DEVELOPMENT OF A MULTI-DISCIPLINARY ECOLOGICAL MODEL FOR CHILDHOOD OBESITY

by

David Walter Hey
Master of Science in Education
B.S., University of Wisconsin at La Crosse, 1987
M.S., University of Wisconsin at La Crosse, 1993

A Dissertation
Submitted in Partial Fulfillment of the Requirements for the Doctor of Philosophy Degree

Department of Health Education and Recreation in the Graduate School
Southern Illinois University Carbondale

August, 2004
I hereby recommend that the dissertation prepared under my supervision by
David W. Hey

Entitled
Development of a Multi-Disciplinary Ecological Model
for Childhood Obesity

be accepted in partial fulfillment of the requirements for the

DOCTOR OF PHILOSOPHY degree

Recommendation concurred in

Committee
for the
Final Examination
AN ABSTRACT OF THE DISSERTATION OF

David W. Hey, for the Doctor of Philosophy degree in Health Education, presented on July 15, 2004, at Southern Illinois University Carbondale.

TITLE: Development of a multi-disciplinary ecological model for childhood obesity

MAJOR PROFESSOR: Roberta J. Ogletree, HSD, CHES

Date of Defense: Thursday, July 15, 2004

During the past two decades the prevalence of childhood obesity has steadily increased in the United States. An ecological model of health behavior change has been recommended to address the rise in childhood obesity. The purpose of this study was to build a comprehensive, multi-disciplinary, ecological childhood obesity model by examining past theory and research in 25 journals covering five disciplines over a decade (1993-2002).

To identify environmental antecedents, this study collapsed 10 existing ecological models of obesity prevention and divided resultant antecedents \( (n=94) \) into five ecological categories (social norms/national policies, community factors, school factors, family/peer or interpersonal factors, and individual or intrapersonal factors). A proposed ecological framework was then devised, defined, and constructed. Codebook reliability tests were conducted resulting in intra-rater reliability of 91.4\% and inter-rater reliability of 89.4\%. Utilizing a grounded emergent process of content analysis, 874 studies were identified in twenty-five journals across five disciplines and coded for ecological antecedents. Five hundred forty five articles (62.4\%) of the sample were identified as empirical articles and three hundred twenty nine theoretical articles (37.6\%). Social norms/national policies had the largest contribution to the model with 345 antecedents.
(39.5% of the sample); followed by individual/intrapersonal antecedents ($n = 314$; 35.9%); family/interpersonal antecedents ($n = 291$; 33.3%); community ($n = 140$; 16.0%) and school antecedents ($n = 122$; 14.0%). Ecological antecedents with the greatest contribution to the model were: (1) social norm/national policy “cultural inactivity/eating poorly” $148$ (16.9%), followed by; (2) individual domain “low levels of physical activity – television viewing” $137$ (15.7%); (3) individual domain “genetic predisposition towards obesity” $110$ (12.6%); (4) family domain “family social economic status” $95$ (10.9%); and (5) social norm domain “modern technology – labor saving devices” $80$ (9.2%).

Study findings suggest key beliefs about critical environmental antecedents are being placed on environmental factors (external to child) providing increased opportunities for overeating and sedentary lifestyle. Results suggest: 1) there is a lack of research addressing childhood obesity in an ecological framework; 2) there is a lack of obesity research addressing community and school antecedents collectively; and 3) published articles on childhood obesity have steadily increased over the past decade, however it is still uncertain if stakeholders will support the proposed ecological initiatives that have been identified as critical to reverse obesity prevalence.
ACKNOWLEDGEMENTS

I would like to sincerely thank Dr. Bobbie Ogletree for her unwavering support during my tenure at SIU. Somehow, I know I probably gave her unanticipated fits, but in the end it was her commitment to me that I so richly want to thank her for. Her smile and her famous quote, “I’m in good shape for the shape I’m in,” provided the comedic moments that at times were timely and so desperately needed. I truly appreciate her continued friendship and couldn’t have completed a project on this scale without her.

Secondly, I would like to extend my deepest appreciation to all committee members: Dr. Joyce Fetro, Dr. Mark Kittleson, Dr. Kelly McKerrow, and Dr. Sara Long for long hours of continued dedication to this research endeavor. May they all live long and productive lives past this shared milestone. All have truly been outstanding mentors and friends, and took ample amounts of time to encourage rigor and quality.

Carbondale natives, Rick and Colleen Ozment introduced me to Carbondale some six years back, and in essence, I became to realize that they both embody living examples of how one should live life ~with zest and love for one another. The Ozments deserve rich credit for pushing me through the challenge of balancing personal life and research with true commitment. Both have become surrogate parents for me down this long path.

A person who largely inspired me to master kindness, gentleness, and determination isn’t here to celebrate in life’s rich pageant, nor has for several years, but Mom, what can I say? If it wasn’t for you, this never would have become a reality.

Finally, Dad, I love you for living life by example and initiating a demanding respect for education. We can finally say,… “We did it Guy.”
TABLE OF CONTENTS

ABSTRACT .............................................................................................................. I

ACKNOWLEDGEMENTS ................................................................................. iii

LIST OF TABLES .......................................................................................... xii

LIST OF FIGURES .......................................................................................... xiii

CHAPTER I. INTRODUCTION ........................................................................ 1

Background of Problem ................................................................. 1

Childhood Obesity: A Complex, Multi-factorial Problem .................. 5

Collaboration between the Health-Related Disciplines Required .......... 6

Need for the Study and Matching Theory with Problem .................... 7

Building a Multi-Disciplinary Ecological Model ................................... 9

Purpose of the Study ........................................................................... 11

Significance of the Study .................................................................. 13

Research Questions ........................................................................ 16

Research Design ................................................................................ 18

Study Sample ..................................................................................... 19

Assumptions ..................................................................................... 19

Limitations ......................................................................................... 20

Delimitations ..................................................................................... 22

Definition of Terms ........................................................................ 23

Summary ......................................................................................... 29

CHAPTER II. REVIEW OF LITERATURE ..................................................... 32

Introduction ...................................................................................... 32

iv
H. An Ecological Perspective: Risk Factors Associated with Childhood

Childhood Obesity ................................................................. 320-321

I. A Flowchart for the Typical Process of Content Analysis Research .............. 322-323

J. Ten Ecological Models or Frameworks Used to Develop Codebook .......... 324-334

K. Journal Article Selection Scheme on Sample (n=25) ............................. 335-336

L. Data Collection Sheets A and B .................................................. 337-340

M. Baseline Codebook and Operational Definitions for Content Analysis ...... 341-345

N. Revised Codebook for Content Analysis ........................................ 346-349

O. Intra-Intercoder Reliability Tests ............................................... 350-354

P. Permission to Re-Print Models ............................................... 355-362

VITA ...................................................................................... 363-364
LIST OF TABLES

Table 1: Percent of Overweight Children and Adolescents, by Sex and Race/Ethnicity .......................................................... 53

Table 2: Journal Sample by Citation Index Factor Rankings ......................... 143

Table 3: Intra-Coder Reliability Agreement of Two Tests in Percent (n=87) ....... 170

Table 4: Inter-Coder Reliability Agreement of Coder A and B in Percent (n=87) ......... 174

Table 5: Profile of Journals and Issues in Sample .................................................. 183

Table 6: Childhood Obesity Articles Published in Twenty-Five Health-Related Journals, 1993-2002 .............................................................................. 185

Table 7: Frequency and Percentage of Articles on Obesity by Year in all Journals Sampled (n=25), 1993-2002 .............................................................................. 186

Table 8: Article Focus .................................................................................................. 187

Table 9: Frequency and Percentage of Environmental Antecedents by Ecological Domain (N=874) .................................................................................. 188

Table 10: Journals in Sample ....................................................................................... 189

Table 11: Frequency and Percentage of National Policy/Social Norm Antecedents ......................................................................................... 193

Table 12: Frequency and Percentage of Community Antecedents ...................... 194

Table 13: Frequency and Percentage of School Antecedents .............................. 196

Table 14: Frequency and Percentage of Family/Interpersonal Antecedents .......... 198

Table 15: Frequency and Percentage of Individual/Intrapersonal Antecedents ........ 199

Table 16: Results: Most Frequent Ecological Antecedents presented in Sample (N=874) ......................................................................................... 202-205
LIST OF FIGURES

Figure 1: The Weight Management/Energy Scheme .................................................43
Figure 2: An Ecological Perspective: Levels of Influence......................................105
Figure 3: Research Questions and Statistical Information Used to Answer
Each Question ..............................................................................................138
Figure 4: Search Strategies for Ecological Models...............................................146
Figure 5: Estimated Effects of varied Environmental Antecedents on the Risk
Of becoming Obese as a Child.........................................................................152
Figure 6: Journal Article Sample: Methods for Inclusion....................................155
Figure 7: Example of Ecological Model...............................................................161
Figure 8: Content Analysis Coding Procedures .................................................177
Figure 9: Final Model ......................................................................................207
CHAPTER ONE

Introduction

Background of the Problem

Global changes in diet and activity patterns are fueling the obesity epidemic, as obesity is reaching pandemic proportions throughout the world (Deckelbaum & Williams, 2001; Popkin, 2001; Salbe & Ravussin, 2000; World Health Organization [WHO], 1998). As the availability of fast, inexpensive, energy-dense foods grow and physical activity declines, obesity rates across all ethnic and age groups in the United States are projected to climb (Flegal et al., 1998; Horgen & Brownell, 2002). Notably, in the United States, the speed of the epidemic spread is alarmingly more pronounced (Halawa, 2001; National Center for Health Statistics [NCHS], 2001), as experts estimate roughly nine million American children are currently overweight or obese (Loecher, 2002). In response to rising prevalence rates across all age groups and ethnic groups in the U.S., Grundy (1998) states “Obesity threatens to become the foremost cause of chronic disease in the world” (p. 563S).

