:	Volunteers need:
First-aid kit	Pen and pencil (1 per student)	
Name tags	Piece of paper (1 per student)	
Attendance sheet	Hand soap	Cutting boards
Calendars (1/student)	Napkins	Knives / whisk / spatula
Recipes (1/student)	Apron & Chef's hat	Small disposable bowls
Recipe Books (1/student)	Set of Measuring cups & spoons (1/group)	Cups
Clean up Responsibility (1/group)	Spatula (1/group)	Spoons
	Whisk (1/group)	
Questionnaires (1/student) & Pens		
Large poster board		
Markers		
Cinnamon (hand washing activity)		*Have the volunteers make the fruit parfaits and cut the fruit for the pie.
Cooking oil (hand washing activity)		
Camera		*Have the volunteers set up a separate work station for ingredients, the instructor and each group. Place a cutting board with a non-slip liner underneath. Place a recipe and a clean-up responsibility at each station. Also, have the volunteers place the student's materials needed for the lesson at each station. This exercise will be repeated for the entire program.

Teacher Preparation:

- Have the volunteers cut the fruit for the pies.
- Read nutritional background information on ingredients.

15 min	Anticipatory Set: Ask the students “Do you like pie? What kind of pie do you like?” Explain to the students that food can be used to express their personalities. Allow the students to visually create a pie that would describe their personality. For example, would their pie be spicy, sweet, savory, fruity, chocolate, vanilla, ice cream, etc. What do the students think that their pies say about them? Have the students name their pie and write it down on a piece of paper with their name and pie name on it. Go around the room and have every student tell their pie story. In addition to a pie story have them say three things about themselves that, in a sense, defines their eating & cooking habits. (Ex: I love apples, I make my own lunch, and my favorite dessert is chocolate cake.)
5 min	Step-By-Step Procedures: 1) Before beginning, collect all consent forms and behavior contracts. If you have not yet given consent forms to the students, pass them out, give a brief explanation, and tell them they need to bring them back next class period. Make sure all of the students are wearing closed-toed shoes. If not, remind them they must wear closed-toed shoes next time. 2) Take attendance while the students are telling their pie story. If you don’t have an attendance sheet, pass around a piece of paper for the students to sign.
5 min	3) Introduction: explain the program. Tell the students that it’s a study and you need their help. Explain what Pink and Dude Chefs is, what they can expect to learn and what they can expect to make in the course. a) Pass out calendars of the program and give them a food safety magnet (or an alternative introductory gift).
10 min	4) Establish classroom norms/rules: a) Explain to the students what classroom norms are and give an example. For example, treat everyone with respect. b) Allow the students to brainstorm and develop the norms of the classroom. i) For example, clean up before anyone leaves. c) Write the norms up on a poster-board and bring with you to display at each class d) Refer to the norms when appropriate.
15 min	5) Questionnaire (If using, otherwise, omit) a) Give a brief description of the questionnaire and that it will be used for a study, but their identity will remain anonymous. b) Inform the students that there is no wrong answer and encourage questions. c) Inform the students that this is an individual questionnaire and they should not converse with their peers before answering the questions. d) Define terms: write definitions on board i) Health: body condition; good health is an equal balance of the mind, body and spirit. ii) Confidence: belief in oneself and one’s power in abilities; self-sufficient. iii) Convenience: any packaged food, dish, or meal that can be prepared quickly and easily, as by thawing or heating. Ex. Macaroni and cheese e) Walk through each question with the students fully explaining what each one is asking.
5 min	6) Snack of the Day: Yogurt Parfaits. Have volunteers assemble them while

10
min

another instructor is administering the questionnaire. Pass them out to the students. Explain the simple assembly process and the health properties of yogurt, fresh fruit, and granola.

