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Application of the PRECEDE-PROCEED Model in the evaluation of a community-based youth fitness and nutrition summer camp program

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APPLICATION OF THE PRECEDE-PROCEED MODEL IN THE EVALUATION OF A COMMUNITY BASED YOUTH FITNESS AND NUTRITION SUMMER CAMP PROGRAM

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ABSTRACT

Background: The PRECEDE-PROCEED Model is an effective and adaptable program planning tool that has been widely used in the design, implementation and evaluation of health promotion programs.
Objective: To retrospectively apply the constructs of the PRECEDE-PROCEED Model to a community-based youth fitness and nutrition summer camp program (Champ Camp) and to identify and describe how the program can be improved based on the findings of the PRECEDE-PROCEED Model evaluation.
Design: A systematic application of the nine phases of the PRECEDE-PROCEED Model applied retrospectively to evaluate and improve the Champ Camp program.
Setting: Children participating in Champ Camp offered through a seven-week summer camp coordinated by Burlington Parks, Recreation and Waterfront of Burlington, Vermont. The summer camp served as a licensed childcare program for children entering first through fifth grade.
Measures: Improvements in nutrition knowledge and fitness scores measured biweekly. Additionally, the retrospective application of the planning model determined valuable demographic, behavioral, environmental, and policy information about the community.
Statistical Analysis: A repeated measures analysis of variance was conducted to determine if there was a statistically significant change over time in nutrition knowledge and physical fitness. Statistical analysis was also performed to determine if there were potential correlations between nutrition knowledge and performance on each fitness assessment individually.
Results: The Champ Camp program significantly improved nutrition assessment scores for males. Additionally, there were statistically significant improvements in the fitness assessment scores for the ball throw within third through fifth grade males and females across the seven-week program. The retrospective application of the PRECEDE-PROCEED Model proved to be successful in identifying the demographic, behavioral and environmental influences, and resources and invested parties of the target population. Most importantly the model emphasized the use of SMART program goals and objectives within successful health promotion programs. The model also stressed the necessity for appropriate and validated nutrition and fitness assessment tools that would offer more generalizable data. Moreover, the model also emphasized the need for stronger program evaluation by including more process evaluative measures and defining the determinants in which the programs' effectiveness and efficiency would be measured.
Conclusions: The unique application proved to be a valuable and fruitful method for evaluating and identifying areas for improvement within a community-based youth fitness and nutrition summer camp program. This research not only serves to improve the existing Champ Camp program but to highlight the importance of program planning models and the critical components of successful health promotion programs.

DEDICATION

This thesis is dedicated to all the men and women in the arena.

The Man in the Arena
-Theodore Roosevelt, 1910

"It is not the critic who counts; not the man who points out how the strong man stumbles, or where the doer of deeds could have done them better. The credit belongs to the man who is actually in the arena, whose face is marred by dust and sweat and blood; who strives valiantly; who errs, who comes short again and again, because there is no effort without error and shortcoming; but who does actually strive to do the deeds; who knows great enthusiasms, the great devotions; who spends himself in a worthy cause; who at the best knows in the end the triumph of high achievement, and who at the worst, if he fails, at least fails while daring greatly, so that his place shall never be with those cold and timid souls who neither know victory nor defeat."

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CHAPTER ONE

REVIEW OF THE LITERATURE

History

Childhood overweight and obesity has overwhelmed our country for the past two decades, leading it to be one of the most serious public health concerns of the twenty-first century. Affecting more than 30% of American children and adolescents, childhood overweight and obesity has plagued society with ever-increasing healthcare costs. Additionally, it has the potential to afflict children with serious physical and psychological health conditions into adulthood (Wang, Wu, Wilson et al, 2013). Overweight and obesity for youth aged 2-19 years, as defined by the Centers for Disease Control and Prevention, is a body mass index (BMI) at or above the 95th percentile for obese and between the 85th and the 95th percentile for overweight on the CDC sex-specific BMI for age growth charts (Ogden, Carroll, Kit et al, 2014; Cunningham, Kramer, and Narayan, 2014; Ogden and Flegal, 2010). The World Health Organization (WHO) defines obesity as excess body fatness to the extent that health is impaired (WHO, 2015). Additionally, BMI is highly correlated with increased body fatness, which makes it a popular assessment tool in determining risk for obesity related diseases and predicting disease risk of a population.

Over the past three decades, data collected by the National Health and Nutrition Examination Survey (NHANES) has demonstrated trends in childhood overweight and obesity. The NHANES is a population-based survey that collects health and nutrition related data on adults and children in the United States. Using both interviews and physical examination procedures, it is able to provide a collective representation of the

health status of the United States population (CDC, 2015). NHANES data trends have shown an increase in childhood overweight and obesity during the 1980's and 1990's. Since then, the trend has slowed its trajectory with slight increases only amongst the upper most percentiles between 2000 and 2010 (Ogden, Carroll, Kit, and Flegal, 2012). Despite the reduction in incidence, childhood overweight and obesity still presents major health concerns for the American public.

Overweight and obesity is not simply an issue existing in the United States, but a worldwide issue affecting many other developed countries, including Australia, England, Scotland, Brazil, and China (Reilly and Kelly, 2011; Han, Lawlor, and Kimm, 2010; Ebbeling, Pawlak, and Ludwig, 2002; Wang and Lobstein, 2006). In a review, by Wang and Lobstein (2006), assessing the worldwide trends of obesity, researchers concluded that the prevalence of childhood overweight and obesity rates doubled and even tripled within five of the seven continents, excluding Africa and Antarctica, between the 1970's and 1990's. However, given the difference in definitions of overweight and obesity between countries, few studies have been able to investigate worldwide prevalence (Wang and Lobstein, 2006). Therefore, a better understanding of the current worldwide prevalence of this issue may be helpful in identifying not only cultural and circumstantial risk factors, but also help to create an international prevention-based program.

Considerations

In addition to geographic locations worldwide, and more specifically within the United States for purposes of this review, there are several demographic considerations for overweight and obesity. Some of these demographic considerations include age,

gender, ethnicity and race, and socioeconomic status. In a systematic review of data collected through NHANES including the Behavioral Risk Factor Surveillance System (BRFSS), the Youth Risk Behavior Surveillance System (YRBSS), and the National Longitudinal Survey of Adolescent Health by Wang and Beydoun (2007), the trends and prevalence of adult, child, and adolescent overweight and obesity were analyzed. Researchers concluded that nearly two thirds of adults and approximately one third of children are overweight or obese in the United States. Data from this study represent the disparities between subgroups of age, gender, ethnicity and race, and socioeconomic status. Overall, trends within these subgroups have continued to rise between both adults and children/adolescents.

According to Wang and Beydoun (2007), of the overweight and obese children, the prevalence was similar between boys and girls, although there were differences among ethnicity/race and socioeconomic status. Addressing boys and girls independently, Mexican-American boys and non-Hispanic black girls were more likely to be overweight or obese. Additionally, non-Hispanic black and Mexican-American children, regardless of gender, were also more likely, compared to non-Hispanic white children. In terms of socioeconomic status, prevalence of overweight and obesity has increased amongst all subgroups indicating that it is not limited to familial income. Furthermore, research suggests a weak correlation between rural and urban geographic locations and the implications for overweight and obesity. Past research indicated a higher prevalence of overweight and obesity in urban areas among children aged 6-9 years, and in rural areas among children 10-18 years (Wang and Beydoun, 2007). Overall, the issue of overweight and obesity is impacted by multiple factors, all of which need to be considered.

Childhood obesity is the result of many interrelated factors including genetics, lifestyle, and culture, established and encouraged by the environment in which children live, learn and play. One particular study, by Reilly et al. (2005), identified some of the factors that increase a child's risk for becoming overweight or obese. These include intrauterine and perinatal factors, including maternal smoking during pregnancy, birth weight, sex, and season of birth; dietary behaviors, including breastfeeding and introduction of solid foods, and childhood eating behaviors; familial health status and demographics, including parental age and BMI pre-pregnancy, ethnicity, and number of siblings; and lifestyle activity behaviors established at a young age, including sedentary time and sleep (Reilly, Armstrong, Dorosty et al., 2005). Han et al. (2010), also discussed several genetic and non-genetic factors associated with overweight and obesity. These included genetic variations, intrauterine exposures, birth weight, diet, physical activity, inactivity, sleep, etc (Han, Lawlor and Kimm 2010). Due to the complex nature of this condition and the magnitude of factors involved, childhood overweight and obesity has become a serious problem.

Health Implications

Childhood overweight and obesity possess both physical and psychological health consequences short and long-term. Overweight and obese children are developing risk factors for several chronic diseases including high blood pressure, elevated blood lipid values, elevated blood glucose and HbA1c levels, glucose intolerance, and insulin resistance. In terms of mental health, the psychological effects associated with childhood overweight and obesity include stigmatization, low self-esteem, eating disorders, and

depression (Ebbeling, Pawlak and Ludwig, 2002). The health consequences resulting from obesity are of critical importance to public health officials, especially because they pose such significant health risks in children, with the opportunity to cause greater risks in adulthood.

Long-term consequences of obesity include heart disease, type 2 diabetes mellitus, metabolic syndrome, osteoarthritis, some forms of cancer, as well as other obesity-related diseases (Reilly and Kelly, 2011). Heart disease is the leading cause of death in the United States. Additionally, cancer, stroke, and diabetes are also among the ten leading causes of death for Americans (CDC Faststats, 2016). In a systematic review of 18 longitudinal studies by Singh et al. (2008), it was found that children who are overweight or obese are more likely to become overweight or obese adults (Singh, Mulder, Twisk, Van Mechelen, and Chinapa, 2008). Similarly, Reilly and Kelly (2011), concluded that the long-term consequences of childhood overweight and obesity poses a significantly greater threat than the short-term consequences. This study aimed to review literature concerning the connection to several factors including premature mortality in adulthood, risk of adult cardiometabolic morbidity, and risk of subsequent miscellaneous morbidity (Reilly and Kelly, 2011). However, a potential limitation of this review is that most of the studies preceded the obesity epidemic by a few decades, making their data difficult to compare to current trends. Despite this, the incidence of both childhood overweight and obesity and the negative health consequences in adulthood identified by Reilly and Kelly (2011), have increased over time, indicating a continuous upward trend for both factors. Consequently, it appears clear that this study's findings represent the

long-term risks of overweight and obesity from childhood and adolescence into adulthood and the specific risks society faces.

Aside from the health implications of obesity, there are also serious economic consequences relating to health care expenditures associated with the disease. Finkelstein et al. (2009), determined health care costs for obese individuals to be 42% higher than those of normal weight individuals. This percentage represents the cost of healthcare spending alone and does not include the additional costs associated with absenteeism and loss of productivity within the workplace for adults. These findings are supported within the wider body of literature. According to data collected through the Medical Expenditure Panel Survey (MEPS), obesity-related diseases account for hundreds of billions of dollars of United States medical expenses annually (Finkelstein, Trogdon, Cohen, and Dietz, 2009; MEPS, 2013). MEPS is an annual national probability survey of both households and insurance components that collects data on American's use of health care services. Information gathered is related to frequency, costs, and responsible parties (MEPS, 2009). For example, of four well-known obesity-related diseases; cancer, type 2 diabetes mellitus, hypertension and hyperlipidemia, total medical expenses for 2013 were approximately $74.5 billion, $63 billion, $47.5 billion, and $34.5 billion respectively (MEPS, 2013). It is evident that the cost of treating diseases related to overweight and obesity places a significant economic burden on both individuals and society as a whole.

Physical Activity

Physical activity has tremendous benefits on health and wellness. Healthful dietary practices and physical activity are two key components to healthy lifestyle

behaviors. Dietary practices aside, physical activity has been shown to improve health in both children and adults. More specifically, there is a strong correlation between physical and psychological health in children who are physically active. Furthermore, there are numerous health benefits associated with physical activity including management of the following: weight, blood lipids and lipoproteins, blood pressure, glucose tolerance, bone mineral density, and obesity related diseases (Ortega, Ruiz, Castillo, and Sjostrom, 2008). Additionally, physical activity improves BMI, total fat, and/or abdominal fat in overweight and obese children. In a systematic review by Janssen and LeBlanc (2010), researchers suggest that for children who already possess risk factors for obesity, physical activity-based interventions may be the most beneficial. Hypertensive children who participated in a structured, aerobic–based physical activity intervention demonstrated significant improvements in both systolic and diastolic blood pressure. This research also suggested that physical activity improved markers of metabolic syndrome, including glucose tolerance and insulin resistance in overweight and obese children. In addition, as little as 10 minutes of moderate-to-high impact activities 2-3 times per week proved to have a positive impact on bone mineral density in children (Janssen and LeBlanc, 2010). These findings reinforce the value and significance physical activity has on the health of children.