It is estimated that 97 million Americans, or about 55% of the adult population, are seriously overweight (Riebel, 2001), and one in four children in the United States are overweight or obese (French, Story, & Jeffery, 2001; Halawa, 2001; Troiano & Flegal, 1998; Troiano, Flegal, Kuczmerski, Campbell, & Johnson, 1995). According to Halawa (2001), “childhood obesity is an underestimated serious public health problem affecting 25 percent of children 6 to 11 years and 39 percent in the 12 to 17-year old range” (p. 32). Survey research conducted in the U.S. indicates obesity prevalence rates for children have doubled from 1976 to 1994.
(Troiano & Flegal, 1998), and rate for obesity across all populations is expected to rise (Foreyt & Goodrick, 1995; Kumanyika, 2001; Troiano et al., 1995).

Increase in obesity prevalence over the past quarter of a century has raised concerns about associated health risks for children, adolescents, and adults (Freedman, Srinivasan, Valdez, Williamson, & Berenson, 1997; Sherwood, 2000; WHO, 1998). In response to the epidemic, National Heart, Lung, and Blood Institute Task Force on Research in Prevention of Cardiovascular Disease in 2001 called for additional research to facilitate reduction of the epidemic of obesity in American children and adults (National Institutes of Health [NIH], 2001).

Obesity in children has been associated with several important chronic diseases such as, diabetes mellitus type 2, asthma, sleep apnea, and gallbladder disease (Dietz, 1998; Must & Strauss, 1999). Several studies have documented that prevalence of diabetes mellitus is increasing among children, and obesity may be the contributor to the increase (American Diabetes Association [ADA], 2000; Pinhas-Hamiel et al., 1996; Rosenbloom, Joe, Young, & Winter, 1999; Rosenbloom, 2002). Notably, incidence of diabetes mellitus type 2 (i.e., normally thought of as an adult disease) has increased ten-fold in children in recent years, and this increase is most apparent among obese children (Fagot-Campagna et al., 2000; Pinhas-Hamiel et al., 1996).

Currently, experts warn that the prevalence of obesity in both children and adults in the United States, as well as in other Westernized countries, is rising rapidly (Bouchard & Blair, 1999; Bray, 1998; Kumanyika, 2001; Must & Strauss, 1999; Salbe & Ravussin, 2000; Smith, 1999; Story, 1999; Wadden, Brownell, & Foster, 2002). Current data suggest not only are there more obese children in the
U.S., but there are more severely obese children (Must & Strauss, 1999; Troiano et al., 1995). This disturbing secular trend has important implications for the likelihood of childhood obesity persisting into adult obesity (Kumanyika, 2001; Must & Strauss 1999; Nieto, Szklo, & Comstock, 1992). The noted persistence of childhood obesity that graduates into adult obesity has prompted one researcher to proclaim: it is "time for action, not complacency" (Styne, 1999, p. 758).

Furthermore, Sherwood (2000) notes, "persistence of this trend, particularly among youth, could lead to further increases in the number of people affected by obesity-related conditions and premature mortality" (p. 1).

Today, there are signs that the problem of obesity has already taken a large toll on the U.S. public health infrastructure (Sturm, 2002; Visscher & Seidell, 2001; Wolf & Colditz, 1998). Although estimated direct and indirect total health care costs for obesity vary considerably (NIH, 1993; Wolf & Colditz, 1994, 1998) annual health care costs in the United States stemming from overweight and obesity now approaches $100 billion (Finkelstein, Fiebelkorn & Wang, 2003); on top of this figure, Americans spend more than $30 billion on various weight-loss schemes and diet regimens annually (Food and Nutrition Board, 1995; Rosenbaum, Leibel & Hirsch, 1997). Obesity has been linked to strokes, type 2 diabetes mellitus, coronary heart disease, hypertension, gallbladder disease, postmenopausal breast cancer, endometrial cancer, colon cancer, infertility, and osteoarthritis (Aronne, 2001; Dietz, 1998b; Sherwood, 2000; Wolf & Colditz, 1998).

In addition to the health care costs of obesity, Battle and Brownell (1996) contend that instead of measuring traditional metrics of morbidity, mortality, and lost productivity, cost of obesity should include indirect costs of psychological and
social consequences of those who suffer from obesity and people around them.

Obesity in children may have serious social, psychological, and economic consequences (Keller & Stevens, 1996). Childhood obesity is associated with such psychosocial problems as higher levels of emotional distress, depression, anxiety, binge eating disorder, poor body image, lack of self-esteem, and other complications (Adami et al., 1998; Mills & Andrianopoulos, 1993; Must & Strauss, 1999; Sherwood, 2000; Smith, 1999; Strauss, 2000; Wadden et al., 2002). Furthermore, for individuals who are obese, the potential exists to be adversely impacted by social bias and discrimination (Berg, 2001; Bray, 1998; Puhl & Brownell, 2001; Sherwood, 2000). However, etiological considerations, prevalence rates, and magnitude of psychosocial sequelae directly linked to obesity are controversial (Strauss, 2000).

Despite warnings from the World Health Organization and United States Surgeon General, childhood obesity prevention continues to remain low on the public agenda of important issues facing policy makers and among health practitioners (AOA, 2000; Dietz, Bland, Gortmaker, Molloy, & Schmid, 2002; Hill & Peters, 1998; Hill & Trowbridge, 1998; MacD. Hunter et al., 1997; Mokdad, Serdula, Dietz, Bowman, Marks, & Koplan, 1999; Seidell, 2000; Smith, 1999; Wadden et al., 2002). Low prioritization, according to Kumanyika (2001), can be attributed to the notion that risk factors for obesity development are difficult to confirm because often times supporting evidence is circumstantial and lag time prevents a direct cause and effect relationship from being substantiated. In addition to the problem of identifying risk factors Horgen and Brownell state, "...almost no
research has been done on environmental causes of obesity or environmental means for its prevention. This is a glaring deficit in the funding picture.” (2002, p. 101).

*Childhood Obesity: A Complex, Multi-factorial Problem*

“The very nature of the complex problems of obesity and its complications requires collaboration of researchers from many different disciplines” (National Task Force on the Prevention and Treatment of Obesity [NTFPTO], 1994, p. 583). Childhood obesity which is determined partially by genetics and partially by environment (Schonfeld-Warden & Warden, 1997; Sherwood, 2000; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997) is best considered a chronic disease (Styne, 1999). Obesity in children, as with adults, is a complex, multi-factorial health condition with both genetic and environmental causes (Bouchard, 1991; Dietz & Gortmaker, 1984; Leibel, Behary, & Friedman, 1993; Rosenbaum & Leibel, 1998b; Sherwood, 2000). To say childhood obesity is multi-factorial presumes physiologic, biochemical, genetic, environmental, cultural, socioeconomic, and psychological participation (Halawa, 2001; NIH, 1993).

Although controversial, while recent research has emphasized the etiological role of genetic predisposition to obesity, experts point to the environment as having greater influence on the increase of obesity prevalence than genetics (Dietz, Bland, Gortmaker, Molloy, & Schmid, 2002; Horgen & Brownell, 2002; French, Story, & Jeffery, 2001; Goran, 1998). Proponents of the environment as having greater influence point to developing societies outside the U.S. as having substantial increases in obesity prevalence as they adopt and transition to westernized lifestyles (Ebbeling, Pawlak, & Ludwig, 2002; James, 1995; McLellan, 2002; Carlos Poston III & Foreyt, 1999; Wadden et al., 2002).
Collaboration Between the Health-Related Disciplines Required

Because childhood obesity is complex and multi-factorial, a variety of health-related professions (e.g., physician, registered dietitian, psychologist, exercise physiologist, health educator, etc.) are called upon collaboratively to halt the current childhood obesity epidemic (Goetz & Caron, 1999; MacD. Hunter et al., 1997; Smith, 1999). MacD. Hunter et al. (1997) suggested a multidisciplinary team of professionals (e.g., behavioral, nutritional, and exercise) should facilitate obesity prevention and treatment programs that would match patient with program. Having a variety of professions working towards prevention and treatment of childhood obesity has had its pitfalls. It has been theorized by researchers that each profession is attributing the cause of childhood obesity to its specific area of expertise (Goetz & Caron, 1999; Neumark-Sztainer, 1999). According to Goetz and Caron (1999), each discipline is unique in its background training, therefore philosophical differences as to the causes of childhood obesity are in conflict. Epidemiologist Diane Neumark-Sztainer (1999) at the University of Minnesota sums up the multidisciplinary collaboration dilemma best:

Health care professionals are generally aware of the complexity of obesity, its etiology, and the treatment process, in particular among children and adolescents. Nevertheless, one's philosophical perspectives surrounding weight-related issues and exposure to various viewpoints are bound to differ in accordance with one's training, sociocultural background, personal weight issues and professional experiences in research and clinical work. (p. S32)

Furthermore, differences of opinion between disciplines are not limited only to attributable cause of obesity; additionally, professionals across disciplines disagree
on three major points: (a) potential physical and psychosocial consequences, (b) primary antecedents leading to the onset of obesity, and, (c) goals of intervention programs aimed at preventing and/or the potential psychosocial consequences of the implemented obesity prevention program (Neumark-Sztainer, 1999). There is evidence that professional viewpoints on obesity issues are polarized between professionals working in the medical field versus those working in the nutrition field. (Neumark-Sztainer, 1999).