- 7) Discussion of students **'top three' goals** during the program (while students eat their snack)
  - a) Have the students vocally list 3 goals they'd like to accomplish during the program. (ex: learn to make easy, healthy breakfasts, learn to bake a cake, cook really tasty fruits & vegetables)
  - b) Write these goals on a poster board to display at each class
  - c) Refer to the goals when appropriate
- 8) **Tour of the kitchen:**
  - a) Show the kids the stove top, ovens, preparation areas, dish washing station, etc.
  - b) During kitchen tour, go over the importance of **cross contamination**
    - i) Discussion of food safety and cross contamination
      - (1) Define Cross Contamination: The physical movement of a harmful substance from one location to another.
        - (a) Example- Cutting raw chicken on a cutting board and then placing raw vegetables on the same cutting board without washing it. The germs from the chicken are being transferred to the raw vegetables.
      - (2) Ask them if they can recall other examples of ways we can spread dangerous germs to food.
        - (a) Utensil to food; equipment to food; person to food (coughing, sneezing, going to the bathroom, touching face etc.)
      - (3) Emphasize to the students that food safety is one of the top priorities when cooking and handling food, and food safety rules will be followed and enforced in the kitchen for everyone's safety.
      - (4) Explain that not washing your hands is the #1 way to spread germs and cross contaminates food.
        - (a) Discuss the importance of hand washing.
          - (i) You should wash your hands for 20 seconds to ensure bad germs are washed away. Sing "Happy Birthday to You" twice
  - c) **"Soapy Solutions" Experiment¹:**

Procedure:

    - Have 3 student volunteers
      - Coat their hands with cooking oil.
      - Sprinkle cinnamon on students' hands.
        - Student 1: wash hands with cold water and no soap
        - Student 2: wash hands with warm water and no soap
        - Student 3: wash hands with warm water and soap
    - Observations
      - Method of hand washing that removed the most "bacteria" was ...
      - Method that removed the least "bacteria" was ...
- 9) Have students wash their hands and give them each an apron and hat to wear. Inform them that they will be wearing a hat and apron at every cooking section

10
min

	for the duration of the program.
5 min	10) Recipe: To familiarize the students with reading recipes. - Have students stand in their groups at each station. - Explain that they need to read each recipe before they start cooking. - Have students take turns reading the recipe while holding up the appropriate measuring cup/spoon and pointing out specific ingredients.
30 min	11) Pie Decorating: - Each student will be given a portion of a pie (or 1 mini-pie). - Each group of students will be given sliced fruit already prepared by the volunteers. - Students prepare the pudding mix and spread it in the pies. - The students will decorate their portion of a pie with the fruit. - While students are decorating pies, make sure questionnaires are filled out properly (allergies, age, etc.). - All of the students will take their decorated pie home. - Take pictures of each student with their decorated pie and the name of their pie. Pictures are to help memorize names and they also can be used for the scrapbook.
10 min	12) Clean up

Plan for Independent Practice:

- Pie decorating with fruit; hand washing; use plain yogurt in recipes.

Closure:

- What did you learn?
- Do you think you might start cooking more at home now?
- The yogurt parfait is a good, healthy snack that is simple to make and takes no time to prepare.
- The yogurt pies are healthy dessert options that can be customized with different flavors and fruit combinations.

Chef Challenge:

- Try singing 'Happy Birthday to You' at home when you wash your hands. Get a family member to wash hands and sing with you.
- Make yogurt parfaits or yogurt pies for your family.

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Pink and Dude Chef™ Culinary Program
 STRIDE Science through Translational Research In Diet and Exercise
 California Polytechnic State University
 Kinesiology Department

References

The Partnership for Food Safety Education. (n.d.) Fight Bac. Curriculum for kids: Grades 4-8, "Soapy Solutions." Retrieved from <http://www.fightbac.org/storage/documents/curriculum/grades4-8experiments.pdf>

APPENDIX D: Recipe Example

Ingredients:

Makes: 1 mini pie, 1 mini pie per serving

cup nonfat plain yogurt

• 1/8 cup blueberries

cup instant pudding mix

• 1/8 cup pear, sliced

cup of strawberries, sliced

• 1/4 cup banana, sliced

cup peaches, sliced

• 1 mini graham cracker crust

Instructions:

medium bowl, stir together yogurt & pudding mix.

graham cracker crust with yogurt.

ornate with fruit. Enjoy!!!

Use seasonal fruit!!!

Winter: oranges & pears

Spring: apricots & mangos

Summer: peaches & strawberries

Fall: apples & pomegranates

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We LOVE fruit!!!

ssium to help maintain blood pressure!

in C keeps your teeth & gums healthy!

min A keeps your eyes & skin healthy!

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APPENDIX E: Lesson Evaluation Example

Lesson 1: *Personality Pie* Evaluation

Did the students remember and utilize the information/skills they learned the week before?

Did you follow the lesson plan with discussion points? YES / NO

Did you make any alterations to the lesson plan? YES / NO

If yes, what were these?

Were there any problems with the lesson?

Did the students correctly read and follow the recipe?