Physical Activity and Health

As discussed above, long-term health consequences are becoming increasingly present within the youth population. More specifically, some of these obesity-related diseases include metabolic syndrome, cardiovascular disease and type 2 diabetes.

Metabolic syndrome is a combination of disorders including high blood pressure, elevated blood glucose and lipid values, and increased abdominal fatness. Research is limited, but physical activity intervention programs for youth are beginning to address childhood overweight and obesity specifically focusing on metabolic syndrome. Physical activity interventions, especially those that include activity in the moderate to vigorous intensity, significantly improve the conditions present in metabolic syndrome (Janssen and LeBlanc, 2010). Furthermore, McMurray and Anderson, 2010 highlighted some of the potential benefits exercise can have on metabolic syndrome. These benefits include weight management, glucose tolerance and insulin response, blood pressure, fat metabolism, blood lipids, inflammatory processes, and hormone control (McMurray and Andersen, 2010). Overall, physical activity interventions positively influence risk factors associated with overweight and obesity.

In an effort to address the need for more physical activity intervention programs for children, researchers have also begun utilizing health-related fitness. Health-related fitness includes physical fitness factors that can decrease the risk for developing obesity-related diseases. These factors include cardiovascular fitness, muscular fitness and flexibility and body composition (Eather, Morgan, and Lubans, 2013). Research also supports that people who are physically active tend to live longer and have lower risk for chronic diseases (CDC, 2014). In a review by Eather et al. (2013), researchers evaluated the effectiveness of a physical activity intervention on health-related fitness. This research concluded that not only can physical activity help with weight control and decrease risk for developing chronic diseases, but it may also contribute to mental health and improve academic performance in students (Eather, Morgan, and Lubans, 2013).

Both psychological health and academic performance are highly correlated with physical activity. Parfitt et al. (2009), found that children who participated in "very light intensity activity" were more prone to anxiety and depression than children who participated in more "vigorous intensity activity" (Parfitt, Pavey, and Rowlands, 2009). Parfitt et al. (2009) concluded that future research is needed to identify recommendations for time spent in particular intensity activities and associated benefits (Parfitt, Pavey, and Rowlands, 2009). Conversely, academic performance and proficiency are often the reason why physical education and activity is removed from school-time activities. Research by Van Dusen et al. (2011) provides supportive data indicating that physical activities, classified as cardiovascular fitness, muscular strength and flexibility, are the strongest indicators for academic achievement. This research provides supportive evidence that physical education curricula should remain an integral part of children's school time (Van Dusen, Kelder, Kohl et al, 2011).

The United States Department of Health and Human Services published Physical Activity Guidelines for Americans, 2008. The guidelines state that children and adolescents should participate in 60 minutes or more of physical activity each day including both moderate and vigorous physical activity (USDHHS, 2016). Participation in physical activity declines as children age especially in adolescence (Troiani, Berrigan, Dodd, Masse, Tilert, and McDowell, 2008). Troiano et al. (2008) used an accelerometer to assess physical activity among children and adolescents in the United States. Based on these findings, children ages 6-11 years achieved more than 60 minutes per day of physical activity, but for adolescents 16-19 years physical activity drops dramatically to 33 minutes per day for males and 20 minutes per day for females. Given total minutes of

physical activity decreases with age, it is likely this trend continues beyond adolescence. Another important factor to note is the differences between genders and physical activity. Research suggests that boys participate in more vigorous-intensity physical activities, while girls spend more time in lighter intensity physical activities (Troiani, Berrigan, Dodd, Masse, Tilert, and McDowell, 2008). Furthermore, it has been shown that gender and age not only affect the amount of time spent physically active, but also the intensity.

Unlike the Troiano et al. (2008) accelerometer research outlined above, most population-based health analysis surveys, including NHANES, use self-reporting mechanisms to record physical activity behaviors. Research reports a significant bias in self-reported physical activity data. Specifically, self-reported physical activity is often over-reported because of issues with recall and intensity and the stigmatization associated with physical inactivity (Sallis and Saelens, 2000). As a result, physical activity interventions often utilize direct measurement tools to determine children's physical activity levels for their accuracy and feasibility of use, like Troiano et al. (2008).

There are several factors that contribute to physical inactivity in children. In a review by Dehghan et al. (2005) researchers investigated these potential factors, which included a decreased involvement in extracurricular activities and school sports, and a decrease in physical education within schools. Additionally, more children are being driven or taking the bus to school versus walking (Dehghan, Akhtar-Danesh, and Merchant, 2005). All of which contribute to physical inactivity in children. Moreover, advancements in technology over the past three decades could also be contributing to decreased physical activity. Children are spending more time playing video games and

watching television than they are participating in sports teams, other extracurricular physical activities, and/or playing in and out of school.

Obesity is a preventable disease with clear policy, environmental, and individual/behavioral influences. Additionally, obesity-related diseases and their associated costs can be avoided. The past decade has seen the development and implementation of numerous initiatives to tackle childhood obesity. Several obesity prevention program geared towards children have worked to change eating and physical activity behaviors. Improving diet and physical activity behaviors can prevent the onset of overweight and obesity, improve psychological health, and prevent the onset of obesity related chronic diseases (Protudjer, Marchessault, Kozyrskyj, and Becker, 2010). When established at an early age, healthy lifestyle habits are more likely to continue through adulthood. Research supports the importance of intervention programs geared towards young children (Reilly, Armstrong, Dorosty et al, 2005). Overall, childhood overweight and obesity is a multifaceted condition that requires a variety of intervention approaches in which early intervention is critical.

Nutrition education and physical activity interventions strive to positively impact children's dietary choices and physical fitness. But, do education programs actually change behaviors long-term? Understanding how to best communicate with children about their perceptions and behaviors is the key to delivering an effective and long-lasting health promotion intervention. Children's behaviors and attitudes about healthy eating habits and physical activity are molded by the environments in which they live, learn, and play. These environments include, but are not limited to, their community, home, and school. A Canadian study by Protudjer et al. (2010) addressed the disconnect

between nutrition knowledge and dietary behaviors in terms of children's perceptions of healthful eating and physical activity. One of the most important aspects of this study is the differing perceptions between genders. Male and female youth perceive healthful behaviors differently, not necessarily what is healthy, but how and why they think something is healthy and why they choose to participate in healthy activities. Protudjer et al. (2010) reported that children regularly choose less nutritious foods and sedentary behaviors despite their ability to identify healthy foods and understanding that being physically active is a healthy behavior. Moreover, nearly all of the children identified fruits and vegetables, as well as other food groups, as important components of healthy eating. Girls were identified to be more health conscious discussing the concept of moderation. In contrast, boys identified high-fat, high-sugar foods as more pleasurable than healthful foods, and often ignored the importance for moderate intake of pleasurable foods. Girls also mentioned the need for balance for health and physical appearance. This suggests that even at a young age girls are already thinking about the effects of body image and consequences of unhealthful eating. In regards to physical activity, both genders noted that being physically active is an easier and more fun contributor to health than dietary changes. As children grow older into adolescence, learned behaviors become more routine and healthy eating and physical activity are no longer a priority. This evidence further emphasizes the need for early intervention strategies for youth.

Interventions and Initiatives

In an effort to address the incidence of childhood overweight and obesity many different programs have been developed and implemented into a variety of settings. For

children, the most likely settings to implement a nutrition education program is within schools, afterschool and summer school programs, summer camp programs, and within the community. With all of this said, there are many different avenues for public health practitioners and community nutritionists to develop and implement physical activity and nutrition education programs within these realms. This section will discuss a few different environments for implementing nutrition education, physical activity programs, and review the pertinent literature addressing the strengths and weaknesses of each.

Schools are a prime site for nutrition education and physical activity programs. Unfortunately, the paradigm shift away from fitness and wellness towards academic achievement has removed time during the school day for nutrition education and physical activity. Without the knowledge for healthy food and good dietary practices, how can we expect children to make healthy choices? Without basic cooking skills, how can we expect children to prepare healthy meals? And finally, how can we expect children to be physically active if that is not emphasized within the structure of a school setting? As public health professionals, it cannot be assumed this information is being passed along to them from their parents or guardians. Moreover, schools provide the best realm for greater impact nutrition education and physical activity for children. School-based interventions provide the opportunity to improve children's health and healthful habits (USDHHS, 2001). Schools also offer access to children at a critical time in their lives where nutrition knowledge and behaviors are established and maintained into adulthood. Significant improvements in nutrition knowledge and dietary behaviors have been shown in elementary-aged children participating in a school-based nutrition education program (Powers, Struempler, Guarino, and Parmer, 2005). Similarly in a study involving

elementary school-aged children, a short three to five week intervention successfully improved attitude, self-efficacy, preference, and nutrition knowledge (Wall, Least, Gromis, and Lohse, 2012). In conclusion, research supports school-based interventions as an effective means for targeting children and adolescent's nutrition-related knowledge, attitudes, and beliefs.

Program Strengths

In an effort to address the efficacy of public health promotions, there has also been a lot of research identifying the strengths and weaknesses of program components. School-based programs were identified above as one of the best realms to implement public health promotion programs to children. In a systemic review by Guerra et al. (2015) of school-based interventions aimed at childhood overweight and obesity, key findings and recommendations for future programs were highlighted (Guerra, Silveira, and Salvador, 2015). The review included data analyzed from 33 interventions. Four factors were identified as being associated with program success; program length, environment and community, age and gender, and theoretical basis. Researchers identified successful behavior change and maintenance of change in programs lasting periods of six months or longer. The longer the children were exposed to the material the more likely they were to make and maintain healthy behavior change. Secondly, the researchers addressed environment and community factors that influence and support behavior change to supplement the school-based interventions. A few considerations were identified within the environment and community realm, including parental involvement, increasing access to healthy foods within the community and in schools, use

of technology in adolescents to promote engagement, and finally the importance of the school and community working cooperatively to reinforce healthy behavior change. Additionally, involving the parents or guardians of the children is a crucial component to any behavioral change intervention. Increasing this social support within the home increases the modeling of healthy behaviors by parents and siblings and increases the impact of the health promotion. Furthermore, increasing access to healthy foods and limiting access to unhealthy options is of critical importance.

Understanding the design and curriculum of programs aimed at different age groups and genders is an important consideration for planning an effective intervention as well. It is valuable for practitioners to utilize different strategies for children of different ages and genders depending on level of comprehension and understanding. Guerra et al. (2015) reported that older children responded better to interventions than younger children. This suggests that the effectiveness of the program depends on how effectively the message was tailored to the age of the children it is addressing. In addition to age and responsiveness to interventions, gender also plays a significant role. Researchers indicated that females respond better to behavioral interventions, whereas males respond better to structural interventions (Guerra, Silveira, and Salvador, 2015).

Finally, the utilization of a theoretical basis within an intervention also contributes significantly to program success (Glanz and Bishop, 2010). Theoretical models serve to identify behaviors and factors contributing to behaviors. Furthermore, research indicates interventions based on theories are more successful than interventions that do not have a theoretical basis (Glanz and Bishop, 2010; Crosby and Noar 2011).

The Importance of Program Planning

Program planning is a critical component for developing systematic health promotion programs. Program planning models have been developed to help health professionals better plan, implement, and evaluate public health programs. Program planning models serve to organize the steps for a health promotion with the ultimate focus on improving quality of life. They define a course of action and predetermine the desired outcome so the goals and objectives are clearly defined from the beginning (Crosby and Noar, 2011; Nnawke, 2013). This process can be time consuming and costly, but plays a significant role in the program's success. Most successful health promotions and interventions are developed using program planning models. Program planning models are chosen with the health promotion and quality of life issues in mind. There are many different approaches used in the development of public health promotions. It is important that a specific planning model or framework is utilized to organize the steps to assure the program achieves its goals and objectives.

When considering a model to choose, there are three terms that help guide the decision making process; fluidity, flexibility, and functionality (Yang, Kuie Ho, and Kuo, 2015). Fluidity refers to the sequence of steps. Do they follow a logical order for the promotion to be designed? Flexibility refers to the adaptability of the program and the outlined steps. Is it adaptable to the needs of the population, community and other invested parties? Lastly, functionality refers to the usefulness of the planning model at improving the quality of life problem. Has the model been successfully used in prior health promotions to accomplish similar objectives (Yang, Kuie Ho, and Kuo, 2015)? Ultimately the goal for health promotions across all contexts is to improve quality of life.