Need for the Study and Matching Theory with Problem

Because of the health implications of childhood obesity, health educators should be working toward the outcome goal of reduced obesity-related mortality and morbidity (Hawks & Richins, 1994). Health educators responsible for developing curricula to address weight control cannot effectively teach without adequate knowledge of environmental factors contributing to overeating and lack of exercise (e.g., increase of fast food portion sizes, passive overeating, or parents as sedentary role models). Likewise, public health officials cannot develop effective community obesity prevention programs without specific knowledge of factors that contribute to overeating and failure to engage in adequate activity to achieve and maintain an ideal weight (e.g., increase availability and affordability of foods low in fat and energy density, or provide incentives to become a physically active individual). Historically, the most effective strategies to address nutrition problems that have caused widespread disease have been policy-driven environmental changes (Booth et al., 2001; Dietz, Bland, Gortmaker, Molloy, & Schmid, 2002). A tremendous quantity of literature has been devoted to obtaining this knowledge over the past decade (Davison & Birch, 2001; Ernsberger & Koletsky, 1999; Wadden et al.,
2002), however, the pending obesity epidemic (e.g., Anderson, 2000; Berg, 2000; Bray, 1998; CDC, 1994; Dietz, 1998b; Dwyer, Stone, Yang, & Webber, 2000; Flegal, 1999; Foreyt & Goodrick, 1995; Fruhbeck, 2000; Gortmaker, Dietz, & Cheung, 1990; Halawa, 2001; Hill & Peters, 1998; James, 1995; Laurier, Guiguet, Chau, Wells, & Valleron, 1992; Mokdad et al., 1999; NCHS, 2001; Nestle & Jacobson, 2000) is germane to the argument that the U.S. has not effectively, nor conceptually approached primary prevention of childhood obesity (Davison & Birch, 2001; Nestle & Jacobson, 2000; Wadden et al., 2002). Effective public health policy designed to combat the childhood obesity epidemic is now urged (Dietz, Bland, Gortmaker, Molloy, & Schmid, 2002; Horgen & Brownell, 2002; Wadden et al., 2002).

The problem does not, however, appear to lie in the lack of childhood obesity research. In fact, empirical research addressing childhood obesity has increased significantly over the past decade demonstrated by an increase of journals specializing in obesity research accompanied by an increased interest in the medical field (Davison & Birch, 2001; Styne, 1999). Davison and Birch (2001) state:

Although this surge of interest has increased our understanding of predictors of childhood overweight, the resulting body of research is limited to a series of simple, or bivariate, relationships. Future research needs to move beyond bivariate relationships and develop a comprehensive model of factors implicated in the development of childhood overweight ... (p. 160-161).

Moreover, Booth et al., (2001) have suggested that historically the research base that identifies important environmental and policy variables has been very limited. According to Sallis et al., (2000) an important component of needed research is a
strong theoretical model to guide the selection of well-defined variables within a framework whereby domains or broad categories (e.g., individual, community, environment etc.,) can be better understood. Recognizing the current prevention dilemma, three states (viz., Iowa, Michigan, and California) have forged ahead with published guidelines for preventing childhood obesity when no previously published models were available (Berg, 2001; Campbell, Waters, O’Meara, & Summerbell, 2001). However, each of the three state initiatives stress weight acceptance, regardless of weight, and encourage healthy lifestyles instead of weight loss. Weight acceptance of an overweight child to protect the child from abuse and stigmatization although accepted is considered controversial and falls short of effective school health programming (Durlak, 1995; Hawks & Richins, 1994). As Kassirer and Angell (1998) state, "...few people would claim that becoming obese is consistent with optimal health" (p. 53). Contrary to proposed obesity prevention initiatives, a comprehensive school health program which aims to "motivate students to maintain and improve their health, prevent disease, and avoid or reduce health-related risk behaviors" (Lohrmann & Wooley, 1998, p. 45), would aim to reduce a child’s weight to an ideal level before claiming success. According to the Joint Committee on Health Education Terminology (1991), an ideal health education program should build the capacity of children, families, systems and communities to **attain**, **maintain**, and **sustain** health.

**Building a Multi-Disciplinary Ecological Model**

One way of conceptualizing interdependence among children, their health, and their environment is through ecological models (Glanz, Lewis, & Rimer, 1997; Sallis & Owen, 1996). The need and value of a comprehensive ecological model to
prevent childhood obesity with the purpose of identifying significant environmental risk factors has been substantiated in the literature (Berg, 2001; Davison & Birch, 2001; Neumark-Sztainer, 2000; Swinburn, Egger, & Raza, 1999). Consistent with the ecological perspective, models that integrate theory and concepts from across disciplines are theorized to generate more comprehensive explanations for behavior and may facilitate more successful interventions to change behavior (Grzywacz & Marks, 2001). Ecological models guide attention to how prevention research can be pursued at the individual, group or community level (Booth et al., 2001; Fisher, Walker, Bostrom, Fischhoff, Haire-Joshu, & Johnson, 2001). Such a model would move beyond intrapersonal factors such as acquisition of knowledge, attitudes, and skills that have been the traditional emphasis of health education programs (McLeroy, Bibeau, Steckler, & Glanz, 1988; Watts, Donahue, Eddy, & Wallace, 2001). The ecological perspective emphasizes multi-factorial causes of childhood obesity and recognizes a need to develop multi-level interventions to combat the epidemic (Neumark-Sztainer, 2000). While a number of ecological models appear to lend support to one another, a clear picture of environmental antecedents cannot emerge until all ecological obesity prevention models are viewed in total (viz., across disciplines concerned with prevention of obesity). By examining multi-disciplinary research, environmental antecedents found to significantly contribute to a prevention model could elucidate leverage points of prevention for childhood obesity. Neuendorf (2002) states:

When existing theory or research literature cannot give a complete picture of the message pool... the researcher may need to immerse himself or herself in
the world of the message pool and conduct a qualitative scrutiny of a representative subset of the content to be examined (p.102-103).

When designing or building a theoretical model through the emergence of categories and units of analysis, the researcher should try to achieve mutual exclusivity (i.e., there must be an appropriate category and code for each and every unit of analysis [viz., the environmental antecedents for childhood obesity]) (Neuendorf, 2002). Justification for adding additional variables (e.g., environmental antecedents related to childhood obesity) to the model or instrument are outlined by Neuendorf (2000):

> Although the content analyst should consult both the scholarly literature and commercial research and use theory as a guide whenever possible, he or she is, in fact, the boss, the final authority on what content needs to be examined and what variables ought to be tapped. (p. 95)

**Purpose of the Study**

The purpose of this study was to build a comprehensive, multi-disciplinary, ecological, childhood obesity model by examining past theory and research in 25 journals covering five disciplines over the course of a decade, 1993-2002. Content analysis was utilized as the research tool. Through the process of content analysis of leading scholarly journals, a grounded or emergent process of variable identification allows for an inductive process of building a theoretically based model. Kerlinger (1973) proposed content analysis as “a method of studying and analyzing communications in a systematic, objective, and quantitative manner to measure variables” (p. 255).

Developing an ecological model through content analysis involved three steps: 1) examining existing ecological models for similarities and differences; 2) developing
broad domains or categories (e.g., individual, family, school, community, or social norms/policies) thought to best represent an ecological perspective which would in effect, exhaust environmental antecedents and, 3) development of a codebook with operational definitions, whereby significant units of analysis (e.g., themes or elements of content) can be identified, classified, and coded to build an ecological model.

Content analysis consists of systematically documenting the presence of environmental antecedents related to childhood obesity in the literature. Neuendorf (2002) identifies this process as a “grounded or emergent process of variable identification” (p. 102). According to Grzywacz and Marks (2001), models that integrate theory and concepts across disciplines will have more explanatory power on behavior and behavior change. Smith (1999) identifies health educators, registered dietitians, exercise physiologists, psychologists, and physicians as professionals directly involved with preventing obesity. Identification of environmental antecedents related to childhood obesity in the scholarly literature can assist health educators in developing and designing more effective pediatric obesity prevention programs in the future.

The new ecological model draws on models, frameworks, and initiatives published in multi-disciplinary scholarly literature. Units of analysis for this study were themes, which were identified by developing and utilizing a theoretical codebook with operational definitions. Thematic text analysis according to Stone (1997) “does not differ fundamentally from analytic procedures in many sciences...the bottom line of whether any thematic analysis is worth doing is whether it delivers useful information” (p. 38-39).
Significance of the Study

Studies suggest prevention of childhood obesity holds the greatest promise to combat the epidemic (Halawa, 2001; Hill & Peters, 1998; Wadden et al., 2002), but there is a paucity of studies that address primary prevention of childhood obesity (Battle & Brownell, 1996; Grundy, 1998; Horgen & Brownell, 2002; Muller, Mast, Asbeck, Langnase, & Grund, 2001; Story et al., 1999; Wadden et al., 2002), and successful prevention models are currently lacking (Berg, 2001; Campbell, Waters, O’Meara, & Summerbell, 2001; Dietz & Gortmaker, 2001). Sallis et al., (2000) add that there are important gaps between what scientists know concerning determinants of behavior and effective interventions for children. Furthermore, researchers have predicted childhood obesity prevalence rates will continue to rise (Bouchard, 2000; Bray, 1998; Foreyt & Goodrick, 1995; Goran et al., 1999; James, 1995; Smith, 1999; Taitz & Wardley, 1989), especially if studies continue to ignore the environment as a significant contributor to the pending epidemic (Booth et al., 2001; Hill & Peters, 1999; Nestle & Jacobson, 2000; Sallis & Owen, 1997; Sherwood, 2000; Styne, 1999).