Do you have any further comments about the lesson?

APPENDIX F: Survey Instrument

Pink & Dude Chef – Cooking is Cool! *Before we get started ...*

Your School: _____ Date: _____

Instructions

We would like for you to complete this survey. You may skip questions you do not want to answer but we hope that you will answer all of them.

Any information about who you are will be kept secret. We will not share your name or identification number. They will only be used for reports.

Part 1: Details about yourself ...

The first few questions are about you. Please circle your answer.

- 1) What grade are you in?
  - a. 6th grade
  - b. 7th grade
  - c. 8th grade
- 2) How old are you? _____
- 3) Are you a boy or a girl?
  - a. Boy
  - b. Girl
- 4) How many people live in your household (including yourself)?
  - a. 2
  - b. 3
  - c. 4
  - d. 5+
- 5) How would you describe yourself? (Circle ALL that apply to you)
  - a. American Indian or Alaska Native
  - b. Asian
  - c. Black or African American
  - d. Hispanic or Latino Mexican
  - e. Native Hawaiian or Other Pacific Islander
  - f. White/Caucasian
  - g. Other (_____)

Part 2: Preferences

Now we want to know how much you like or don't like some foods.

6) How much do you like these fruits and vegetables?	Please check the box for your answer				
	I do not like this	I like this a little	No Opinion	I like this a lot	I don't know what this is
Acorn Squash	☐	☐	☐	☐	☐
Asparagus	☐	☐	☐	☐	☐
Avocados	☐	☐	☐	☐	☐
Beets	☐	☐	☐	☐	☐
Broccoli	☐	☐	☐	☐	☐
Cabbage	☐	☐	☐	☐	☐
Carrots	☐	☐	☐	☐	☐
Cherries	☐	☐	☐	☐	☐
Cooked Greens	☐	☐	☐	☐	☐
Corn	☐	☐	☐	☐	☐
Dried Plum	☐	☐	☐	☐	☐
Grapefruit	☐	☐	☐	☐	☐
Green Beans	☐	☐	☐	☐	☐
Tangerines	☐	☐	☐	☐	☐
Melons	☐	☐	☐	☐	☐
Mushrooms	☐	☐	☐	☐	☐
Peas	☐	☐	☐	☐	☐
Peppers	☐	☐	☐	☐	☐
Persimmons	☐	☐	☐	☐	☐
Plums	☐	☐	☐	☐	☐

Potatoes	☐	☐	☐	☐	☐
Pumpkins	☐	☐	☐	☐	☐
Radishes	☐	☐	☐	☐	☐
Salad Greens	☐	☐	☐	☐	☐
Spinach	☐	☐	☐	☐	☐
Sweet Potatoes	☐	☐	☐	☐	☐
Tomatoes	☐	☐	☐	☐	☐
Zucchini	☐	☐	☐	☐	☐

Part 3: What do YOU usually eat?

These questions are about the foods you USUALLY eat.

During the past 7 days, how many times did you ...	Please check the box for your answer						
	Not at all	1-3 times	4-6 times	1 time per day	2 times per day	3 times per day	4 or more times per day
7) Drink 100% fruit juices (orange, apple, or grape juice). <i>Do NOT count punch, Kool-Aid, sports drinks, or other fruit-flavored drinks.</i>	☐	☐	☐	☐	☐	☐	☐
8) Drink fruit drinks, sport drinks, or punch	☐	☐	☐	☐	☐	☐	☐
9) Drink milk or put it on cereal	☐	☐	☐	☐	☐	☐	☐
10) Drink regular (not diet) soda?	☐	☐	☐	☐	☐	☐	☐
11) Eat fruit? <i>Do NOT count fruit juice</i>	☐	☐	☐	☐	☐	☐	☐
12) Eat green salad	☐	☐	☐	☐	☐	☐	☐
13) Eat potatoes <i>Do NOT count French fries, fried potatoes, or potato chips.</i>	☐	☐	☐	☐	☐	☐	☐
14) Eat carrots	☐	☐	☐	☐	☐	☐	☐
15) Eat other vegetables <i>Do NOT count green salad, potatoes, or carrots.</i>	☐	☐	☐	☐	☐	☐	☐

16) Eat fruits or vegetables as snacks	☐	☐	☐	☐	☐	☐	☐
17) Use the Nutrition Facts panel on the back of the food label?							
	☐	☐	☐	☐	☐	☐	☐
18) Eat breakfast	☐	☐	☐	☐	☐	☐	☐

19) If you ate breakfast today, what did you eat? (Circle ALL that apply.)