In addition to planning models, theoretical models also play a valuable role in health promotion programs, especially when a behavior change is desired. Planning models often utilize theoretical models in effort to identify the behavioral factors contributing to the problem. Moreover, theoretical models serve to predict behaviors and identify factors contributing to behaviors. When used in combination, planning models and theoretical models work together to strengthen the impact of the health promotion program (Crosby and Noar, 2011).

Theoretical Models

There are many commonly used theoretical models in health promotion programs. These include, but are not limited to, the Health Belief Model, Stages of Change/Transtheoretical Model, Social Cognitive Theory, Theory of Reasoned Action and Theory of Planned Behavior (Glanz, Rimer, and Lewis, 2002). Each of these models identifies behavioral influences relevant to the issue targeted by a health promotion program.

The Health Belief Model (HBM) was developed in the early 1950's, in an effort to identify why participation in public health promotions was underutilized (Champion and Skinner, 2002). The HBM is effective in predicting behavior and identifying how a population perceives a problem. Additionally, the HBM proposes that a person's beliefs, perceptions of risk, and actionable benefits influence their willingness to change (Glanz and Bishop, 2010). There are three major constructs of the HBM that revolve around the concept of perception; the perceived threats of a given disease/condition/ or problem, perceived benefits from addressing the disease/condition/or problem, and the perceived

barriers to achieve the desired outcome (Nnakwe, 2013). The Health Belief Model is a commonly used theoretical model in behavior-based health programs, especially when motivation to change is an issue.

The Social Cognitive Theory (SCT) focuses on a given behavior of an individual and what factors affect that behavior. There are three main constructs to the Social Cognitive Theory; behavioral capacity, efficacy expectations, and outcome expectations (Nnakwe, 2013). The SCT states that the environment, social interactions, and other external influences all impact peoples' behaviors. SCT is one of the most widely used theoretical models in health promotion (Glanz and Bishop, 2010). Research supports its use to effectively identify the ecological aspects of an individual's environment that need to be addressed in the intervention. In a study involving an after-school nutrition intervention for urban Native American youth, the SCT was effectively used to improve dietary self-efficacy. In other words, post-intervention, children felt confident in their ability to select healthy foods (Rinderknecht and Smith, 2004). Additionally, literature supports the use of the Social Cognitive Theory across a variety of contexts in identifying behavioral factors and determining self-efficacy for long-term behavior change (Glanz and Bishop, 2010; Rinderknecht and Smith, 2004).

The Transtheoretical Model (or Stages of Change Model) (TTM) theorizes that each individual is at a different stage of willingness to change, and that movement from one stage to the next is dynamic and person-centered. The TTM identifies five stages of change: pre-contemplation, contemplation, preparation, action, and maintenance. The pre-contemplation and contemplation stages address knowledge and emotions around readiness before a change is made. In the pre-contemplation stage there is no

understanding for, or interest, in making a change. The contemplation stage is when a person is thinking about making a change. The preparation and action stages are when planning and adoption of change takes place. Lastly, the maintenance stage is when the person continues to uphold the behavior change (Glanz and Bishop, 2010; Nnakwe, 2013). Most importantly, the TTM has been identified as one of the most useful methods in behavior change interventions for both physical activity and dietary behaviors (Glanz and Bishop, 2010).

The Social-Ecological Model is a theoretical-based planning model that utilizes an ecological approach. An ecological approach attempts to address every aspect of an individual's environment as potential intervention targets. Some of these targets include their knowledge, attitudes, and beliefs, as well as their environment, actions and behaviors. The Social-Ecological Model identifies four different levels of influences; individual, interpersonal, community/institutional/organizational, and government and policy (Contento, 2011). By addressing the varying levels affecting an individual you can influence the environment into one that enables behavior change (Glanz and Bishop, 2010). In a study applying the Social-Ecological Model researchers, identified that the Social-Ecological Model effectively and efficiently implemented a public health program that facilitated long-term behavior change. The researchers also concluded that using a multivariate approach in program planning, like the Social-Ecological Model, is the first step in universalizing and comparing public health promotions nationally (Gregson, Foster, Orr et al, 2001). The Social-Ecological Model is a widely used model that successfully identifies the characteristics of an individual's community and the way it

affects a given behavior. In conclusion, the Social-Ecological model is an effective theoretical model that utilizes an ecological approach.

Introduction to the PRECEDE-PROCEED Model

Similar to the Social-Ecological Model, the PRECEDE-PROCEED model is a program planning model that uses an ecological approach to health promotion. Unlike the Social-Ecological Model, the PRECEDE-PROCEED Model is a program planning model, not a theoretical model. It provides a framework of step-by-step phases that help practitioners to plan, implement, and analyze a program and its effectiveness. The PRECEDE model was developed by Dr. Lawrence W. Green and colleagues in the 1970's to address the lack of direction and adequacy of public health promotions to sufficiently plan before implementing interventions (Glanz, Rimer, and Lewis, 2002). The name is an acronym that stands for Predisposing, Reinforcing, Enabling Constructs in Educational/Environmental Diagnosis and Evaluation. It wasn't until 1991 when Dr. Green and Dr. Marshall Kreuter developed the PROCEED portion of the model to include the ecological aspect to the model. The PROCEED acronym stands for Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development (Glanz, Rimer, and Lewis, 2002). In other words, the acronyms represent the different actions within each planning, implementing, and evaluating phase.

Public health issues are typically complex and multifaceted, especially when the intervention program is aiming to create long-term behavior change. Practitioners need to understand, and health promotions need to address, each individual construct. This framework allows for prioritization and allocation of different intervention strategies amongst causal factors of a given public health behavior. Another component of this

planning model involves a participatory approach, which allows for consistent feedback within each preceding phase from the target population (Glanz, Rimer, and Lewis, 2002). The multiple phases of the PRECEDE-PROCEED model strive to account for the multidimensional and complex nature of public health promotions.

Within the PRECEDE-PROCEED Model, phase one, is the social diagnosis. At this point, practitioners determine the health beliefs and values of the given population. This social diagnostic phase is critical in that it establishes what the community idealizes and how invested they may become in a future program. This information can be collected from a variety of sources including public records, or directly from the community through forums, focus groups, and surveys. This is where researchers can address different levels of acculturation, eating habits, and behaviors. Additionally, researchers may examine qualities of the community, including climate, economy, and education that contribute to the identified problems.

Phase two is the epidemiological assessment. This is the phase in which the practitioner identifies the problem and the influences that may support or hinder it. In terms of the planning process, this phase defines the objective of the program or the desired outcomes. Once the desired outcome is established, practitioners can begin to outline the individual and environmental changes impacting the problem.

Phase three is the behavioral and environmental diagnosis. As mentioned above, public health issues are complex and multifaceted. This diagnostic phase aims to identify behavioral factors of a community including incidence and prevalence data. It also aims to address aspects of the community environment including community cultures,

economic, political, and family environments. This allows the practitioner to achieve a more well-rounded picture of the target population.

Phase four is the educational and ecological diagnosis. This phase primarily recognizes characteristics of the problem on the individual level. More specifically, the predisposing, reinforcing, and enabling factors are considered here. Predisposing factors are actions and behaviors of an individual that are causal. These factors include the individual's knowledge attitudes and beliefs. Reinforcing factors are elements that support or encourage a given behavior. Reinforcing factors include the influence of others within their family and social environment. Finally, enabling factors arethe resources available to them (Glanz, Rimer, and Lewis, 2002). This is also the phase in which a practitioner may identify a particular theoretical model for the intervention.

Phase five, administrative and policy assessment, is the final phase of the PRECEDE portion of the planning model. Within this phase, the investigator determines what state and local programs may already be in place, whether or not there are policies around the given intervention, and the support networks involved.

Phase six begins the PROCEED portion of the Model and is the implementation phase. This is when the developed program is implemented into the community. All of the methods and resources that are identified and developed within the PRECEDE phases are applied. This is also a time where complications that may have arose during implementation are addressed.

Phases seven, eight and nine are all evaluative phases in which the process, impact and outcome are assessed. Throughout the planning phases there are several intermediate objectives that are identified and contribute to the ultimate objective of the

intervention. The impact evaluation determines the effect of the intermediate objectives identified in the planning phases. These intermediate objectives are more process-based and tend to be more short-term objectives established throughout the program intervention. Finally, the ninth phase is the outcome measure. This phase determines whether or not the intervention was successful long-term. Ideally the ultimate outcome aims to positively impact public health by reducing the risk of, preventing, and/or changing behaviors. Likely there will be barriers that cannot be controlled or changed in order to improve the outcome of the intervention. Within this final phase practitioners address any final barriers to program success.

The PRECEDE-PROCEED model, as discussed above, is an ecological approach to health promotion. The nine phases of the model provide structure for planning and implementing successful multifaceted public health promotions (Glanz, Rimer, and Lewis, 2002). In preparation for designing and implementing public health promotions, selection of the most appropriate program-planning model is imperative. The PRECEDE-PROCEED model is primarily used in the educational context of health promotion programs geared towards behavior change. Moreover, literature supports the success of the model in health promotions improving nutrition-related knowledge.

Use of the PRECEDE-PROCEED Model

Numerous studies have supported the positive impact the PRECEDE-PROCEED model has had on the effectiveness of health promotion programs. Some of these studies include preventive behaviors for type 2 diabetes mellitus in high-risk individuals (Moshki, Dehnoalian, and Alami, 2016), health promotion options for breast cancer

survivors (Tramm, McCarthy, and Yates, 2012), fitness-emphasized physical activity and heart-healthy nutrition education program for elementary school children (Slawta and DeNeui, 2009), internet based weight management program for young adults (Kattelmann, White, Green et al, 2014), among others (Cole and Horacek, 2009; Li, Cao, Lin, Li, Wang, and He, 2009; Sjostrom, Karlsson, Kaati, Yngve, Green, and Bygren, 1999; Buta, Brewer, Hamlin, Palmer, Bowie, and Gielen, 2011). It is clear that public health promotions in the form of prevention-based programs are necessary to address the issue of childhood overweight and obesity. It is also clear that there are many planning models, including the PRECEDE-PROCEED model, to choose from when planning a public health promotion. Current and future research provides a continuous supply of feedback on program outcomes.

The PRECEDE-PROCEED model has become one of the most successful program planning models. Moshki et al. (2016) stated the application of the model significantly improved knowledge and behaviors, specifically related to the predisposing, reinforcing, and enabling factors identified in preceding phases (Moshki, Dehnoalian, and Alami, 2016). Tramm et al. (2012) identified that the use of additional theoretical approaches used in combination better support complex issues and strengthen the planning model further (Tramm, McCarthy, and Yates, 2012). Two articles successfully combined additional theoretical models to supplement the planning and implementation of the programs. Specifically, Project YEAH combined the Community Based Participatory Research process to foster collaboration between community and researchers. Researchers also concluded the benefit of the extensive formative evaluation process within the precede phases and the adaptability of the intervention based on

intermediate feedback (Kattelmann, White, Green et al 2014). A formative evaluation is the process of testing and assessing certain elements of a program before it is implemented fully (Boyle and Holben, 2010). Li et al. (2009) conducted a community-based needs assessment and combined that with the PRECEDE-PROCEED model framework to identify the issue to be addressed. The researchers emphasized the importance of collaborating with the community to identify important issues to address (Li, Cao, Lin, Li, Wang, and He, 2009). The utilization of program planning models strengthens health promotion programs and literature supports their use for identifying areas of improvement within existing programs. In conclusion, the PRECEDE-PROCEED Model proves to be a successful and widely used program planning tool across a variety of contexts and methods of application.

It is clear that more research needs to address the problems presented by the childhood overweight and obesity epidemic and the evaluation of such programs. Given the proven effectiveness and flexibility of the PRECEDE-PROCEED Model, the constructs of the model were retrospectively applied to evaluate a youth fitness and nutrition summer camp program for children in Burlington, Vermont. This application described the effectiveness of the program and identified ways to improve the program based on the results of the PRECEDE-PROCEED Model evaluation.