The need to identify environmental causes of childhood obesity from an ecological stance has been recommended by a handful of researchers (Flegal, 1999; Goran et al., 1999; Grundy et al., 1999; Hill & Melanson, 1999; Hochbaum, 1981; Schmitz & Jeffery, 2000). Specifically, several empirical studies and review articles (Davison & Birch, 2001; Egger, Swinburn, & Rossner, 2003; Flegal, 1999; Hochbaum, 1981; Horgen & Brownell, 2002; James, 1995; McLeroy et al., 1988; Nestle & Jacobson, 2000; Ritenbaugh et al., 1999; Schmitz & Jeffery, 2000) have suggested an ecological approach to preventing childhood obesity with the
epidemiological triad as the foundation (e.g., agent is the energy imbalance favoring positive energy storage, host or individual is the child predisposed to obesity including interpersonal and intrapersonal makeup, and environment is the child’s surroundings favoring excessive energy intake and/or inadequate energy expenditure). Childhood obesity is multiply determined; so all factors (e.g., agent, individual, and environment) contribute to etiology (Horgen & Brownell, 2002). According to Egger et al. (2003), education, behavior change, and multidisciplinary practices deal with the host; technology affects the agent of obesity (e.g., energy imbalance); and policy and social change are needed to cope with the environment.

Researchers Hill and Melanson (1999) state that even though genetic and environmental contributions to obesity are not completely understood, environment may explain 75% of body fatness among people who are gaining weight. However, in a more recent article, Hill et al. (2000) state that because it is difficult to accurately estimate the contribution of genetics, the environment may contribute from 30% to 75% of a person’s body fat.

While researchers recognize a person-centered approach to disease prevention may yield marginal improvements in health, they suggest prevention strategies that focus solely on individual behavior change (e.g., altering diet and increasing exercise) should remain secondary to environmental approaches, including changes in the physical and social environment (McLeroy et al., 1988; Nestle & Jacobson, 2000). From a theoretical perspective, Davison and Birch (2001) note:

Because childhood overweight is a multi-factorial problem, additional research is needed to develop and test theoretic models describing how a
wide range of environmental factors and behavioral intermediaries can work in concert with genetic predispositions to promote the development of childhood overweight. The crucial test of these theoretic models will be in preventive interventions (p. 893).

Stressing and focusing on environmental factors, which contribute to obesity development in children, represents a shift in thinking from the individual to targeting risk factors beyond the individual (Horgen & Brownell, 2002; Booth et al., 2001; Durlak, 1995). Environmental risk factors or antecedents have been chosen because researchers have deemed programs to be more successful if the environment is targeted in all domains (Booth et al., 2001; Durlak, 1995; Goetz & Caron, 1999; Hill & Melanson, 1999; Kumanyika, 2001; Ritenbaugh et al., 1999). For example, environmental risk factors in the individual, peer group, school, family, and community are all associated with obesity development in children (Davison & Birch, 2001; Dietz & Gortmaker, 2001; Neumark-Sztainer, 2000).

Identifying the presence of significant environmental antecedents theorized to cause childhood obesity utilizing an ecological approach across selected disciplines is crucial for three reasons: (a) each discipline identifies its professional turf, claiming exclusive expertise on causes of obesity which is usually in their specialty area (Goetz & Caron, 1999); (b) in order to transcend the gap between research and health practice, an ecological framework across many disciplines has been recommended to guide healthy behavior (Grzywacz & Fuqua, 2000); and (c) research historically has focused too narrowly on changing behavior through changes in interpersonal factors such as knowledge, attitudes, and skills (Durlak, 1995; Horgen & Brownell, 2002; Sallis & Owen, 1997). Also apparent was lack of
focus on our environment as a potential cause for current childhood obesity
epidemic (Flegal, 1999; Grundy et al., 1999; Hill & Melanson, 1999; Nestle &
Jacobson, 2000).

By identifying and analyzing environmental antecedents thought to
contribute to childhood obesity across disciplines (identified by Smith, 1999),
comparisons may provide insights into conceptual differences each discipline holds
as significant in preventing obesity in youth. Stokols (1992) argued, “... health
promotion interventions must address the environmental resources that may
facilitate or hinder the targeted health behavior changes” (p. 410). An important first
step in combating the obesity epidemic in children is to identify potential strategies
and interventions that target specific environmental influences on eating and
physical activity (French, Story, & Jeffery, 2001). Henceforth, development of a
multi-disciplinary, comprehensive, ecological model will aid in understanding of
our current environment and will act as a practical tool for prioritizing
environmental antecedents for future research and intervention. Health educators
can benefit by targeting ubiquitous environmental factors theorized to contribute to
childhood obesity above and beyond the child. Lastly, the value of a multi-
disciplinary ecological model, rather than championing individual or implementing
isolated approaches, is that key players such as legislators, health professionals,
governments and industry can see their roles in attenuating and reversing the
childhood obesity epidemic.

Research Questions

The methods of this study were structured with the intent of addressing the
following research questions:
Question 1. What environmental antecedents related to childhood obesity (ages 3 to 14), if any, are presented in multi-disciplinary health-related journals from 1993-2002?

Rationale for RQ1: Environmental antecedents identified in the literature will emerge and will be utilized to build a new model. Due to the immediacy of this health crisis, a variety of researchers across disciplines have recommended viewing childhood obesity prevention from an ecological perspective. It is important to recognize all environmental antecedents related to childhood obesity in both theoretical and empirical studies. For example, in theoretical articles factor significance is rarely fully reported, therefore all environmental antecedents in theoretical articles need be considered part of the final model.

Question 2. To what extent (frequency) are environmental antecedents of childhood obesity covered in selected journals from 1993-2002?

Rationale for RQ2: Environmental antecedents that appear more frequently in sampled literature will have greater explanatory power, or accrued validity and will be depicted with greater weight to form a new ecological model. The formation of a new multi-disciplinary ecological model will depict, identify or highlight certain antecedents to improve upon existing models. Conversely, failure to address environmental antecedent(s) in an intervention program may highlight a lost opportunity for successful prevention. Specifically, studies highlight that obesity prevention programs are deemed more successful if a strategy for addressing environment is present.

Question 3. What are major trends and differences of frequencies of environmental antecedents to childhood obesity as presented in theoretical articles
and/or empirical articles among the five disciplines in selected journals from 1993-2002?

Rationale for RQ3: Environmental antecedents that have greater weight (viz., that significantly appear more frequently across the scholarly literature) may have greater acceptance and validity across each health-related discipline concerned with obesity prevention. Greater acceptance among the disciplines is important, to ameliorate the conceptual differences each discipline holds. Environmental antecedents related to childhood obesity present in the literature, but not identified contextually as significant, can be further identified as: a) antecedents with fairly consistent support in the multi-disciplinary literature, b) antecedents thought to be related to the model for theoretical reasons or c) antecedents with some justification in the multi-disciplinary literature.

Research Design

This research design was a non-experimental descriptive approach utilizing the research technique of content analysis to develop a multi-disciplinary ecological model. When existing theory or content within research literature cannot give a complete picture of the content pool, a researcher can utilize a grounded or emergent process of variable identification to conduct a qualitative inquiry (Neuendorf, 2002). The unit of analysis, (e.g., environmental antecedent) coded for in this study was a theme or assertion. Holsti (1969) identified the textual theme one of the most useful to make detailed and sophisticated comparisons.

The descriptive portion of the study consisted of conducting simple statistical procedures, such as tabulating frequencies and percentages of environmental antecedents present in each of the 25 journals from 1993 to 2002. Results of
identifying and tabulating environmental antecedents as presented in the sample provided the basis for a new model. If environmental antecedents within existing models are valid, those factors should emerge from content analysis of the theoretical and empirical literature.

**Study Sample**

A non-probability purposive sampling design was utilized for the content analysis. Multi-disciplinary health-related journals selected in the sample are representative of disciplines involved in prevention of childhood obesity. Professions directly involved in prevention of obesity include: health educators, registered dietitians, exercise physiologists, psychologists, and physicians (Smith, 1999). Purposive sampling has its power in its ability to allow the researcher to select cases for study that are rich in information from which one can learn most about issues central to the purpose and needs of the investigator (Patton, 1990).

**Assumptions**

For the purpose of this study, the following assumptions were made:

1. Multi-disciplinary health-related journals examined in this study are representative journals commonly utilized by practitioners and academicians.

2. Adequate sources of theoretical and empirical data on childhood obesity exist and are accessible.

3. The existing databases (i.e., ERIC (First Search), PsychINFO, EBSCO, CINAHL, HealthINFO (First Search), MEDLINE (First Search), and SPORTDiscus) are valid and reliable to identify existing childhood obesity ecological models.

4. A sufficient amount of empirical and theoretical research exists in the described population to conduct a content analysis.
5. Relevant variables (environmental antecedents related to childhood obesity) could be identified and coded using existing theoretical ecological models as a guide.

6. The relationship between childhood obesity antecedent variables in the ecological model are causal and interdependent.

7. Environmental antecedents related to childhood obesity present in the literature, but not identified specifically will be captured.

**Limitations**

Factors beyond the researcher’s control that were considered when interpreting results of this study included:

1. Published studies in the sample may not be representative of all childhood obesity related studies published in non-sampled journals.

2. As publication is quite competitive, results of all programs and research relevant to childhood obesity may not have been submitted or published.

3. Changes in content and frequency of articles of a few journals in the field may reflect changes in editorial leadership, and/or editorial policies rather than broad-based shifts in interests within the field itself.

4. Only those journal articles with a keyword: “obesity” will be included in the content analysis portion of this study. Journal articles were retained if the keyword “obesity” was present in at least one of the following: a) keyword section, b) abstract, or d) title of the article.
5. All theorized, relevant, and causal environmental antecedents related to childhood obesity may or may not be identified in available studies.

6. Mutual exclusivity and primary focus requirements of content analysis procedure may be responsible for apparent lack of coverage of certain categories and subcategories (e.g., identified units of analysis may need to collapse into other subcategories to fit the definition of mutual exclusivity). It is the work of the investigator to narrow down the messages according to his/her substantive interest (North, Holsti, Zaninovich & Zinnes, 1963).