- a. High-fiber cereal
  - b. Fruit
  - c. Milk and/or Yogurt
  - d. Eggs
  - e. Vegetables
  - f. 100% Fruit Juice
  - g. None of the above
- Please explain

We want to know how sure you are that you can cook your own food.

I think I can ...	Please check the box for your answer		
	I don't think I can	I'm not sure	I'm sure I can
20) Cook from basic, raw ingredients, from scratch 	☐	☐	☐
21) Create meals using new ingredients <i>(New = fruits, vegetables, spices, herbs that you have never tried before)</i>	☐	☐	☐
22) Follow a simple recipe when cooking	☐	☐	☐

23) Safely use a knife when cooking 	☐	☐	☐
24) Use coupons and/or store fliers to plan a meal that tastes good but does not cost a lot of money 	☐	☐	☐
25) Use leftovers to create a new, tasty meal	☐	☐	☐

There are many things that influence the way we eat.	For each of these statements, please check the box for how much you AGREE or DISAGREE				
	Agree strongly	Agree	Neither agree nor disagree	Disagree	Disagree strongly
26) Other foods taste better for snacks than fruits & vegetables	☐	☐	☐	☐	☐
27) There are not a lot of fruit & vegetables at my house	☐	☐	☐	☐	☐
28) I don't have time to fix foods like fruits & vegetables	☐	☐	☐	☐	☐
29) I don't know how to fix foods like fruits & vegetables	☐	☐	☐	☐	☐
30) My parents/guardian won't let me cook	☐	☐	☐	☐	☐
31) I think cooking for my family is cool & fun	☐	☐	☐	☐	☐
32) What my family thinks about cooking is important to me	☐	☐	☐	☐	☐
33) My friends think cooking is cool and fun	☐	☐	☐	☐	☐
34) What my friends think about cooking is important to me	☐	☐	☐	☐	☐

Part 4: Fruits and Vegetables (I think)

We want you to tell us what you know about healthful eating.

I think I can ...	Please check the box for your answer		
	I don't think I can	I'm not sure	I'm sure I can
35) Ask someone in my family to buy my favorite fruit or vegetable	☐	☐	☐
36) Ask someone in my family to make my favorite vegetable dish	☐	☐	☐
37) Ask someone in my family to have fruits out where I can reach them	☐	☐	☐
38) Ask someone in my family to have cut up vegetables out where I can reach them	☐	☐	☐
39) Help my mom or dad fix a fruit or vegetable	☐	☐	☐
40) Fix a fruit or vegetable by myself	☐	☐	☐

Please circle your answers.

41) In your household, who is usually in charge of what foods to buy for dinner?

- a. I am
- b. Shared decision
- c. Parents
- d. I don't know

42) When you eat at home, who is usually in charge of how to prepare the food for dinner?

- a. I am
- b. Shared decision
- c. Parents
- d. Other person

Part 5: Fruits and Vegetables

We want you to tell us what you know about healthful eating. Please circle your answer.

- 43) Eating fruits and vegetables can help lower your chances of getting diseases like high blood sugar (diabetes) or heart disease.
- a. True
  - b. False
  - c. Don't Know
- 44) Fruits and vegetables that are high in Vitamin A are _____ in color.
- a. Red and white
  - b. Blue and light brown
  - c. Yellow-orange and dark green
  - d. Brown & purple
  - e. I don't know
- 45) Most of the Vitamin C we get comes from fruits and vegetables.
- a. True
  - b. False
  - c. Don't know
- 46) A fruit salad will be higher in Vitamin C if you add _____ to it.
- a. Apples
  - b. Grapes
  - c. Bananas
  - d. Oranges
  - e. I don't know
- 47) Almost all fruits and vegetables contain a lot of vitamins and _____.
- a. Protein
  - b. Fiber
  - c. Cholesterol
  - d. Fat
  - e. Don't know
- 48) Fruits and vegetables like apples and pears are best when eaten with the peel because that is where most of the fiber and antioxidants are.
- a. True
  - b. False
  - c. Don't know
- 49) Fruits and vegetables are high in fat and sugar.
- a. True
  - b. False
  - c. Don't know

50) Which ONE of these foods is a healthy snack?

- a. Ice cream
- b. Potato chips
- c. Fresh fruit
- d. Fruit Roll-ups
- e. I don't know

51) How many cups of fruits and vegetable do you think health experts recommend eating every day?