CHAPTER TWO

ABSTRACT

Background: The PRECEDE-PROCEED Model is an effective and adaptable program planning tool that has been widely used in the design, implementation and evaluation of health promotion programs.
Objective: To retrospectively apply the constructs of the PRECEDE-PROCEED Model to a community-based youth fitness and nutrition summer camp program (Champ Camp) and to identify and describe how the program can be improved based on the findings of the PRECEDE-PROCEED Model evaluation.
Design: A systematic application of the nine phases of the PRECEDE-PROCEED Model applied retrospectively to evaluate and improve the Champ Camp program.
Setting: Children participating in Champ Camp offered through a seven-week summer camp coordinated by Burlington Parks, Recreation and Waterfront of Burlington, Vermont. The summer camp served as a licensed childcare program for children entering first through fifth grade.
Measures: Improvements in nutrition knowledge and fitness scores measured biweekly. Additionally, the retrospective application of the planning model determined valuable demographic, behavioral, environmental, and policy information about the community.
Statistical Analysis: A repeated measures analysis of variance was conducted to determine if there was a statistically significant change over time in nutrition knowledge and physical fitness. Statistical analysis was also performed to determine if there were potential correlations between nutrition knowledge and performance on each fitness assessment individually.
Results: The Champ Camp program significantly improved nutrition assessment scores for males. Additionally, there were statistically significant improvements in the fitness assessment scores for the ball throw within third through fifth grade males and females across the seven-week program. The retrospective application of the PRECEDE-PROCEED Model proved to be successful in identifying the demographic, behavioral and environmental influences, and resources and invested parties of the target population. Most importantly the model emphasized the use of SMART program goals and objectives within successful health promotion programs. The model also stressed the necessity for appropriate and validated nutrition and fitness assessment tools that would offer more generalizable data. Moreover, the model also emphasized the need for stronger program evaluation by including more process evaluative measures and defining the determinants in which the programs' effectiveness and efficiency would be measured.
Conclusions: The unique application proved to be a valuable and fruitful method for evaluating and identifying areas for improvement within a community-based youth fitness and nutrition summer camp program. This research not only serves to improve the existing Champ Camp program but to highlight the importance of program planning models and the critical components of successful health promotion programs.

INTRODUCTION

Childhood obesity is one of the most serious public health challenges of the 21st century affecting nearly 30% of children in the United States.[5] It is the result of many interrelated factors including genetics, lifestyle, and culture, established and encouraged by the environment in which children live, learn and play. More importantly, children's dietary habits and physical activity play significant roles in overall health and wellbeing. This is not simply an issue confined to the United States but a worldwide issue present in many developed countries including Canada, England, Australia, and many more.[6,7]

Overweight and obesity have proven to play a significant role in many short and long-term health risks with a substantial economic impact accounting for hundreds of billions of dollars of US medical expenses annually.[8] Children who are overweight or obese demonstrate many risk factors for various obesity-related diseases including cardiovascular disease, metabolic syndrome, type 2 diabetes, osteoarthritis, and some forms of cancer.[9] Not only are children facing the possible diagnosis of chronic illness, but children who are overweight or obese are more likely to remain overweight or obese into adulthood and face the burden of these diseases long-term.[10] In addition to these physiological health issues, there is also a significant impact on psychological health including risk for stigmatization, decreased self-esteem, and even depression.[9]

Recent studies demonstrate that children who have higher levels of health related fitness (cardiovascular fitness, muscular fitness, flexibility and body composition) have a decreased risk of developing obesity-related diseases and chronic illness.[3] The Centers for Disease Control and Prevention (CDC) states that children and adolescents should participate in 60 minutes or more of physical activity per day with recommendations on

intensity and duration. However, less than three in ten high school students meet this recommendation.[11] This trend only continues as adolescents age into adulthood.[12] Physical activity has also been proven to aid in weight management and improves academic performance in children. Additionally, physical activity is a strong predictor of both physical and psychological health in children. Currently, sports and extracurricular activities account for the majority of children's daily physical activity. Over the past few decades, there has been a paradigm shift in curriculum towards academic achievement, taking away from physical education programs within schools.[3,13] This further justifies the need for supplementary fitness programs.

There have been many published studies of interventions aimed towards reducing the prevalence of childhood overweight and obesity through improving nutrition knowledge and behaviors and increasing physical activity. Early intervention strategies have been shown to combat the rising levels of obesity in American children effectively.[14,15] These strategies target unhealthy behaviors by working to improve decision-making skills, enabling children to reap the benefits of proper nutrition and physical activity. Furthermore, additional interventions that are clearly developed using a program planning model, and target the unhealthy behaviors outlined above, are necessary for improving current programs and initiatives.

Program planning is a critical component for developing systematic health promotion programs. Program planning models serve to organize the steps for a health promotion program with the ultimate focus on improving quality of life. They define a course of action and predetermine the desired outcome so the goals and objectives are

clearly defined from the beginning.[16,17] This process can be time consuming and costly, but plays a significant role in the program's success.

There are many commonly used program planning models. When designing a health promotion program, it is best to choose the model that best fits the health promotion and population of interest. When considering which model to choose three terms help guide the decision making process; fluidity, flexibility, and functionality.[18] Fluidity refers to the sequence of steps. Do they follow a logical order for the program that is to be designed? Flexibility relates to the adaptability of the program and the outlined steps. Is it adaptable to the needs of the population, community, and other invested parties? Lastly, functionality refers to the usefulness of the planning model at improving the quality of life problem. Has the model been successfully used in prior health promotions to accomplish similar objectives?[18] Overall, these serve to help select and guide the model that will be most effective.

In addition to planning models, theoretical models play a valuable role in health promotion programs, especially when a behavior change is desired. There are many commonly used theoretical models used in health promotion programs, including the Health Belief Model, Stages of Change/Transtheoretical Model, Social Cognitive Theory, Theory of Reasoned Action and Theory of Planned Behavior.[19] Theoretical models serve to predict behaviors and identify factors contributing to behaviors. Planning models that incorporate theoretical models are more efficient at identifying the behavioral factors contributing to the problem. When used in conjunction, planning models and theoretical models work together to strengthen the impact of the health promotion.[17]

Program planning models, or logic models, are often used by public health professionals in the planning and preparation of health promotion programs. The PRECEDE-PROCEED Model (PPM) is a program planning model that is practical and adaptable across a variety of contexts. The PRECEDE-PROCEED Model uses an ecological approach to health promotion, meaning that all aspects of a person's environment are considered when assessing a given problem.[16,17] These factors may include a variety of influences such as the individual's attitudes, beliefs, skills and behaviors, the environment including their living, working, and family/social settings, as well as the community in which they live, including available programs and resources at the local, state, and national levels. All of these factors influence an individual's actions and behaviors. Planning models that utilize this ecological approach have been shown to be more successful than those that do not.[20]

The PRECEDE-PROCEED Model consists of nine multidimensional phases that serve to provide a step-by-step framework for planning public health promotions. The model's name includes two acronyms that define the processes completed within each set of phases. PRECEDE stands for predisposing, reinforcing, enabling constructs in educational/environmental diagnosis and evaluation. The PRECEDE phases of the model include five assessment based steps listed in the planning and preparation component of designing a health promotion. PROCEED stands for policy, regulatory, and organizational constructs in educational and environmental development. The PROCEED portion of the model includes the remaining four phases involving program implementation and evaluation procedures.[16,17,19] Figure 1 shows a flow chart representing the PRECEDE-PROCEED Model.

Another essential feature of the model is the integration of a community-based participatory approach throughout the entirety of designing, implementing and evaluating the health promotion.[17] For example, when assessing the needs of the community and factors contributing to an identified problem, the model encourages the investigators to engage the population of interest in defining the issues that are most important to them. Researchers should explore what factors are contributing to said problem, and once implemented involve the community in the evaluative assessment of the program's success. This participatory strategy may be achieved through a variety of approaches including surveys, community forums and focus groups. Research shows that for behavior change to be successful, it needs to be voluntary.[17] Engaging the community in the development of programs targeting behavior change allow for community members to participate in the development of behavior change strategies that are more appropriate for them. Therefore, health promotions that incorporate a participatory approach are more successful than ones that do not.

The PRECEDE-PROCEED Model is a widely used planning model that serves to guide the planning, implementation and evaluation of health promotion programs. The model was designed to be employed in a prospective way, from the beginning stages of programming planning and development. Many researchers have utilized the PRECEDE-PROCEED Model in its entirety and support its effectiveness and success across a variety of contexts.[21,22,23,24,25,4] However, several studies have also used the model in a modified, adapted, and retrospective way.[26,27,28,29] Research supports the use of the PRECEDE-PROCEED Model in these varied and adaptable ways to meet the particular needs of health promotion programs.[30] In a study by Kattelmann et al. (2013), researchers

developed a web-based weight management intervention for young adults in the collegiate setting utilizing the constructs of the PRECEDE-PROCEED Model.[21] This study provides support for the use of the model in a very precise and exact manner, highlighting the thorough assessment and evaluation procedures. Conversely, researchers Cole and Horacek (2008) used a consolidated version of the PRECEDE-PROCEED Model to develop an intuitive eating non-dieting approach to weight management pilot program.[26] A consolidated version of the model was used to better account for time constraints. Although a consolidated version of the model was used, researchers were still able to maximize key components of the model, one being the participatory engagement of the target population. The pilot program proved to be effective due to the participatory nature and diagnostic abilities of the assessment phases. Furthermore, this study provides support for the successful use of a consolidated version of the PRECEDE-PROCEED Model.[26] Lastly, several studies have used the PRECEDE-PROCEED Model in a retrospective way.[27,28,29] In a study by Hashimoto et al. (2015), researchers used components of the PRECEDE-PROCEED Model retrospectively to evaluate the effectiveness of a disease surveillance system and determine its strengths and weaknesses. Specifically, researchers utilized the educational and ecological assessment phase (Phase 3) to determine the predisposing, reinforcing and enabling factors present following program implementation. The retrospective analysis also took advantage of the participatory aspect of the model. This study aimed to address what changes needed to be made based on the program analysis and assessment, and involve specific stakeholders in the development of program improvements. Despite the retrospective application, researchers were still able to capitalize on many of the key components of the model

including thorough assessment and community participation and engagement. Overall, the flexibility of the model proves to be a key feature unique to the PRECEDE-PROCEED Model that has contributed to its successful use across different contexts and the varied applications outlined above.

As mentioned earlier the PRECEDE-PROCEED Model is a useful tool for evaluating health promotion programs. In this study the constructs of the PRECEDE-PROCEED Model were retrospectively applied to evaluate a seven-week youth fitness and nutrition summer camp program conducted in June through August of 2015. The objectives of this youth fitness and nutrition program were to improve nutrition knowledge and fitness assessment scores and to determine if there was a correlation between nutrition knowledge and the fitness assessments. The specific aim of the study was to retrospectively apply the PRECEDE-PROCEED Model to evaluate the summer camp program and to identify and describe how it could be potentially improved, based on the constructs of the PRECEDE-PROCEED Model.

METHODS

Overview of The Champ Camp Program

For this study, the PRECEDE-PROCEED model was applied retrospectively onto a community-based youth fitness and nutrition education program. The youth fitness and nutrition education program was offered through a local summer camp called Champ Camp, run by Burlington (Vermont) Parks, Recreation and Waterfront (BPRW). Champ Camp has been in existence for over twenty-five years and is one of BPRW's longest running camps. It is one of fifty-five summer camps and programs that BPRW offers,

many of which promote movement and nutrition education among area youth.[31] The Champ Camp is a seven-week open enrollment licensed childcare program for children entering first through fifth grade. The camp is also partially subsidized for families who qualify financially and is supported by the Summer Food Service Program (SFSP), run by the United States Department of Agriculture, which offers access to foods during the summer months.

Burlington Parks, Recreation and Waterfront initially partnered with Body Resolution, a local personal training and wellness studio, in the summer of 2014 to offer nutrition education and fitness activities for the Champ Camp. The mission was to improve nutrition knowledge and physical fitness through interactive and engaging activities. In 2015 BPRW was awarded a grant through the National Parks and Recreation Association in conjunction with the Walmart Foundation to offer a program that supports children's health and promotes nutrition and recreation through out-of-school time programs.

Description of the Participants

This study includes data that were collected on the children participating in the 2015 summer Champ Camp program, offered at two different local elementary school locations. At each site, the children were broken into age groups of 1st-2nd graders and 3rd-5th graders. Accurate demographic information was not collected on the Champ Camp participants or their families, but the population information can be generalized based on community-wide data. The Summer 2015 Champ Camp served approximately 129 children of the greater Burlington area.