7. Personal bias of the researcher may have influenced results pertaining to identification of frequencies of environmental antecedents contained in the sample. “Making valid inferences from information,… may require…other talents beyond measuring” (Stone, 1997, p. 38). Researcher bias, however, was minimized by intra- and inter-coder reliability tests, and expert review of a codebook of operational definitions.

8. Journals with published studies of different sample sizes and research designs will be considered equal in weight (e.g., \( n = 30 \) and \( n = 5000 \) are considered equal in weight).

**Delimitations**

Aspects of this study that the researcher controlled were the following:

1. The study population was comprised of 25 selected multi-disciplinary health-related journals published in five disciplines (e.g., medicine, nutrition, health education, psychology, and sport sciences) covering a decade, 1993 to 2002.

2. Twenty-five journals with a high impact factor ranking relevant to childhood obesity were selected for the sample. Development of a multi-disciplined ecological childhood obesity model will begin with a key word search for all
theoretical multi-disciplinary ecological models published from 1993 to the present. Environmental antecedents present in existing models will be utilized as examples to construct a coding sheet of operational definitions. The coding sheet of operational definitions was used as a guide to build a new multi-disciplinary ecological model.

3. Emergent factors identified through content analysis of the literature was added to build an ecological model as the study progressed. This study examined units of analysis in the form of a theme or an assertion. All units of analysis present in applied/theoretical articles were added to the model. Mentioned antecedents and/or significant (>0.05) units of analysis (i.e., environmental antecedents) in data-based/empirical articles were added to the model. Environmental antecedents identified as part of a data based/empirical study with a reported significance of (<0.05) were not included in the final model. Furthermore, when environmental antecedents were mentioned in either an applied article/theoretical or data-based/empirical but level of significance was not given, the antecedents were added to the new model.

In the interest of building an emergent, grounded, theoretical, multi-disciplinary, ecological model, environmental antecedents appearing in the sample from studies (e.g., applied article/theoretical or data-based/empirical), as research published prior to 1993 (e.g., outside of the primary sample), were included in the model, indicated as such, and coded for.

4. Environmental antecedents appearing as part of the introduction or background section of an article coded as a data-based/empirical article were included in the content analysis process.
5. Environmental antecedents present or identified as significant, from the same source study, appearing in two or more data-based or empirical articles were counted once if a certain condition applies (e.g., two or more articles identify significant data from a source study, as in the case of a meta-analysis study, the variable would be coded for but counted once in terms of frequency).

6. In the case where a conceptual ecological model appears in the sample of journal articles, all factors identified in the model were coded for and added to the new model.

7. Content analysis was conducted using 25 journals written in the English language.

8. This study examined health-related journals from multiple disciplines only, and not other resources or supplementary material.

Definition of Terms

Applied Articles/Theoretical Articles: An idea or set of ideas that is intended to explain something; concerned with theory of a subject rather than its practical application (Oxford Dictionary of Current English, 2001, p. 947). Journal articles defined as applied/theoretical include: a viewpoint, a commentary, an editorial, a general article, a recommendation, a guideline, a teaching technique, and/or a teaching application. See Appendix A for article focus definitions.

Body Mass Index: Commonly referred as BMI or the Quetelet Index; Calculation is weight in kilograms. Body Mass Index is the standard formula to assess a person’s body weight relative to height. It is a useful, indirect measure of body composition because it correlates with body fat in most people, with the exception of outliers such as professional athletes. In calculating the BMI, weight in
kilograms is divided by height in meters squared (kg/m²) (Dietz, 1998). BMI can also be calculated with the following formula, which uses weight in pounds and height in inches: weight (in pounds) divided by the square of the height (in inches) multiplied by 704.5 (Smith, 1999, p. 21).

Childhood: This age group was operationally defined from ages 3 to age 14 (Whitaker, Wright, Pepe, Seidell, & Dietz, 1997).

Coding: The process of transforming raw data—either manifest or latent content—into standardized, quantitative form (Babbie, 1995, p. 335).

Content Analysis: A social research method appropriate for studying human communications. Besides being used to study communication processes, it may be used to study other aspects of social behavior (Babbie, 1995, p. 335). Content analysis is a research technique for making replicable and valid inferences from data to their context (Krippendorff, 1980, p. 21). Content analysis is essentially a coding operation. Communications—oral, written, or other—are coded or classified according to some conceptual framework (Babbie, 1995, p. 311).

Content Analysis—Analysis in terms of frequency counts: The units (i.e., words, phrases, or themes) are identified and placed in well-defined coding categories. A count is then made of the number of times units that fit the categories are found in the communication (Fraenkel & Wallen, 2000, p. 472). An example of a unit in the category of family domain would be the presence or availability of high fat/low nutrient food in the home.

Data-Based Article/Empirical Article: Based on observation or experience rather than theory or logic (Oxford Dictionary of Current English, 2001, p. 292). Journal articles defined as data-based/empirical include: intervention technique(s),
survey research, and/or knowledge, attitude and behavior research. See Appendix A for article focus definitions.

Ecological Models: Comprehensive health promotion models that are multifaceted, concerned with environmental change, behavior, and policy that help individuals make healthy choices in their lives (Glanz, Lewis, & Rimer, 1997). The defining feature of an ecological model is that behaviors are influenced by intrapersonal, social, cultural, and physical environment variables (Booth et al., 2001; Sallis & Owen, 1997). Levels of influence: individual, interpersonal, organizational, community, and public policy (Sallis & Owen, 1997). Since ecological models target both individual and environment, program effectiveness is thought to be a more sound approach to behavior change (Booth et al., 2001; Glanz, Lewis, & Rimer, 1997).


Energy Balance: The principle that states that the amount of energy consumed in the diet must equal the amount expended by the body for weight to remain constant (Salbe & Ravussin, 2000, p. 69).

Environmental Antecedents: Theoretical factors or units that represent multiple levels of environmental influence on behavior (McLeroy et al., 1988). An antecedent is a precursor influenced by the environment resulting in a behavior (Kirby, 2001). For this study, two negative health outcomes, which can be modified, are of interest (i.e., lack of physical activity and non-nutritious food choice in children). The environmental antecedents are the units of analysis (viz., themes) for this study. Units of analysis will be coded into broad categories or domains (i.e.,
social norms/national policies, community, school, interpersonal and intrapersonal antecedents to childhood obesity).

Environments: space outside the individual (Sallis & Owen, 1997). Environments directly influence behavior (Lewin, 1951). Environments can be natural (e.g., weather, geography, or climate) or constructed (e.g., homes, worksites, or local communities) (Glanz, Lewis, & Rimer, 1997). Environments are the result of the constant interaction between natural and constructed spatial forms, social processes, and the relationships between individuals and groups (Lindheim & Syme, 1983).

Frequency: The number of times that a symbol, idea, or subject matter occurs in a stream of messages (e.g., across media) tends to be interpreted as a measure of importance, attention, or emphasis (Krippendorff, 1980, p. 40).

Health education-related literature: For this study, the published health education-related literature ($n = 25$) is operationally defined as the following publications within the subject category listing referenced by the Journal Citation Reports: Science Edition (1999), (ISI, 1999).

**(Medicine) Subject Category: Medicine, General, Internal and Pediatrics**


2. *Journal of the American Medical Association*

3. *The Lancet*

*4. *The Journal of Pediatrics*

*5. *Archives of Pediatrics and Adolescent Medicine*

**(Nutrition) Subject Category: Nutrition and Dietetics**

1. *American Journal of Clinical Nutrition*
2. *Obesity Research*

3. *Critical Reviews in Food Science and Nutrition*

*4. *International Journal of Obesity*

*5. *Nutrition Reviews*

**Psychology** Subject Category: Psychology and Clinical Psychology

1. *Psychological Bulletin*

2. *Psychological Review*

3. *Journal of Clinical Psychiatry*

4. *Journal of Consulting and Clinical Psychology*

5. *Psychological Medicine*

**Health** Subject Category: Health Education (including) Public, Environmental, and Occupational Health

1. *American Journal of Epidemiology*

2. *American Journal of Public Health*

*3. *Health Education Quarterly/Health Education and Behavior*

*4. *Journal of School Health*

*5. *American Journal of Health Behavior*

**Sport Sciences** Subject Category: Sport Sciences

1. *American Journal of Sports Medicine*

2. *Medicine and Science in Sports and Exercise*

3. *Journal of Applied Physiology*

4. *Journal of Sport and Exercise Psychology*

*5. *Journal of Physical Education, Recreation, and Dance*: (Not listed)
See Appendix B for subject categorization and journal impact rankings (ISI, 1999). (Note: asterisk (*): indicates journals selected as relevant to childhood obesity theme and not necessarily ranked in top five journals by ranking).

Ideal/Optimal Weight: The most favorable weight as determined by such factors as existing health problems, percentage and location of body fat, age, sex, heredity, psychological implications, and realistic weight maintenance goals (Brownell & Steen, 1987).

Impact Factor Ranking: The average number of times recent articles in a specific journal were cited in the Journal Citation Reports cover year. Recent articles are those published in the two years preceding the Journal Citation Reports cover year (ISI, 2000).

Latent Content: Refers to the meanings contained within communications. The determination of latent content requires judgments on the part of the researcher (Babbie, 1995, p. 335).

Manifest Content: Refers to the directly visible, objectively identifiable characteristics of a communication, such as specific words in a book, the specific colors used in a painting, and so forth (Babbie, 1995, p. 335).