- a. 1 cup
- b. 2 cups
- c. 3 cups
- d. 4 cups
- e. 5+ cups

Thanks for your help!

Your time and opinions are very valuable to us!

We look forward to having a GREAT Pink & Dude Chef series and we can't wait to get started cooking some DELICIOUS recipes!!!

APPENDIX G: Data Coding Table

Survey Question	Options
What grade are you in?	6. 6 th grade 7. 7 th grade 8. 8 th grade
How old are you?	_____ (blank for fill-in)
Are you a boy or a girl?	1. Boy 2. Girl
How many people live in your household (including yourself?)	2. 2 3. 3 4. 4 5. 5+
How would you describe yourself? (Circle <u>ALL</u> that apply to you)	1. American Indian or Alaska Native 2. Asian 3. Black or African American 4. Hispanic or Latino Mexican 5. Native Hawaiian or Other Pacific Islander 6. White/Caucasian 7. Other (_____)
During the past 7 days, how many times did you eat fruit? Do NOT count fruit juice.	0. Not at all 2. 1-3 times 5. 4-6 times 7. 1 time per day 14. 2 times per day 21. 3 times per day 28. 4 or more times per day
During the past 7 days, how many times did you eat green salad?	0. Not at all 2. 1-3 times 5. 4-6 times 7. 1 time per day 14. 2 times per day 21. 3 times per day 28. 4 or more times per day
During the past 7 days, how many times did you eat potatoes?	0. Not at all 2. 1-3 times 5. 4-6 times 7. 1 time per day 14. 2 times per day 21. 3 times per day 28. 4 or more times per day

During the past 7 days, how many times did you eat carrots?	0. Not at all 2. 1-3 times 5. 4-6 times 7. 1 time per day 14. 2 times per day 21. 3 times per day 28. 4 or more times per day
During the past 7 days, how many times did you eat other vegetables? Do NOT count green salad, potatoes, or carrots.	0. Not at all 2. 1-3 times 5. 4-6 times 7. 1 time per day 14. 2 times per day 21. 3 times per day 28. 4 or more times per day
During the past 7 days, how many times did you eat fruits or vegetables as snacks?	0. Not at all 2. 1-3 times 5. 4-6 times 7. 1 time per day 14. 2 times per day 21. 3 times per day 28. 4 or more times per day
There are many things that influence the way we eat. For each of these statements, how much do you AGREE or DISAGREE? Other foods taste better for snacks than fruits & vegetables.	-2. Agree strongly -1. Agree 0. Neither agree nor disagree 1. Disagree 2. Disagree strongly
There are many things that influence the way we eat. For each of these statements, how much do you AGREE or DISAGREE? There are not a lot of fruit & vegetables at my house.	-2. Agree strongly -1. Agree 0. Neither agree nor disagree 1. Disagree 2. Disagree strongly
There are many things that influence the way we eat. For each of these statements, how much do you AGREE or DISAGREE? I don't have time to fix foods like fruits & vegetables.	-2. Agree strongly -1. Agree 0. Neither agree nor disagree 1. Disagree 2. Disagree strongly
There are many things that influence the way we eat. For each of these statements, how much do you AGREE or DISAGREE? I don't know how to fix foods like fruits & vegetables.	-2. Agree strongly -1. Agree 0. Neither agree nor disagree 1. Disagree 2. Disagree strongly