Body Resolution worked with each age group for one hour per day, two days per week. The program curriculum consisted of seven weekly themes geared towards the five food groups (fruits, vegetables, grains, proteins, and dairy) and reinforced decision-making skills for healthy choices. Each weekly theme utilized different interactive activities educating the children about nutrition and wellness. Most activities included an exercise and nutrition component, while other program elements included taste tests and recipes to bring home.

Assessments and Frequency

The programming also consisted of a nutrition knowledge assessment and three field-based fitness assessments. The nutrition knowledge and fitness assessments were conducted at baseline (week one day one), intermittently in weeks three and five, and ending week seven. The nutrition knowledge assessment was a subjective questionnaire consisting of nine questions, evaluating the children's knowledge of the five food groups, and healthy options for each food group. Figure 2 shows a sample of the nutrition assessment. The nutrition knowledge assessment was not a validated evaluation tool and was solely developed by Body Resolution staff for basic nutrition knowledge assessment purposes. The field-based fitness assessments tools included three standard methods adapted from the Presidential fitness test: a 15-meter pacer test, a medicine ball chest toss, and a sit and reach, assessing cardiovascular fitness, muscular strength and flexibility respectively.

The data from both of the assessments were coded and recorded into an Excel spreadsheet for subsequent analysis and review. The responses from the nutrition

assessment were scored based on correctness. Each question was assigned 1 point. For the questions that required multiple answers, the point was divided accordingly. For example, if the question necessitated three responses (i.e. list 3 green vegetables) each correct answer was given .33 points. Children's nutrition scores and fitness assessments were tracked over time. Missing or blank responses received zero points.

Statistical Analysis of the Assessments

The assessment data were analyzed in two ways using IBM SPSS software (version 22.0, SPSS, Chicago, Illinois 2013). The nutrition and fitness assessments were analyzed to determine if there were any statistically significant changes over time. Data were statistically analyzed by a Repeated Measures Analysis of Variance based on gender (male or female) and age group, with 1st and 2nd graders in one group and 3rd through 5th graders in another. Additionally, a correlation assessment was conducted to determine if a statistically significant correlation existed between the nutrition assessments and each of the fitness assessments.

Retrospective Application of the Precede-Proceed Model

Initially, the Champ Camp Youth Fitness and Nutrition Program was not originally developed through a structured program planning model. However, in this study the PRECEDE-PROCEED Model was retrospectively applied to the Summer 2015 Program to determine how the model can be used to evaluate and potentially improve the program goals and outcomes. The use of a program planning model would likely improve the results of the program and provide a more systematic approach to program structure and addressing the needs of the children of the greater Burlington area. As mentioned

above, the PRECEDE-PROCEED Model is broken into nine multidimensional phases including steps for assessment, implementation and evaluation. The retrospective application of this model starts with the five preceding phases, followed by the four proceeding phases. Each assessment phase was applied retrospectively. The methods in which they were employed is outlined below.

The first preceding phase of the PRECEDE-PROCEED Model is the social assessment. This phase addresses the needs of a given population, identifying what problems are present, similar to a community needs assessment. With the typical prospective application of the PRECEDE-PROCEED Model, this information is obtained through community focus groups or forums, surveys, or interviews. For the retrospective application of the model, these assessment data were obtained from United States population census bureau data. Additionally, indicative health data from the CDC's High School Youth Risk Behavior Surveillance System[32] was utilized, recognizing the six health risk behaviors that contribute to the leading causes of death and disability among youth and adults. Within this assessment phase demographic information was obtained from data provided by the Burlington (Vermont) School District (BSD) Annual Report.[33]

The second phase of the PRECEDE-PROCEED Model is the epidemiological assessment that includes data specific to the primary problem identified in the social assessment. This assessment includes national, state, and locally representative data on overweight and obesity incidence. It also includes data presented on health and behavior surveys with a focus on dietary habits and physical activity. Specifically, the National Survey of Children's Health, 2011[34] was reviewed, a multifaceted measure of childhood wellness and healthy habits. Additionally, the CDC's Middle and High School Youth

Risk Behavior Surveillance System, 2013[35] which monitors six types of health risk behaviors that contribute to the leading causes of death and disability among American youth and adults was utilized. Through both of these surveys, data unique to Vermont were compared to that of the United States National averages.

The next phase (Phase Three) includes the behavioral and environmental assessments. This phase serves to identify the key behavioral and environmental factors that contribute to the problem. For both components of this assessment, data described in several state indicator reports generated by the CDC's National Center for Chronic Disease Prevention and Health Promotion, Division of Nutrition, Physical Activity and Obesity were analyzed. Specifically, the State Indicator Report on Physical Activity, 2014, Behavioral Indicators[36] and the State Indicator Report on Fruits and Vegetables, 2013, Behavioral Indicators[37] were utilized to gather information on the state of Vermont. For the environmental assessment data, the State Indicator Report on Children's Food Environment, 2011[38] was reviewed to address regulations present within childcare, school, and community settings regarding nutrition and physical activity. Also, the missions and values of the Burlington School District and Burlington Parks, Recreation and Waterfront were examined to obtain information on their efforts and initiatives for addressing childhood overweight and obesity.

The fourth phase involves the ecological and educational assessment, which addresses the predisposing, enabling, and reinforcing factors contributing to the problem and/or behavior. To meet the elements of this phase, components of the Champ Camp Youth Fitness and Nutrition Program were categorized as predisposing, reinforcing or enabling factors. The predisposing factors include the individual's knowledge, attitudes,

values, beliefs, and perceptions. The enabling factors include the skills, resources, or barriers that contribute to the problem and relate to availability and accessibility. Finally, the reinforcing factors are the peer and social supports that serve as either positive or negative reinforcement of a behavior. In summary, all of these factors are considered modifiable contributors to the problem and could promote the maintenance of behavior-change.

The fifth assessment phase (Phase Five) of the PRECEDE-PROCEED Model includes the administrative and policy assessment, which identifies all of the political and organizational resources that could inhibit or support the development of a health promotion program. To address the elements of this phase, the State Indicator Reports on Environmental and Policy Indicators were examined. More specifically, the State Indicator Report on Fruits and Vegetables, 2013[37] and State Indicator Report on Physical Activity, 2014[36] were considered because they provide insight into the food and physical activity cultures in Vermont. Current programs and supportive initiatives of the United States Department of Agriculture (USDA) and the Vermont Department of Health (VDH) were also examined.

Phase six includes the implementation of the health promotion. Considering the retrospective application of the model, the characteristics of the 2015 Summer Champ Camp Program were reviewed. This review included an assessment of the supporting organizations and programs. Additionally, for the particular youth fitness and nutrition component, the program length, frequency, duration of activity, and grouping of participants were identified.

The final three phases are the evaluative phases of the model, including the process (phase 7), impact (phase 8), and outcome (phase 9) evaluations. The process evaluation can be described as a formative assessment of program performance throughout the implementation of the program. This process evaluation is a way for investigators to assess the program performance and identify areas for improvement before program completion. In the Champ Camp youth fitness and nutrition summer camp program there were several changes made to the programming and assessment tools that would be considered aspects of a process evaluation.

The impact and outcome evaluations were addressed by analyzing the actual assessment data of the program while considering the effort, efficiency and effectiveness. This refers to how successfully the goals and objectives were met. Effort can also describe how well the program performed about the program design and implementation procedures. Effectiveness refers to how well the desired outcomes were achieved, and efficiency refers to the how much was achieved with the minimum use of resources. All are factored into the impact and outcome evaluations of the program using the PRECEDE-PROCEED Model.

RESULTS

The results of this study are organized within the framework of the PRECEDE-PROCEED Model. Sections one through five discuss each of the initial assessment phases. Section six outlines the components of the Champ Camp youth fitness and nutrition education program and how the program was initially implemented. Lastly, sections seven, eight, and nine discuss the results of the program evaluation. Within these

evaluative sections, areas for improvement are supplemented by suggestions for future programs.

Phase 1: Social Assessment

The social assessment serves to describe the demographics of the community, determine the quality of life issues present, and define the problem that is most important to the community. According to United States census data as of April 1, 2010 the population of Burlington, Vermont was approximately 42,417, accounting for approximately 6.7% of the Vermont population.[38] Of that, persons aged 5-18 years represent 9.4% of the total population.[43] Burlington, Vermont also supports a diverse demographic compared to the rest of the state. For a more in-depth description of the target population, the demographic information presented in the BSD Annual Report was reviewed. According to the BSD Annual Report for 2015 and Proposed Budget Details published February 10, 2016, there are approximately 4,000 students in the Burlington School District, 65.2% of whom are White, 14.1% are Black African American, 11.5% are Asian, 3.6% are Hispanic or Latino of any race, 0.1% are American Indian or Alaskan Native, and 5.4% are two or more races. Of these, 16.4% are receiving English Language Learning services and identify with 46 different home languages. Additionally, 61.9% qualify for free/reduced meals. These data do not include children who go to private schools or are home schooled.[33] There are six private schools within the Burlington community and thirteen public schools within the Burlington School District (BSD).[44] Within the BSD, there are five elementary schools, two of which are classified as magnet, meaning they attract students of diverse social, economic, ethnic, and racial backgrounds. In particular, these two schools focus on arts and sustainability to immerse children in

learning through these particular subjects. There are also two middle schools and three high schools. Two of those high schools include alternative high school programs.[45] These alternative programs utilize an innovative approach to engage a more diverse population of students, both racially and socio-economically. The objective is to expose students to more specific career paths and technical programs including but not limited to cosmetology, mechanics, woodworking, and culinary arts for students who may be having a difficult time succeeding in more conventional and traditional high school curricula.

According to several sources, including the FOX News Health report and USA today, Vermont is the second healthiest state in the country.[39,40] Both sources report Hawaii as the most healthy and Louisiana as the least healthy states. Time Magazine also named Burlington, Vermont as the best place to raise healthy kids, touting it for the schools, pediatric care, culture and diversity, and outdoor activities year round.[41] These reports paint a societal picture of the health status of Burlington, Vermont, and is an important component of the social assessment. Additionally, this information is consistent with data reported in the United Health Foundation America's Health Rankings 2015 Annual Report.[42]

Phase 2: Epidemiological Assessment

Despite the notable quality of life present in Burlington, childhood overweight and obesity is still an issue. According to the Vermont State Nutrition, Physical Activity, and Obesity Profile, 2015[46], curated by the National Center for Chronic Disease Prevention and Health Promotion Division of Nutrition, Physical Activity and Obesity, of

children aged 2 to 5 years 15.5% were overweight, and 12.2% were obese. Of adolescents aged 5 to 18 years, 13.6% were overweight, and 12.2% were obese.[46] These data represent the severity and prevalence of overweight and obesity in the state of Vermont.

From the National Survey of Children's Health, 2011 report, information was gathered on the health status, health care, schools and activities, diet and family life, and neighborhoods of Vermont children and compared to the United States national averages.[34] Regarding health care, Vermont had a higher percentage of children with preventative health care for primary care and dental care and fewer children requiring mental health counseling compared to the United States average. Ninety percent of Vermont children are participating in activities outside of school, which is ten percent greater than the national average. For diet and family life, a greater percentage of children in Vermont are breastfed and are enjoying family meals four or more days per week. Lastly, Vermont neighborhoods are safer and more supportive of the children living in them by approximately 10% and 7% respectively compared to the national average.

In addition to demographic information, additional health information specific to the target population was reviewed. According to the CDC's High School Youth Risk Behavior Surveillance System the six health risk behaviors that contribute to the leading causes of death and disability among youth and adults include unintentional injuries and violence, sexual behaviors, alcohol and other drug use, tobacco use, unhealthy dietary behaviors, and inadequate physical activity.[32] All of these factors contribute to the sociological status of the target population. However, for purposes of this study data categorized as unhealthy dietary behaviors and/or inadequate physical activity were examined. More accurate behavioral statistics for Vermont were gleaned from the CDC's

High School Youth Risk Behavior Surveillance System, 2013. Based on these data, Vermont children struggle to meet physical activity recommendations and display poor dietary behaviors including insufficient fruit and vegetable consumption, not eating breakfast regularly, and high consumption of sugar sweetened beverages.[35] This information is also supported by data presented in the Vermont State Nutrition, Physical Activity, and Obesity Profile, 2015.[46] Only 23.7% of Vermont adolescents were meeting the CDC's physical activity recommendations and only 19.4% of Vermont adolescents attended daily physical education classes.