Obesity: An excess of adipose tissue or body fat and is usually defined as a body mass index (BMI) higher than 30 (Anderson, Hamilton, & Brinkman-Kaplan, 1991; National Institutes of Health/National Heart, Lung, and Blood Institute, 1998; WHO, 1998). The BMI distinction of (30 kg/m² and above) is highly justified in terms of both etiology of the conditions and the levels of risk for morbidities and mortality rates (Bouchard, 2000; Bray, 1998a). Death is attributable primarily to obesity’s association with cardiovascular disease and type 2 diabetes, as well as
several other cancers (Pi-Sunyer, 1993). Also defined as children with BMI between the 85th and 95th percentile on the U.S. Department of Health and Human Services Centers for Disease Control and Prevention pediatric growth charts (National Center for Chronic Disease Prevention and Health Promotion and Centers for Disease Control and Prevention, 2001). See boys’ and girls’ growth charts in Appendix C.

Overweight: When an individual exceeds his/her ideal weight listed by gender, height, and frame size in a table of standard values; defined as having a BMI of 25 kg/m² to 29.9 kg/m² (Bouchard, 2000). Also defined as children with BMI between the 85th and 95th percentile on the U.S. Department of Health and Human Services Centers for Disease Control and Prevention pediatric growth charts (National Center for Chronic Disease Prevention and Health Promotion and Centers for Disease Control and Prevention, 2001).

Units of Analysis: The units of analysis can be words, phrases or sentences, themes, paragraphs, stories, paintings, as well as logical structure of expression (Krippendorf, 1980; Weber, 1990). Refers to words, phrases, or themes in the scholarly literature that mutually exclusively delineate an environmental antecedent related to childhood obesity.

Summary

Factors affecting the development of childhood obesity are numerous and constitute a highly complex interplay between conceptual theories (Neumark-Sztainer, 1999). Genetic predisposition affects susceptibility to obesity while environmental factors can mediate the effects of genetics and ultimately influence the development of childhood obesity (Hill & Peters, 1998; Neumark-Sztainer, 1999; Schonfeld-Warden & Warden, 1997). A plethora of researchers have
proclaimed that our environment has been theorized to be a major cause of the childhood obesity epidemic (Battle & Brownell, 1996; Carlos Poston II & Foreyt, 1999; Hill & Peters, 1998; Hill et al., 2000; Schmitz & Jeffery, 2000).

Additionally, Hill and Peters (1998) noted, “In order to stop and ultimately reverse the obesity epidemic, we must ‘cure’ this environment” (p. 1371).

Paramount to any epidemic is the critical first step of recognizing all factors thought to contribute to the problem. Researchers are suggesting an ecological approach to combating the childhood obesity epidemic is urgently needed (Booth et al., 2001; Flegal, 1999; Hill & Melanson, 1999; Horgen & Brownell, 2002; Nestle & Jacobson, 2000; Neumark-Sztainer, 2000). Currently there is no one conclusive model to prevent childhood obesity (Berg, 2001), nor has any prevention model exhibited long-term success (Dietz & Gortmaker, 2001). Models that integrate theory and concepts across disciplines are thought to have more explanatory power describing behavior (Grzywacz & Marks, 2001).

It was the investigator's intent to examine the environmental antecedents theorized to contribute to childhood obesity that were most commonly presented and quantify factors as they emerge. This study examined 25 professional journals that were dominant, widely circulated and read in five respective disciplines, as defined from Journal Citation Reports (Institute for Scientific Information, 1999) from 1993 to 2002. The health education profession can benefit by better understanding the environmental factors thought to contribute to the epidemic of childhood obesity across all disciplines concerned with prevention. As Hill, Wyatt, and Melanson state, “although the environment in the United States was not developed to promote
obesity, it is critical to examine which factors in the environment promote obesity and why” (2000, p. 335).

The investigator posits that the development of a multi-disciplinary ecological model to prevent childhood obesity can ameliorate broad acceptance across disciplines. An ecological model with research backing can glean important strategies or leverage points for health policy-makers and allied health professionals (Booth et al., 2001; Stokols, 1992). Additionally, such a model could serve as an important taxonomy derived to promote investigation of the complex multi-factorial etiology of childhood obesity and facilitate development of effective intervention, prevention programs, and health policy to combat our current childhood obesity epidemic in the United States. Most importantly, health educators with improved understanding of the ecological perspective as it pertains to obesity, can facilitate and design more successful curricula to prevent obesity in children. Implications and findings will be presented and discussed in Chapter Five.
CHAPTER 2
REVIEW OF LITERATURE

Introduction

The literature review is divided into five sections: 1) broad background of the problem of obesity in the United States; 2) prevalence of obesity in the United States; 3) childhood obesity determinants: environment and heredity; 4) recent shift in prevention paradigm towards ecological approach; and 5) utilizing content analysis as a research method. A brief summary will conclude chapter two.

Purpose of Study

The purpose of this study is to build a comprehensive multi-disciplinary ecological childhood obesity prevention model by examining past theory and research in 25 journals in five disciplines over the course of a decade, 1993-2002. Content analysis will be utilized as the research tool. Kerlinger (1973) proposed content analysis as "a method of studying and analyzing communications in a systematic, objective, and quantitative manner to measure variables" (p. 255). Developing an ecological model through content analysis involves three steps: 1) examine existing ecological models for similarities and differences; 2) develop broad domains or categories (e.g., individual, family, school, community, or social norms/policies) thought to best represent an ecological perspective and exhaust environmental antecedents and, 3) develop a codebook with operational definitions, whereby significant units of analysis (e.g., themes or elements of content) can be classified and coded for to build a model. Content analysis will consist of systematically documenting the presence of environmental antecedents (e.g., significant and non-significant) in the literature. Neuendorf (2002) identifies this
process as a “grounded or emergent process of variable identification” (p. 102). According to Grzywacz and Marks (2001), models that integrate theory and concepts across disciplines will have more explanatory power on behavior and behavior change. Smith (1999) identifies health educators, registered dietitians, exercise physiologists, psychologists, and physicians as professions directly involved with preventing obesity. Identification of statistically significant environmental antecedents in the scholarly literature may assist health educators in developing and designing more effective pediatric obesity prevention programs in the future.

The new ecological model will draw on models, frameworks, and initiatives published in the multi-disciplined scholarly literature. The units of analysis for this study will be themes, which will be identified by utilizing a codebook. Thematic text analysis according to Stone (1997) “does not differ fundamentally from analytic procedures in many sciences...the bottom line of whether any thematic analysis is worth doing is whether it delivers useful information” (p. 38-39).

The need for a multi-disciplined model resulted from a recent shift in thinking from the treatment paradigm of the medical model to a prevention paradigm utilizing an ecological approach. (Battle & Brownell, 1996; Goetz & Caron, 1999; Hochbaum, 1981; Rosenbaum & Leibel, 1998b; Styne, 1999). Researchers posit that only from a prevention paradigm (e.g., a public health, epidemiological, or ecological approach) can the childhood obesity epidemic be halted (Battle & Brownell, 1996; Egger, Swinburn, & Rossner, 2003; Hochbaum, 1981; Rosenbaum & Leibel, 1998; Styne, 1999).
Obesity Defined

The term "obese," taken from the Latin term *obesus*, which literally means *excess fat* (Webster's New Ideal Dictionary, 1978, p. 363), is defined simply as "excessive body fat" (Smith, 1999, p. 18). Application of the term obesity, in a biological sense and as a disease, as opposed to labeling obesity as a condition, is highly complex and not without controversy (Allison & Saunders, 2000; Flegal, 1999; Heshka & Allison, 2001; Jeffcoate, 1996).

Researchers Heshka and Allison (2001) argued that obesity should be labeled as a condition and not a disease because characteristics of obesity do not "fit the common and recurring elements of definitions of diseases taken from a sample of authoritative English language dictionaries" (p. 1401). The problem of defining obesity as a disease rests with the use of the term "epidemic," according to several authors (Flegal, 1999; Heshka & Allison, 2001). Moreover, Flegal (1999) suggested that use of the term epidemic in the literature "suggests a disease model" (p. S511); however, authors point out that use of the term epidemic with childhood obesity may be a rhetorical device to move obesity to a higher public health priority without sound scientific basis (Flegal, 1999; Heshka & Allison, 2001). According to a Report of the World Health Organization: *Obesity: Preventing and managing a global epidemic* in 1997, the Consultation recognized obesity as a disease (WHO, 1998).

Notwithstanding disagreement in the review literature, the ideal method of defining obesity from a medical perspective would be to match a child's or young adult's weight with undesirable outcomes, such as heart attacks, experienced by the person later in life (Smith, 1999). Consequently, there is no generally accepted
definition of obesity for children and adolescents due to difficulties in standardizing height and weight tables because of changes in body habitus with normal development (Must & Strauss, 1999; Sherwood, 2000) and confounding influences of race (Rosner, Prineas, Loggie, & Daniels, 1998).

Additionally, Smith (1999) stated that caution must be taken in defining obesity in children. Data concerning children are difficult to validate due to variability in physical size and growth among children, especially when “many growing children . . . may have weights that fluctuate” (Smith, 1999, p. 21). Hence, defining obesity and overweight in children is complicated by normal processes of growth, pubertal development, and normal body composition changes. Historically, classifications for overweight and obesity for children have included weight-for-height percentiles, relative weight, percent of ideal body weight, skinfold measures, and BMI (Sherwood, 2000). BMI is currently the most accepted and widely used measure (Bray, 1998; Sherwood, 2000; Smith, 1999). Currently, the most widely used method for defining obesity in adults and children, particularly in population studies, is Quetelet or Body Mass Index (BMI = kg/m²). For example, in the case of a child who weighs 48 kilograms and is 122 centimeters tall, the BMI is 48 kilograms divided by 1.22 meters squared, or 32. In this example, the child would be classified as obese because the child’s BMI is greater than 30 kg/m² (WHO, 1998).