There are many things that influence the way we eat. For each of these statements, how much do you AGREE or DISAGREE? My parents/guardian won't let me cook.	-2. Agree strongly -1. Agree 0. Neither agree nor disagree 1. Disagree 2. Disagree strongly
There are many things that influence the way we eat. For each of these statements, how much do you AGREE or DISAGREE? I think cooking for my family is cool & fun.	2. Agree strongly 1. Agree 0. Neither agree nor disagree -1. Disagree -2. Disagree strongly
There are many things that influence the way we eat. For each of these statements, how much do you AGREE or DISAGREE? What my family thinks about cooking is important to me.	2. Agree strongly 1. Agree 0. Neither agree nor disagree -1. Disagree -2. Disagree strongly
There are many things that influence the way we eat. For each of these statements, how much do you AGREE or DISAGREE? My friends think cooking is cool and fun.	2. Agree strongly 1. Agree 0. Neither agree nor disagree -1. Disagree -2. Disagree strongly
There are many things that influence the way we eat. For each of these statements, how much do you AGREE or DISAGREE? What my friends think about cooking is important to me.	2. Agree strongly 1. Agree 0. Neither agree nor disagree -1. Disagree -2. Disagree strongly
I think I can cook from basic, raw ingredients, from scratch.	-1. I don't think I can 0. I'm not sure 1. I'm sure I can
I think I can create meals using new ingredients. (<i>New = fruits, vegetables, spices herbs that you have never tried before</i>)	-1. I don't think I can 0. I'm not sure 1. I'm sure I can
I think I can follow a simple recipe when cooking.	-1. I don't think I can 0. I'm not sure 1. I'm sure I can
I think I can safely use a knife when cooking.	-1. I don't think I can 0. I'm not sure 1. I'm sure I can
I think I can use coupons and/or store fliers to plan a meal that tastes good but does not cost a lot of money.	-1. I don't think I can 0. I'm not sure 1. I'm sure I can
I think I can use leftovers to create a new, tasty meal.	-1. I don't think I can 0. I'm not sure 1. I'm sure I can

I think I can ask someone in my family to buy my favorite fruit or vegetable.	-1. I don't think I can 0. I'm not sure 1. I'm sure I can
I think I can ask someone in my family to make my favorite vegetable dish.	-1. I don't think I can 0. I'm not sure 1. I'm sure I can
I think I can ask someone to have fruits out where I can reach them.	-1. I don't think I can 0. I'm not sure 1. I'm sure I can
I think I can ask someone in my family to have cut up vegetables out where I can reach them.	-1. I don't think I can 0. I'm not sure 1. I'm sure I can
I think I can help my mom or dad fix a fruit or vegetable.	-1. I don't think I can 0. I'm not sure 1. I'm sure I can
I think I can fix a fruit or vegetable by myself.	-1. I don't think I can 0. I'm not sure 1. I'm sure I can
Eating fruits and vegetables can help lower your chances of getting diseases like high blood sugar (diabetes) or heart disease.	1. True 0. False 0. Don't know
Fruits and vegetables that are high in Vitamin A are ____ in color.	0. Red and white 0. Blue and light brown 1. Yellow-orange and dark green 0. Brown & purple 0. I don't know
Most of the Vitamin C we get comes from fruits and vegetables.	1. True 0. False 0. Don't know
A fruit salad will be higher in Vitamin C if you add ____ to it.	0. Apples 0. Grapes 0. Bananas 1. Oranges 0. I don't know
Almost all fruits and vegetables contain a lot of vitamins and ____.	0. Protein 1. Fiber 0. Cholesterol 0. Fat 0. Don't know
Fruits and vegetables like apples and pears are best when eaten with the peel because that is where most of the fiber and antioxidants are.	1. True 0. False 0. Don't know
Fruits and vegetables are high in fat and sugar.	0. True 1. False 0. Don't know

Which <u>ONE</u> of these foods is a healthy snack?	0. Ice cream 0. Potato chips 1. Fresh fruit 0. Fruit Roll-ups 0. I don't know
How many cups of fruits and vegetable do you think health experts recommend eating every day?	0. 1 cup 0. 2 cups 0. 3 cups 1. 4 cups 0. 5+ cups
Location	1. Arroyo Grande 2. Carpinteria
How much do you like acorn squash?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like asparagus?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like avocados?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like beets	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like broccoli?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like cabbage?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is

How much do you like carrots?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like cherries?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like cooked greens?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like corn?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like dried plums?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like grapefruit?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like green beans?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like tangerines?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like melons?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is

How much do you like mushrooms?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like peas?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like peppers?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like persimmons?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like plums?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like potatoes?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like pumpkins?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like radishes?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like salad greens?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is

How much do you like spinach?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like sweet potatoes?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like tomatoes?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is
How much do you like zucchini?	-2. I do not like this 1. I like this a little 0. No opinion 2. I like this a lot -1. I don't know what this is

APPENDIX H: Informed Consent Form

Informed Consent Form for Cal Poly STRIDE Research

INFORMED CONSENT TO PARTICIPATE IN: **Pink and Dude Chefs**

A research project using cooking classes to increase confidence for cooking meals prepared at home is being conducted by Dr. Lisa Nicholson in the Food Science and Nutrition Department, Dr. Ann McDermott in the Kinesiology Department, and Tianna Sheehan, B.A. in the Food Science and Nutrition Department at Cal Poly, San Luis Obispo, California. The purpose of this study is to improve your child's confidence for cooking and to teach your child menu planning, food buying and food preparation skills.