Phase 3: Behavioral and Environmental Assessment

The behavioral assessment was addressed by examining the State Indicator Report on Physical Activity, 2014: Behavioral Indicators [36] and State Indicator Report on Fruits and Vegetables, 2013: Behavioral Indicators.[37] According to the State Indicator Report on Physical Activity, 2014, 13.7% of Vermont youth reported no physical activity, 25.4% reported meeting aerobic activity guidelines, and 14.5% reported engaging in daily physical education.[36] According to the State Indicator Report on Fruits and Vegetables, 2013: Behavioral Indicators, in Vermont, 30.7% of adolescents report consuming fruits less than one time per day and 26.4% report consuming vegetables with the same frequency; both of which fall below the national average.[37]

The State Indicator Report on Children's Food Environment, 2011[38] was reviewed to identify regulations present within the childcare, school, and community settings regarding nutrition and physical activity.[38] According to this report, Vermont does not have any laws to restrict sugar drinks although they do have regulations to

require access to drinking water throughout the day, and regulations to limit screen time within the child care environment. Within the school environment, 53.2% of middle and high schools offer sugar drinks as competitive foods, 50.9% offer less healthy competitive foods, and 41.8% allow advertising of less healthy foods.[38]

The Burlington School District (BSD) has placed a significant value on fostering a healthy food environment that emphasizes and supports the use of locally grown and produced foods. The BSD supports the Burlington School Food Project, which is a part of the Farm to School Program and helps to connect and educate children and families on the benefits of locally grown and sourced foods.[47] Furthermore, it is part of the National Farm to School Network, which helps connect schools to local farms. Farm to School goals and objectives became a part of the BSD Wellness policy in December of 2011.[48] Other key components of the system include nutrition education, physical activity, and other wellness-based endeavors. The BSD also provides nearly eight school gardens that are maintained by students and parents. Additionally, Burlington High School and Burlington Technical Center support the operation of a local food truck, "Fork in the Road", employing adolescents to encourage the development of business and culinary skills.[47]

In addition to the BSD initiatives, Burlington Parks, Recreation and Waterfront (BPRW) of Vermont plays a valuable role in educating and engaging Burlington youth in recreation-based wellness.[31] BPRW's mission is "to connect diverse, dynamic public spaces, and programs which grow, inspire and create inclusive social interaction through land, water and people".[31] BPRW offers approximately 150 programs and activities, 40 of which are youth specific programs. BPRW's youth programs serve approximately one-

fifth of the children of Burlington. BPRW also maintains 23 parks, three bike paths, three trails, two marinas, four beaches, one campground, 13 community gardens, and five facilities including a recreation center, auditorium, concert venue, ice arena, and teen center.[31]

Phase 4: Ecological and Educational Assessment

As mentioned earlier in this review, the educational and ecological assessment identifies the predisposing, enabling and reinforcing factors. Given that the program was not developed using a logic model, existing components of the Champ Camp Youth Fitness and Nutrition Program were categorized according to one of the factors mentioned above. Beginning with the predisposing factors, which refers to an individual's knowledge, attitudes and beliefs, nutrition-knowledge information from the children was gathered from the nutrition assessments. More detailed analysis of the nutrition and fitness assessment results are discussed later in this paper (Phase Eight: Impact Evaluation). Other components of the Champ Camp program addressed nutrition attitudes and beliefs, although there were no data collected on the effectiveness of these activities. Those activities included fruit and vegetable taste tests and positive messaging around nutrition and exercise.

The enabling and reinforcing factors are those that influence the children to the greatest degree within their environment. Given that the Champ Camp program is recreation-based, the youth camp fosters a healthy lifestyle and fun ways to engage children in physical activity. The camp is also supported by the Summer Food Service Program (SFSP), which reimburses the camp for offering nutritious meals to children

when school is not in session. Since the Burlington School District has greater than 50% of their children and families who qualify for free and reduced-priced meals, the district qualifies for the SFSP.[49] Both programs are considered enabling factors and encourage positive behaviors because the children and their families have access to healthier foods and physical activity during the summer months. Regarding the reinforcing factors, the Champ Camp Program utilized group/peer-based team building activities to reinforce community values among the children. Some of these activities include relay and other competition-based games, which encourage the children to work together to develop particular values, such as trust, leadership, and collaboration, among others. Additionally, to encourage healthier eating within the home, recipes were sent home with the children to engage parents or guardians. These aspects are identified as reinforcing factors within the camp because they serve to strengthen the motivation for behavior change.

Phase 5: Administrative and Policy Assessment

The administrative and policy assessment determines the feasibility of implementing the program about resources available, associated organizations, and other invested parties. This phase also addresses the national, state and local policies that serve to mitigate the problem. The CDC's National Center for Chronic Disease Prevention and Health Promotion Division of Nutrition, Physical Activity, and Obesity State Indicator Report on Fruits and Vegetables, 2013[37] and State Indicator Report on Physical Activity, 2014[36] outline the policy and environmental indicators for each state compared to the national average. It was from these state indicator reports that state and local policy data were obtained.

According to the State Indicator Report on Fruits and Vegetables, 2013[37], Vermont does not have a state-level healthier food retail policy, although Vermont has the highest number of farmers markets per 100,000 residents (15 farmers markets per 100,000 residents). Additionally, 50% of the Vermont farmers markets accept SNAP benefits and 25.5% accept WIC Farmers Market Nutrition Program coupons. All of this contributes to the healthier food retail environment in the communities of Vermont. However, Vermont is one of 31 states that do not authorize farmers to accept WIC Cash Value Vouchers. Also, in Vermont there are no state childcare regulations that align with national standards for serving fruits and vegetables within a school, childcare, and early-education centers. However it does have state-level farm to school/preschool policy. Additionally, Vermont does not have a state-level food policy council, although it does have three local food policy councils that serve and benefit local food movements.[37]

Regarding physical activity and in comparison to all 50 states, Vermont is one of the strongest supporters of physical activity policy on the state and local levels. According to the State Indicator Report on Physical Activity, 2014[36], 46.2% of Vermont youth have access to safe places for physical activity including parks, community centers, and side walks within their neighborhood. With regard to physical activity and physical education in schools and childcare settings, Vermont is one of 28 states that provides state-level policy guidance on time spent in moderate- to vigorous-intensity activity in physical education, one of 30 states that provides state-level policy guidance on recess, and one of 34 states that provides state-level policy guidance on walking or biking to/from school.[36]

Within this PRECEDE-PROCEED Model phase, other programs with resources and involvement in childhood overweight and obesity were examined. These included programs offered through the United States Department of Agriculture (USDA) and the Vermont Department of Health (VDH). The USDA supports numerous Child Nutrition Programs aimed at mitigating the factors contributing to childhood overweight and obesity such as the Child and Adult Care Food Program, National School Lunch Program, School Breakfast Program, Summer Food Service Program, Special Milk Program, and the Fresh Fruit and Vegetable Program.[50] Other USDA programs and initiatives include the Expanded Food and Nutrition Education Program, HealthierUS School Challenge, the Farm to School Program, and Team Up for Nutrition Success.[50] Similarly, the VDH has a variety of programs geared towards improving dietary behaviors and increasing physical activity to mitigate childhood overweight and obesity. These programs include the Fit and Healthy Kids Initiative, Fit WIC Vermont, the Vermont Healthy Schools Resource, Safe Routes to School, among others.[51] Combined, these national and state level programs work to further promote healthy behaviors among children and adolescents in Vermont. Programs like these provide a significant amount of resources to engage the public in healthy eating and physical activity behaviors, and serve as the main stakeholders in the success of similar public health promotions programs.

Phase 6: Implementation

To implement the youth fitness and nutrition component of the Champ Camp program, BPRW applied for a grant from the National Recreation and Parks Association (NRPA), which had partnered with the Walmart Foundation to support children's health

through park and recreation out-of-school programs. Additionally, in 2015 the NRPA created a partnership with an organization called OrganWise Guys (OWG). OWG is an organization that develops and provides educational materials and curricula for youth fitness and nutrition education afterschool and summer camp programs. In the spring of 2015, BPRW was awarded the grant and OWG materials were provided to BPRW to supplement the programming and curricula of the 2015 Champ Camp Youth Fitness and Nutrition Program.

In 2015, BPRW (a public municipality), partnered with Body Resolution (a private business), to deliver the nutrition education and fitness activities to the children participating in the summer camp. Body Resolution is a local personal training and wellness studio in South Burlington, Vermont. Body Resolution's role was to develop programming and curriculum to meet the needs of the grant guidelines. Body Resolution staffing for the program consisted of nutrition and fitness professionals, certified personal trainers, and qualified interns from the University of Vermont, all with experience working with children.

Outlined above are the results of the retrospective assessment of the Burlington, Vermont community using an ecological approach. As important as the socio-ecological assessments are, program evaluation plays an equally valuable role in defining program success. Additionally, evaluation needs to be both formative and summative. Below describes the results of the process, impact, and outcome evaluations of the PRECEDE-PROCEED Model, which proved to not only to be a critical component of the model, but served as a key component to this research.

Phase 7: Process Evaluation

The retrospective application of the PRECEDE-PROCEED Model identified the value and importance of process evaluation procedures and the inadequacy of this evaluative measure within the youth fitness and nutrition program. In general, there was limited process evaluation that occurred during the program. This limitation is likely due to the short program length and the lack of a program planning model. However, throughout the Champ Camp Program there were a few changes made to the assessments and curriculum that could be classified as process evaluative measures. These changes involved minor adjustments to the design and implementation of the nutrition assessment to account for varying degrees of literacy for some of the children, particularly the group of 1st and 2nd graders. Many of these children could not read or write, so questions had to be read to them and their answers were recorded by a staff member. Also, some of the nutrition and fitness activities proved to be less engaging than anticipated. This necessitated minor alterations to better appeal to the Champ Camp children.

Utilization of the PRECEDE-PROCEED Model identified the inadequacy of the evaluation process present within the Champ Camp. Through this identification, potential improvements for future program process evaluation were noted. Some of the possible improvements include structured feedback meetings and communication between the Champ Camp site directors and the Body Resolution youth fitness and nutrition program staff. Within these meetings the goals and objectives of the program would be reinforced between both staffing agencies and the desired outcomes of the program would be more clearly defined.

Phase 8: Impact Evaluation

The result of a program can be clearly defined by the objective application performance data. The nutrition and fitness assessment data were analyzed and evaluated using a within subjects Repeated Measures Analysis of Variance to determine a statistically significant change over time using IBM SPSS software (version 22.0, SPSS, Chicago, Illinois 2013). These results are presented in Figures 3-6.

The nutrition assessments were administered to the children participating in the summer camp program to assess baseline nutrition knowledge in week one, intermittent improvements in nutrition knowledge during weeks three and five, and ending nutrition knowledge of the children during week seven. All children scored above 30% on the baseline nutrition knowledge assessment. Since the nutrition assessment was not a validated assessment tool, conclusions regarding the strength of the improvements over time or potential implications for changed behavior could not be drawn. However, the Repeated Measures Analysis of Variance identified a statistically significant change over time for the nutrition assessment and the ball throw alone. More specifically, the statistically significant change over time for the nutrition assessment was only noted for the males in both age groups, 1st through 2nd grade and 3rd through 5th grade. For the ball throw, statistically significant change was noted for both male and female 3rd through 5th graders only.

A correlation analysis was also performed to determine if there was a statistically significant correlation between the nutrition assessment scores and each of the three fitness assessments. A significant positive correlation was identified between the nutrition assessment scores and the pacer test, except for week five (week 1 r=0.279, p-

value=0.029; week 3 r=0.325, p-value=0.008; week 7 r=0.291, p-value=0.014). A significant positive correlation was also noted between the nutrition assessment scores and the ball throw on weeks three and seven (week three r=0.350, p-value=0.003; week seven r=0.295, p-value=0.011). No significant correlation was noted for the sit and reach assessments.

Regarding the impact evaluation, the PRECEDE-PROCEED Model identified areas for improvement within the quantitative data analysis. The assessment results were not as positive as expected. Given that the nutrition assessment tool was not validated, the results are not reliable, generalizable, or comparable to other studies. Moreover, the nutrition assessment proved to be time consuming and inappropriate for the 1st and 2nd graders. As previously mentioned, most of the children in that age group lacked the literary capacity to read and write their responses, so they required more support from staff to complete the assessment successfully. Had the nutrition assessment tool been validated, the reliability of the data sets would have been stronger and the results would have been more generalizable to other case studies. Additionally, the fitness assessment results proved to be weaker than anticipated. This may be due to a lack of proper training of the technical staff responsible for conducting the assessments and the recording of the results. Future programs could benefit from more in-depth training of technical staff to ensure competence in utilizing the assessment tools.