In his book, *Understanding Childhood Obesity*, Smith (1999) simplifies the definition for all age groups by standardizing percentile rankings for all individuals. A person is labeled as being overweight if BMI is equal to or greater than the 85th percentile for age and sex and the person is considered obese if BMI is equal or
exceeds the 95th percentile for age and sex (Smith, 1999). Historically, various researchers have used “different BMI cut-off points to define obesity” (Allison & Saunders, 2000, p. 305), and use of different cut-off points for defining obesity has made the definition convoluted and controversial (Parizkova & Hill, 2001).

Paramount to the confusion is the fact that it is difficult to link weight status to chronic disease outcomes in youth (Sherwood, 2000), and another major disadvantage of using BMI according to Smith (1999) is the complexity of explaining the index to parents and others.

Prentice (1998) argues that the adult fixed classification system is not appropriate for children, whereby normal growth and BMI shows a natural progression of profound body fat change from birth through early adulthood. In addition to validity of the measurements to chronic disease, Parizkova and Hills (2001) further warn that BMI tends to misclassify individuals at extreme ends of the height spectrum, with very short and very tall individuals often incorrectly categorized as obese. Furthermore, Parizkova and Hills (2001) recommend that “direct measurement of fat and lean body mass are preferable for the evaluation of obesity whenever possible” (p. 68).

Because BMI changes dramatically with age during childhood, BMI measures warrant assessment using age-specific, percentile-ranking reference curves. Gender-specific values were needed for children because of the differences in body composition and timing of puberty (Sherwood, 2000). In response to the need, the Institute of Medicine Committee to Develop Criteria for Evaluating the Outcomes of Approaches to Prevent and Treat Obesity, the National Institutes of Health Consensus Conference on Obesity, and the Committee on Clinical
Guidelines for Overweight in Adolescent Preventive Services in accordance with the CDC and the National Center for Health Statistics (NCHS) released growth charts that incorporated gender-and age-specific BMI percentiles based on the data from the National Health Examination Study (NHES) and National Health and Nutrition Examination Study (NHANES) (U.S. Department of Health and Human Services, 2000). The BMI growth charts were designed for children age 2 to age 20 and allow for practitioners and researchers to accurately and more quickly determine the risk of potential obesity in children (Parizkova & Hills, 2001; Payne & Hahn, 2002; Smith, 1999). Determination of obesity risk by utilization of the newly released BMI growth charts is considered paramount, if obesity prevention is to occur (Roberts & Dallal, 2001). See Appendix C for growth charts.

Sherwood (2000) notes that the terms obesity and overweight are often used interchangeably, but it should be stressed that overweight and obesity are not synonymous terms, insomuch that “overweight is in many ways very different from obesity” (Bouchard, 2000, p. 6). Bouchard stated that two major distinctions between overweight and obesity are that an obese individual is made up of more fat per total weight and he/she has likely been in a longer, sustained positive energy balance compared to an individual who is merely overweight. Sherwood (2000) cited “obesity refers to excess adipose tissue, while overweight refers to excess weight for height” (p. 1).

**BMI and Morbidity and Mortality in Adults**

Currently, obesity is considered the second leading lifestyle cause of death in U.S. adults behind tobacco use (Allison, Fontaine, Manson, Stevens, & VanItallie, 1999). Recent data suggest the estimated number of annual deaths in the U.S. due to adult
obesity approaches 325,000 (Allison et al.) although actual number of deaths attributed to obesity is debated (Kassirer & Angell, 1998). In a recent *Chicago Sun Times* newspaper article entitled “Americans Stuffing Selves to Early Graves: Obesity Gaining on Cigarettes as Top Killer,” George Will (2002) writes “although Americans spend $30 billion dollars a year on weight loss products or programs, obesity is, strictly speaking, epidemic” (p. 29).

Medical conditions common in obese individuals include: hypertension, type 2 diabetes, hyperlipidemia, and sleep apnea (Ernsberger & Koletsky, 1999). Above a BMI of 25 kg/m², morbidity for a number of health conditions increases as BMI increases (Allison & Saunders, 2000). Higher morbidity in association with overweight and obesity has been observed for hypertension (Havlik, Hubert, Fabsitz, & Feinleib, 1983), type 2 diabetes (Bray, 1996; Ford, Williamson, & Liu, 1997; Haffner et al., 1991; Pi-Sunyer, 1993), coronary heart disease (Willett et al., 1995), specific cancers (e.g., prostate, breast, colon, and endometrial) (Williams & Knight, 1995), depression (Friedman & Brownell, 1995; Smith, 1999), and stroke (Walker et al., 1996) in adults.

The link between obesity and type 2 diabetes is undeniable (Ernsberger & Koletsky, 1999). The often-cited statistic is that 80% of persons with type 2 diabetes are obese (Bray, 1996; Pi-Sunyer, 1993). Less often mentioned is the fact that the demographic group with the highest incidence of type 2 diabetes constitutes women in their 50s, and their overall prevalence of obesity is roughly 60% (Flegal, Carroll, Kuczmarski, & Johnson, 1998). However, studies do show that type 2 diabetes can be genetic in origin (Ernsberger & Koletsky, 1999). Barnett, Eff, Leslie, and Pyke (1981) contended that if one identical twin over the age of 50 has type 2 diabetes,
there is a 91% chance that the second twin will also develop it. Despite the direct link between genetics and diabetes manifestation when identical twins normally share their environment and diet while growing up (Ernsberger & Koletsky, 1999).

Paradoxically, as Bray (1998) points out, overall death rates in the U.S. have declined in the last decade. It has been posited by Bray (1998) that since the obesity epidemic is largely recent, the declining death rates reflect a reduction in the number of heart attacks, to which obesity makes a more modest contribution than does diabetes, hypertension, or gallbladder disease. It must be noted that no risk-based criteria have been established for children because it is difficult to longitudinally link youth weight status to chronic disease outcomes (Sherwood, 2000). However when young adults were examined, Brownell and Steen (1987) stated that the risk for diabetes, hypertension, lipid disorders and cardiovascular disease increased at $>20\%$ overweight.

Health-Related Conditions Associated with Obesity in Adults

An estimated 97 million adults in the United States are overweight or obese (Kuczmarski, Carrol, Flegal, & Troiano, 1997), a condition that substantially raises their:

1. Risk of morbidity from hypertension (Aronne, 2001; Stamler, Stamler, Riedlinger, Algera, & Roberts, 1978);
2. Type 2 diabetes (Aronne, 2001; Ford, Williamson, & Liu, 1997);
3. Coronary heart disease (CHD) (Hubert, Feinleib, McNamara, & Castelli, 1983; Haffner et al., 1991; Willett et al., 1995);
4. Stroke (Hubert et al., 1983; Rexrode, Hennekens, Willett, et al., 1997; Walker et al., 1996);
5. Gallbladder disease (Khare, Everhart, Mauer, & Hill, 1995; Stampfer,
6. Osteoarthritis (Carman, Sowers, Hawthorne, & Weisfeld, 1994; Cicuttini, Baker, & Spector, 1996; Hart & Spector, 1993);
7. Sleep apnea and respiratory problems (Loube, Loube, & Mitler, 1994);

and,


Comorbidities associated with obesity are similar in children as in the adult population (Deckelbaum & Williams, 2001). Deckelbaum and Williams reported that "elevated blood pressure, dyslipidemia, and type 2 diabetes," once considered adult manifestations, are now predominant in obese children. Consequently, in addition to the myriad of health conditions obese individuals experience, the resultant effect is that "... the obese tend to die at a younger age" (Williams & Knight, 1995, p. 92).

Health-Related Conditions Associated with Obesity in Children

Despite recognition of severe health and psychosocial damage done by childhood obesity, it remains low on the public agenda of important issues facing policy makers (AOA, 2000; Hill & Peters, 1998; Hill & Trowbridge, 1998; MacD Hunter et al., 1997; Mokdad et al., 1999; Seidell, 2000; Smith, 1999). Perhaps this is because the most serious health effects of obesity in today's children will not be seen for several decades (Hill & Trowbridge, 1998, p. 570). Another firmly held view, is that policymakers are placed into non-traditional roles, such as advocating behavior change as a preventive measure in light of rising levels of pediatric obesity (Fielding, Marks, Myers, Nolan, Rawson, & Toomey, 2002). Presence of obesity in childhood is associated with numerous medical problems related to physiological, metabolic, and structural changes (Dietz,
In addition, negative social and psychological implications have been associated with obesity and overweight (Brownell & Steen, 1987; Dietz, 1998b; Keller & Stevens, 1996; Strauss, 2000; Stunkard & Mendelson, 1967; Williams & Knight, 1995). A major concern about childhood obesity is that obese children tend to grow into obese adolescents and then into obese adults (Serdula et al., 1993; Guo, Roche, Chumlea, Gardner, & Siervogel, 1994; NIH, 1995; Power, Lake, & Cole, 1997; Whitaker et al., 1997), facing increased risk for diabetes, cardiovascular disease, and many other chronic diseases (Anderson, Crespo, Bartlett, Cheskin, & Pratt, 1998; Dietz, 1998c; Halawa, 2001; McMurray, Harrel, Levine, & Gansky, 1995; Parizkova & Hill, 2001; Story, 1999; Unger, Kreeger, & Christoffel, 1990; Williams, 1984).

Obesity has been identified as a precursor of cardiovascular disease, a leading cause of death among adults in the United States (Must, Jacques, Dallal, Bajema, & Dietz, 1992). However, the natural history of childhood obesity that persists into adulthood suggests that the obese child who becomes an obese adult will have more severe adult obesity than adults who became obese in adulthood (Dietz, 1993; NTFPTO, 1994; Serdula et al., 1993).