Your child is being asked to take part in this study by attending a total of 12 educational cooking classes: two classes per week for six weeks (2-2.5 hours each). These classes will include a short talk regarding the daily topic; group activities and games; and cooking the recipe of the day. There will be a 2-hour focus group following the completion of the program to discuss attitudes towards cooking, diet, and exercise, at which all responses will be audio recorded. The program will take place at ***Mesa Middle School, 2555 Halcyon Road, Arroyo Grande***. No transportation to or from Mesa Middle School will be provided by our program. Participation in the program will occur during the following days and times:

<i>Phase 1: Let's Get Started!</i>	<i>Tuesday, October 4, 2011 – Thursday, November 10, 2011</i>	<i>Tuesdays & Thursdays: 2:30- 4:30pm</i>

Your child will be asked to complete a survey before and a survey after the 6-week program. These questions ask about your child's current diet, attitudes towards cooking, cooking skills, and general nutrition knowledge.

There will also be a 1- to 2-hour focus group following the end of the 6-week program. During this focus group, Tianna Sheehan, the STRIDE Health Ambassador Coordinator, will lead a discussion with the children about their attitudes towards cooking, diet, and exercise. These group discussions will be audio recorded.

In addition, your child will be sent home with a questionnaire to determine which cooking supplies, materials, and appliances they have access to in the home. These items include, but are not limited to: a microwave; stove and oven range, pots and pans, bowls, a computer, and internet access. Verbal questions will be asked about your family's preference for the weekly recipes.

Please be aware that your child is not required to participate in this research and your child may discontinue his/her participation at any time. Your child may also omit any questions he/she prefers not to answer.

During food preparation, your child will be directly supervised to reduce the risk of injury. Your child will be required to wear closed-toed shoes with traction (slip-resistant shoes) for their protection. Your child will be taught safety rules for extinguishing a fire (a fire extinguisher is located in the kitchen), proper knife use and storage, consistent use of pot holders to reduce the risk of burns, food safety and the proper handling of food to prevent food-borne illnesses.

The possible risks associated with participation in this study are minor but may include burns from stovetop, oven, scalding water, cuts from knives, falls from spillage, choking from food consumption, or psychological stress from completing survey questions. If your child should experience any injuries due to possible cuts or burns, please be aware that you may contact your own physician/clinic or the Arroyo Grande Fire Department at 2391 Willow Rd., Arroyo Grande (805)473-7171. Insurance coverage will not be offered for this program, should your child experience any injuries due to participation in the classes. If you should experience any discomfort with the questions, please be aware that you may contact Tianna Sheehan, Program Coordinator for Pink and Dude Chefs (805)756-2195 for assistance.

To protect your child's confidentiality all identifying information will be kept in a filing cabinet in a locked room. Participants will only be identified by code number on data sheets or other paperwork. Only project coordinators will have access to the information. Your child's responses will remain private and only presented as anonymous or group data.

Potential benefits associated with this program include: increased knowledge of nutrition and web-based cooking resources, building skills for healthful cooking, communication, time management and goal setting, and increased confidence for cooking family meals. All participants will bring food home weekly. Other incentives your child may receive include cooking tools and supplies, which are given for attendance and participation in activities and games.

We would like to take photographs and video of the children as they participate in the program and use these images in presentations and publicity. Please indicate below if you do not authorize this. Your child will not be identified by name.

☐

NO, *I do not give permission for my child's photo and video to be taken for presentations and media use.*

If you have questions regarding this study or would like to be informed of the results when the study is completed, please feel free to contact Dr. Ann McDermott at (805)756- 6447 and/or the STRIDE office (805)756-0673, STRIDE@calpoly.edu. If you

have questions or concerns regarding the manner in which the study is conducted, you may contact Dr. Steve Davis, Chair of the Cal Poly Human Subjects Committee, at (805)756-2754, sdavis@calpoly.edu, or Dr. Susan Opava, Dean of Research and Graduate Programs, at (805)756-1508, sopava@calpoly.edu.

If your child agrees to voluntarily participate in this research project as described, please indicate your agreement by signing below. Please keep one copy of this form for your reference, and thank you for your participation in this study.