Phase 9: Outcome Evaluation

The outcome of the program can be determined by the effectiveness in which the desired results were achieved. The retrospective application of the PRECEDE-PROCEED Model outlined the strengths and weaknesses of the Champ Camp program.

More specifically, the use of the model helped to identify the existing program goals and objectives along with the measurable outcomes of the program and helped to determine more appropriate outcome measures for future programs. The goals and objectives of the 2015 Youth Fitness and Nutrition Program were to target a youth population, expose participants to nutrition education curriculum, demonstrate fun and accessible ways to exercise, and encourage healthy lifestyles through cooperative games and activities. These goals were developed with consideration of the short program length and limited availability of resources. Given that these goals and objectives were not specific nor measurable, this limits the ability to effectively evaluate the program. Furthermore, this reinforces the necessity for specific and measurable goals and objectives to be clearly defined in the early stages of program development.

Through the retrospective application of the PRECEDE-PROCEED Model the outcome evaluation also identified weakness in the effort, efficiency, and relative costs of the program. While the Champ Camp program reaches nearly $1/5^{th}$ of Burlington youth, the youth fitness and nutrition program, within the Champ Camp, lacked the organizational qualities to effectively educate and encourage significant behavior change. Additionally, the program lacked appropriate assessment tools to effectively evaluate the desired changes. Moreover, the program proved to be inefficient when compared to the resources spent. The inefficiency was a result of poor program planning, lack of specific and measurable goals and objectives, and inappropriate assessment tools. Additionally, the program would benefit from more appropriate outcome evaluation methods for determining the effectiveness of the program.

DISCUSSION

The goal of this study was to examine how the PRECEDE-PROCEED Model could be used to evaluate and potentially improve a community-based physical activity and nutrition education summer camp program for children. When considering all of the information that was collected through the retrospective application of the PRECEDE-PROCEED Model it is clear that initial program planning would be both more effective and efficient. The retrospective approach effectively identified and described the PRECEED assessment data including the quality of life issue, social assessment and demographic information, behavioral and environmental factors, and resources and invested parties. Additionally, in their evaluative nature, the PROCEED phases were able to emphasize the need for systematic and definitive program evaluation. The PRECEDE-PROCEED Model successfully highlighted the target areas of improvement for future implementations of the Champ Camp Program.

The use of the PRECEDE-PROCEED Model helped to emphasize the importance of determining the goals and objectives in the preceding/planning phases of the model. This is one of the key components to the model, and has been continuously emphasized within the literature. Defining SMART (specific, measurable, agreed upon, realistic, and time sensitive) goals and objectives early on helps to define what factors need to be addressed to achieve the desired outcomes. Proper goal setting within well-planned health promotion programs contributes to drive the direction and strength of the program itself. One of the major downfalls of the original youth fitness and nutrition summer camp program was that the goals that were established were not specific or realistic and therefore were not able to provide a framework for the program's success.

Given that the youth fitness and nutrition program is to be repeated for future summer Champ Camp programs, it is recommended that the overarching goal of the new curriculum be to improve children's nutrition knowledge and health-related physical fitness based on the Dietary Guidelines for Americans 2015[52] and the FITNESSGRAM Healthy Fitness Zone Performance Standards (2015-16)[53]. The specific SMART goals and objectives proposed for future summer Champ Camp programs will be as follows:

- By seven weeks of the Champ Camp Program, 80% of youth participants will be able to accurately identify all of the MyPlate food groups based on the Champ Camp nutritional curriculum.
- By seven weeks of the Champ Camp Program, 80% of youth participants will be able to accurately sort appropriate foods into corresponding food groups as determined by the Dietary Guidelines for Americans 2015 based on the Champ Camp nutritional curriculum.
- By seven weeks of the Champ Camp Program, 80% of youth participants will be categorized within the Healthy Fitness Zone for aerobic capacity determined by the Fitnessgram Performance Standards (2015-16) for field-based health-related fitness assessments.
- By seven weeks of the Champ Camp program, 80% of youth participants will be categorized within the "Healthy Fitness Zone" for upper body strength and endurance according to the corresponding age appropriate 90° push-up standards (Fitnessgram Performance Standards (2015-16)) for field-based health-related fitness assessments.

- By seven weeks of the Champ Camp program, 80% of youth participants will be categorized within the "Healthy Fitness Zone" for muscular flexibility according to the corresponding age appropriate back-saver sit and reach standards (Fitnessgram Performance Standards (2015-16)) for field-based health-related fitness assessments.

The programming and curriculum for the youth fitness and nutrition program included appropriate activities to educate children on the MyPlate food groups and healthy options for those food groups. However, the use of more appropriate assessment tools is necessary. More specifically, the use of a validated nutrition assessment tool will allow for more reliable and generalizable results. Appropriately measuring the nutrition-related knowledge of the youth will successfully determine the effectiveness of the youth fitness and nutrition program. The utilization of picture-based assessments is widely used within nutrition knowledge assessments for children. To address the new nutrition goals and objectives, the nutrition-related knowledge of the children should be determined using a nutrition survey adapted from the All 4 Kids Study.[55] The tailored survey includes 10 questions asking children to identify food groups represented by pictures of different foods and appropriately identify healthy foods within those food groups.

The fitness activities included a variety of aerobic, muscular strength building, and flexibility exercises. While the goals, objectives, and assessment tools were not appropriate, the activities embedded in the curriculum were suitable. More suitable physical fitness measures have the potential to reveal more positive outcomes within the short program length. To better meet the goals and objectives related to the fitness

measures, the program should incorporate the FITNESSGRAM assessments and performance standards. FITNESSGRAM is a widely used program in establishing standards for field-based fitness assessments and measuring health-related fitness.[56] FITNESSGRAM has set criterion-referenced fitness standards for children's performance on several health-related fitness assessments.[53] Literature supports the use of these assessments because of their validity, reliability, and their comparability across other studies to determine the health status of children.[57,58] As defined in the new goals and objectives, future summer Champ Camp programs should utilize three of the FITNESSGRAM assessments. These assessments include the 20-meter PACER test, the 90° push-up, and the back-saver sit and reach.

In addition to the FITNESSGRAM assessment tools, the new program assessments will include a self-reported physical activity questionnaire administered during week one of the program to determine baseline physical activity. Due to the nature of the summer camp program, accessing a direct measure of the children's activity prior to the camp would be challenging. Therefore, the program should utilize a self-reported measure. This questionnaire will only be administered to the older children, ages 8-14 years. Specifically, the program will use the Physical Activity Questionnaire for Older Children (PAQ-C) to determine moderate to vigorous physical activity in the last seven days.[59] However, there are some limitations to the use of self-reported physical activity questionnaires in children. These limitations include inaccurate recall of physical activities and time spent physically active, and the interpretation of these questions.[59]

Aside from determining specific goals, objectives, and assessment tools, appropriate program planning would also serve to improve efficiency. For example, the

PRECEDE-PROCEED Model successfully identified the diverse demographic of the Burlington, Vermont population. If this cultural diversity had been known initially, the programming and activities might have accounted for this. Furthermore, it would be advisable for future programming to include more culturally sensitive curriculum and the use of pictures to overcome potential language barriers.

The model also identified the importance for increased technician standards to include more experienced staff and/or additional training. This lack of data strength could be the result of poorly trained and underprepared staff in the assessment implementation, data collection and recording of the fitness assessments. The PRECEDE-PROCEED Model evaluation emphasized the significance of properly trained technicians and their ability to carry out the program responsibilities. Future programs need to consider the competence of their staff and ensure that adequate training is provided prior to the beginning of the program.

Lastly, the PRECEDE-PROCEED Model evaluation emphasized the importance for effective program evaluation. As described above, there are three evaluative phases of the model: a process, impact, and outcome. The Champ Camp program included several process-evaluative measures outlined in the Phase Seven results section. Proposed additional process-evaluative measures include structured feedback meetings with program staff on assessments and activities. Defining the methods for program evaluation prior to the beginning of the program actually, determines the standards in which the program is to be held. The outcome evaluation identified weakness among the responsiveness, effectiveness, efficiency, and relative costs of the program, all of which play a critical role in program evaluation and determining success.

In conclusion, the PRECEDE-PROCEED Model adequately evaluated and identified areas for improvement within a community-based physical activity and nutrition education summer camp program for children. The designated areas for improvement will be established within the future summer Champ Camp programs. Overall, this reinforces the flexibility and value of the PRECEDE-PROCEED Model in program development and evaluation. Future research may analyze the efficacy of the proposed changes.

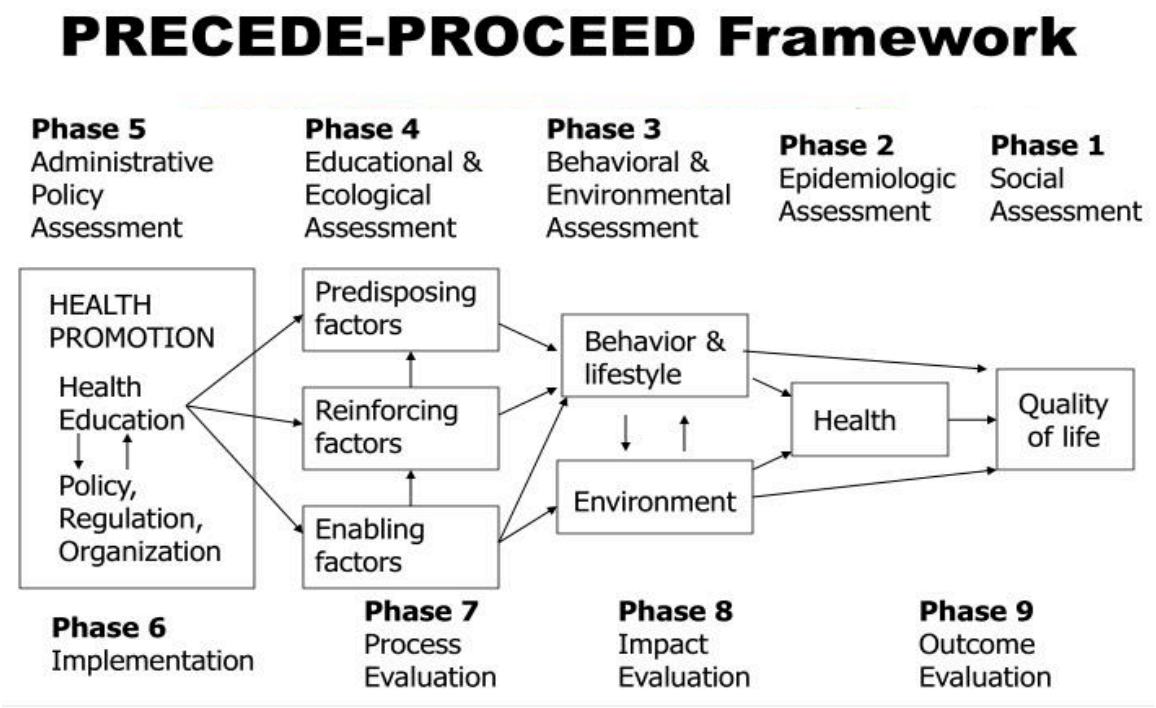

Figure 1: The PRECEDE-PROCEED Model Framework [60]

Nutrition Assessment Questions
Q1: What is being healthy to you?
Q2: Define nutrition.
Q3: What are the five food groups?
Q4: List 3 healthy protein foods.
Q5: What is a whole grain?
Q6: List 3 green vegetables.
Q7: Write three fruits.
Q8: Name one dairy containing food.
*Q9: What was your favorite part about Champ Camp?

Figure 2: The nutrition assessment tool used in the Champ Camp.
*Question 9 was not considered in the scoring process of the assessments.