(PRINT) Name of Child Volunteer	Date

(PRINT) Name of Parent and/or Guardian	Date
(SIGNATURE)	

(PRINT) Name of Emergency Contact Person	Phone #

(PRINT) Relationship of Emergency Contact Person

Signature of Researcher	Date

APPENDIX I: Informed Assent Form

Informed Assent Form for Cal Poly STRIDE Research

INFORMED ASSENT TO PARTICIPATE IN: **Pink and Dude Chefs**, a program of Cal Poly STRIDE For the Participant

Pink and Dude Chefs is a research project that was created by professors and students at Cal Poly, San Luis Obispo. The people who are currently running the project are Dr. Lisa Nicholson in the Food Science and Nutrition Department, Dr. Ann McDermott in the Kinesiology Department, and Tianna Sheehan, a graduate student in the Food Science and Nutrition Department at Cal Poly, San Luis Obispo, California. The goal of Pink and Dude Chefs is to use cooking classes to make you more confident in your ability to cook meals at home. We hope to do this by teaching you the skills to prepare food, showing you how to buy food, and allowing you to create a menu.

Pink and Dude Chefs has a total of 12 educational cooking classes: two classes per week for six weeks (2 hours each). These classes will include a short talk regarding the daily topic; group activities and games; and cooking the recipe of the day. The classes are held at **Mesa Middle School, 2555 Halcyon Road, Arroyo Grande**. Cal Poly STRIDE will not be able to provide you with rides to or from Mesa Middle School.

As part of Pink and Dude Chefs, we will be asking you to take a survey at the beginning and end of the 6-week program. The questions in the survey will ask you about what you usually eat, how you feel about cooking, how you rate your cooking skills, and basic nutrition questions.

There will also be a 1- to 2-hour focus group at the end of the 6-week program. Focus groups are a chance for you to tell us how you felt about the program and for us to ask you more questions about your experiences with the program. During the focus group, Tianna Sheehan, the STRIDE Health Ambassador Coordinator, will lead a discussion with you on how you feel about cooking, diet, and exercise. This group discussion will be audio recorded.

In addition, you will be sent home with a questionnaire to determine which cooking supplies, materials, and appliances you can use at your house. These items include, but are not limited to: a microwave; stove and oven range, pots and pans, bowls, a computer, and internet access. We will also ask you verbal questions about what your family usually likes to eat.

You are not required to take the survey, go to the focus group, or take the questionnaire home and you can stop coming to the Pink and Dude Chefs classes at any time. You can also skip any questions you prefer not to answer.

There will always be adults present to prevent injuries during cooking and activities. You'll be required to wear closed-toed shoes with traction (slip-resistant shoes) for your protection. You will be taught safety rules for extinguishing a fire (a fire extinguisher is located in the kitchen), proper knife use and storage, consistent use of pot holders to reduce the risk of burns, food safety and the proper handling of food to prevent food-borne illnesses.

There is a chance you may be injured as a result of participating in this program. The possible risks may include: burns from stovetop, oven, scalding water, cuts from knives, falls from spillage, choking from food consumption, or psychological stress from completing survey questions. If you get hurt while participating in Pink and Dude Chefs activities, notify an adult in the room immediately. Your parents have been told how to get medical attention if you require it. If you're uncomfortable with any of the questions or activities, please contact Tianna Sheehan, Program Coordinator for Pink and Dude Chefs (805)756-2195 for assistance.

The surveys that you take are all confidential. This means that we will write a code number on your survey instead of your name. Any information about you will be kept in a filing cabinet in a locked room. We will use a code number on any data sheets or other paperwork instead of your name. Only project coordinators will have access to any information about you. Your answers will remain private and only presented as anonymous or group results.

There are benefits that you might gain from participating in this program. These include: increased knowledge of nutrition and web-based cooking resources, building skills for healthful cooking, communication, time management and goal setting, and increased confidence for cooking family meals. You will be able to bring food home weekly. Other incentives you might receive include cooking tools and supplies, which are given for attendance and participation in activities and games.

We would like to take photographs and video of you as you participate in the program and use these images in presentations and publicity. Please indicate below if you don't want us to take photographs or video of you. You will not be identified by name.

☐ **NO**, *I do not give permission for my photo and video to be taken for presentations and media use.*

If you want to participate in this research project as described, please indicate this by signing below. Please keep one copy of this form for your parent/guardian and thank you for your participation in this study.

(PRINT) Name of Child Volunteer

Date

(SIGNATURE) Name of Child Volunteer

Signature of Researcher

Date