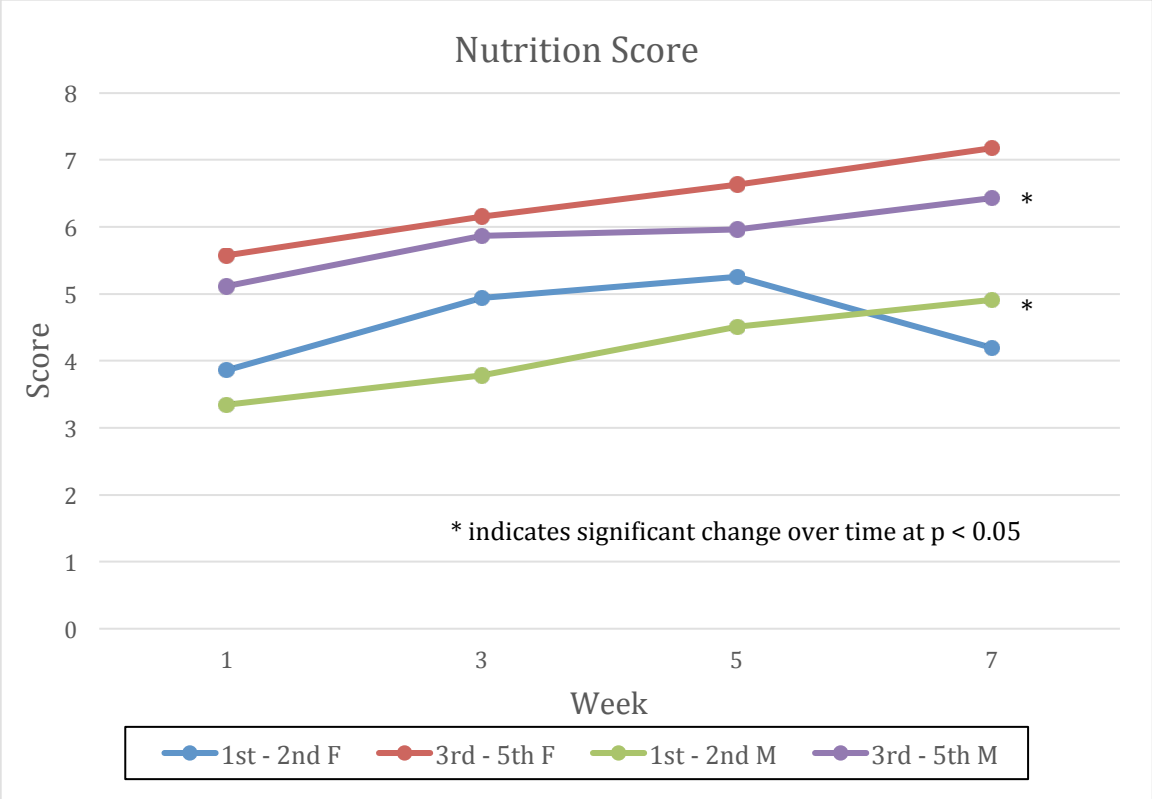

Figure 3: Nutrition Assessment scores across seven-week youth fitness and nutrition program for 1st-2nd grade Males and Females and 3rd-5th grade Males and Females.
Week 1 n=76
Week 3 n=78
Week 5 n=76
Week 7 n=87

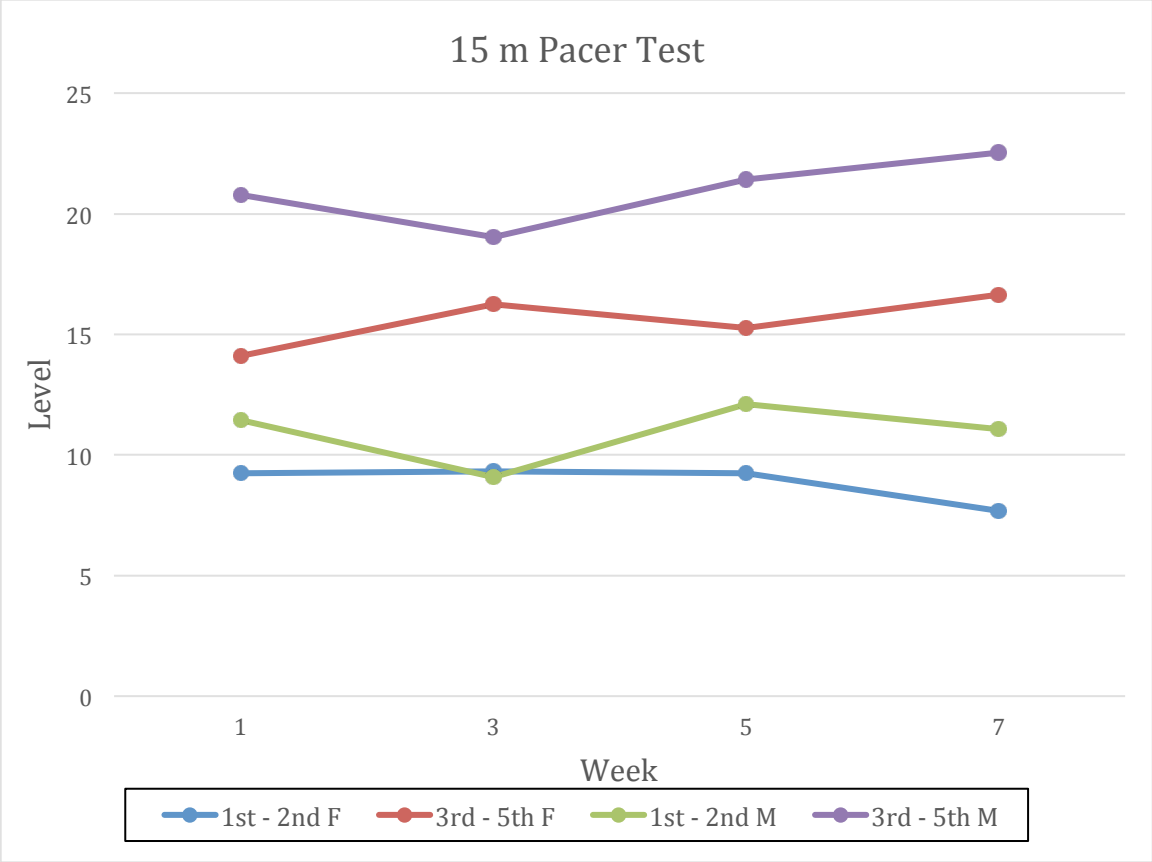

Figure 4: Fitness Assessment, 15-meter Pacer test scores across seven-week youth fitness and nutrition program 1st-2nd grade Males and Females and 3rd-5th grade Males and Females.
Week 1 n=73
Week 3 n=75
Week 5 n=58
Week 7 n=73
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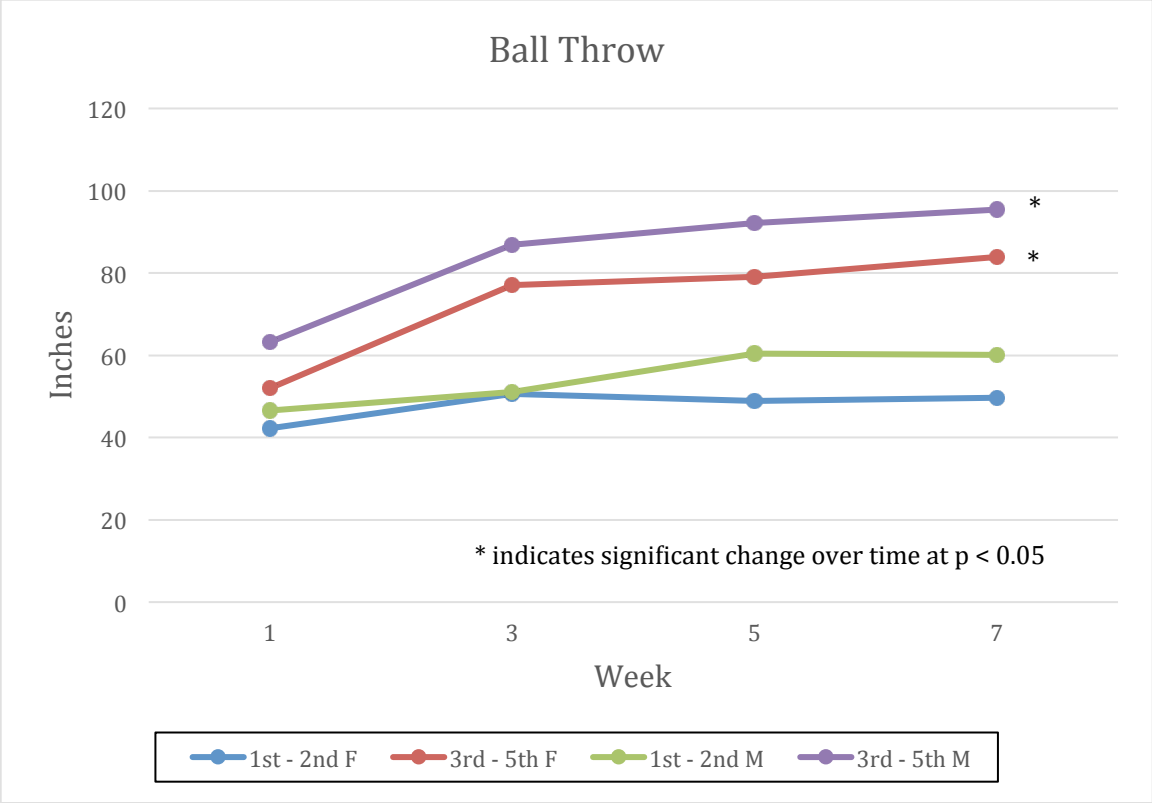

Figure 5: Fitness Assessment, Ball-throw test scores across seven-week youth fitness and nutrition program 1st-2nd grade Males and Females and 3rd-5th grade Males and Females.
Week 1 n=75
Week 3 n=73
Week 5 n=62
Week 7 n=76

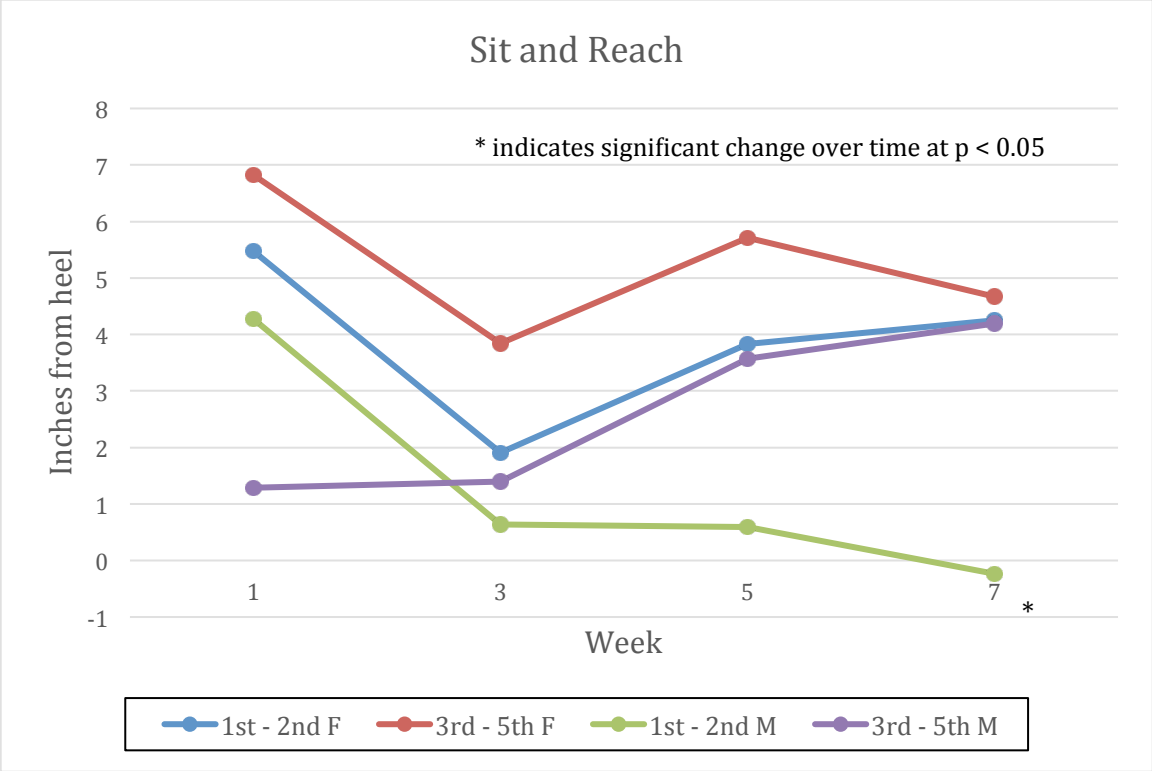

Figure 6: Fitness Assessment, Sit-and-reach test scores across seven-week youth fitness and nutrition program 1st-2nd grade Males and Females and 3rd-5th grade Males and Females.
Week 1 n=74
Week 3 n=75
Week 5 n=63
Week 7 n=76

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