Pediatricians are now reporting increased prevalences of childhood hypertension, dyslipidemia, atherosclerosis, and non-insulin-dependent diabetes mellitus (NIDDM) (Hill & Trowbridge, 1998; Ludwig & Ebbeling, 2001). Pinhas-Hamiel et al. (1996) report that the incidence of NIDDM (typically thought of as an adult disease) has increased ten-fold in children in recent years, and this increase is most apparent among obese children. As a result of this epidemic, we face the prospect of coronary heart disease becoming a disease of young adulthood (Ludwig...
Furthermore, Visscher and Seidell (2001) postulate that with the dramatic increase in people diagnosed with obesity-related type 2 diabetes, industrialized countries will not be able to afford sufficient insulin therapy for the number of projected obesity-linked diabetes patients.

Obesity is associated with an enormous burden of physical, economic, and emotional suffering (NIH/NHLBI, 1998). Complications related to and other conditions associated with obesity include: some types of adult onset cancer (e.g., colon, breast, pancreatic cancer), dermatologic disorders, pulmonary and orthopedic conditions, menstrual abnormalities, and psychosocial morbidities (MacKenzie, 2000; Rippe, 1998). Although overt symptoms of cardiovascular disease are manifested most commonly in adults, precursors to these symptoms are known to be present and to progress without detection for years prior to onset of disease, as has been demonstrated in collaborative studies such as Framingham, Muscatine, and Bogalusa heart studies (Dawber, 1973; Freedman et al., 1987; Kannel, McGee, & Gordon, 1976; Lauer, Conner, Leaverton, Rieter, & Clarke, 1975; Voors, Foster, & Frerichs, 1978).

Theories on Energy Balance

Laws of thermodynamics dictate that an energy surplus is at the core of all obesity; stated simply, if energy intake exceeds energy expenditure, energy storage will occur (Anderson, 2000; Kraemer, Berkowitz, & Hammer, 1990; NTFPTO, 1994; Melby, Ho, & Hill, 2000; Nestle & Jacobson, 2000) (See Figure 1). Energy output comprises basal metabolic rate, thermic effect of food and physical activity. By measure, 3,500 calories is equivalent to one pound; thus, an excess intake of only 50 to 100 calories per day will lead to a five- to 10-pound weight gain over one year (Hill et al., 2000; Kolata,
1986). As a result, a relatively small imbalance between energy input and output can lead to significant weight gain over a period of years. Studies concur with this example, citing that most obese individuals demonstrate a slow but consistent weight gain over several years (Hill et al., 2000; Bouchard, 1991). How many calories you need depends on your gender, age, frame size, percentage of body fat, metabolism, and level of activity (Williams & Knight, 1995). On the simplest level, obesity prevalence rates rise only when energy intake exceeds energy expenditure in a population (Hill & Peters, 1998; Melby, Ho, & Hill, 2000). This phenomenon is better known as positive energy balance (Hill & Peters, 1998).

Figure 1. The Weight Management/Energy Balance Scheme

Uncertainty and controversy surround the cause or multiple reasons for the dramatic rise in childhood obesity over the past 20 to 30 years (Jebb & Moore, 1999; Keller & Stevens, 1996). Several authors (Gill, 1997; Halawa, 2001; Sherwood, 2000) claimed that there has been a scarce amount of research conducted on preventing childhood obesity. For example, Halawa (2001) stated, “childhood obesity remains to be a relatively new and not fully explored field” (p. 33). Three traditional theories for the current epidemic of childhood obesity are suggested in the literature: (a) There has been a change in the dietary intake of children favoring weight gain over the last two to three decades (WHO, 1998); (b) there has been a change in the amount of physical activity favoring weight gain over the last two to three decades (Bouchard, 2000; Jebb & Moore, 1999; Hill & Peters, 1998; Kohl & Illoths, 1998; Luepker, 1999; Rosenbaum & Leibel, 1998b); or (c) a combination of one and two has occurred over the past two to three decades (Kraemer, Berkowitz, & Hammer, 1990; NTFPTO, 1994; Story & Davis, 2000).

Theoretically, uncertainty of diet versus exercise and their unique contribution to childhood obesity is relevant because of the difficulty of measuring dietary intake and physical activity on either an individual or a population level (Briefel et al., 1995; Flegal, 1999; Smith, 1999). Historically, focus of much of the research on energy balance centered around small differences in metabolic efficiency and psychological functioning, which Hill and Peters (1998) believe are insufficient to explain our current childhood obesity epidemic.

Aside from determining cause or causes of a positive energy balance in children, there has been paucity of research that directly addresses primary prevention of obesity in children (Battle & Brownell, 1996; Gill, 1997; Halawa,
2001; Sherwood, 2000), and efforts to prevent obesity in individuals, cohorts, or entire communities have had very little success (Gill, 1997). Additionally, there are authors who question whether obesity is preventable in our fast-food society (Charney, 1998; Foreyt & Goodrick, 1995; Garrow, 1990; Gill, 1997; Hill et al., 2000; Smith, 1999). The doubling of obesity prevalence across all age, race, and gender groups in the past 30-years (Foreyt & Goodrick, 1995) prompted Nestle and Jacobson (2000) to state: “trends in prevention and treatment of obesity are . . . moving in precisely the wrong direction” (p. 16).

**Economic Cost of Obesity**

Future implications for our healthcare system concerning excess weight in children and other age groups are considered to be catastrophic in nature (Bouchard & Blair, 1999). According to medical literature, for the year 1990, economic costs of obesity were estimated to be $69 billion or 8% of our total healthcare costs (Colditz, 1999; Wolf & Colditz, 1994). In a related study Goran et al. (1999) estimated healthcare costs of obesity to reach approximately $100 billion in the United States by the year 2000. Halawa (2001) further detailed annual economic cost of obesity in the United States by citing that “. . . $46 billion is spent on direct medical care of obese individuals; $19 billion caused by death and disability; over $4 billion in workdays lost to obesity-related illness; and $33 billion for various weight reduction products and services” (p. 33). In an extensive study, McGinnis and Foege (1993) estimated that 14% of all deaths in the U.S. in 1992 were attributable to poor diet and lack of physical activity. Furthermore, in the United States 13.5 million people have coronary heart disease (CHD), which is the leading cause of cardiovascular death in the U.S. (Colditz & Mariani, 2000). Each year CHD is newly diagnosed in approximately 1.5 million persons
and of the many risk factors for CHD, obesity and inactivity are included (Colditz & Mariani, 2000).

In a related study, two RAND researchers, health economist Roland Sturm and psychiatrist Kenneth Wells, examined comparative effects of obesity, smoking, heavy drinking, and poverty on chronic health conditions and health expenditures. According to Sturm and Wells (2001), obesity was the most serious problem, as obesity was linked to a large increase in chronic health conditions and significantly higher health expenditures. Furthermore, obesity affected more people in the sample than smoking, heavy drinking, or poverty (Sturm & Wells, 2001).

Coincidentally, due to study design limitations, there are discrepancies in research as to the overall annual cost of obesity to our society. Variability of obesity-resultant conditions that are factored into overall annual health care costs associated with obesity vary from study to study (Colditz & Mariani, 2000; Sturm & Wells, 2001). In popular literature, annual health care costs in the U.S. stemming from obesity currently approach $240 billion, not including personal weight loss and diet expenditures estimated at $33 billion (Schlosser, 2002).

*Future Outlook*

Obesity is challenging to cure. During thousands of years marked by food scarcity, humans developed efficient physiological mechanisms to store and maintain energy in the form of fat (Schlosser, 2002). Unfortunately, there are few effective programs available for children or adults who become obese (Epstein, Myers, Raynor, & Saelens, 1998; Gortmaker et al., 1990; Klesges, Shelton, & Klesges, 1993; Levick, 1994; NIH, 1993; Visscher & Seidell, 2001). Rosenbaum, Leibel, and Hirsh (1997) reported that once a child is obese, treatment is more difficult and the condition often
graduates into a lifelong problem. Long-term studies of children who initially lose weight demonstrate that 80% to 90% typically return to their previous weight percentiles (Klesges et al., 1993), which is comparable to the rate of recidivism reported in adults (Rosenbaum & Leibel, 1998a).

Specifically, researchers posit that primary prevention commence in preschoolers as young as three years old. Whitaker et al. (1997) reported that after the age of three years, the probability that obesity will persist into adulthood increases with advancing age. In 1999, the American College of Sports Medicine Roundtable Consensus Statement reported that obesity acquired in childhood appears to be predictive of adult obesity (Grundy et al., 1999). More specifically, the more obese the child is, the greater the probability of lasting obesity (Whitaker et al., 1997).

Ironically, concern about obesity is not a recent phenomenon. In 1952, the American Heart Association had identified obesity as a cardiac risk factor modifiable through diet and physical activity (Harvard School of Public Health, 1952). Then in the mid 1970s, Jelliffe and Jelliffe (1975) declared infant and childhood obesity had arrived as a significant public health problem. Yet today, “all indications are that the current generation of children will grow into the most obese generation of adults in United States history” (Hill & Trowbridge, 1998, p. 570).

Prevalence of Childhood Obesity in America

“[N]ot only has obesity become more prevalent over the past decades, but obese children are becoming even more obese” (Pinhas-Hamiel & Zeitler, 2000, p.
702). From 1991 to 1994, the CDC and participating state health departments conducted an annual random survey of United States residents \( n = 100,000 \) to determine the prevalence of obesity (otherwise known as the United States Behavioral Risk Factor Surveillance System). Researchers conducted a random-digit telephone survey and calculated the body mass index for each respondent based on self-reported measures and defined obesity as a \( \text{BMI} \geq 30 \text{ kg/m}^2 \). Results of the survey showed that obesity levels in all age, sex, race, and educational levels increased from 12\% to 18\% (Mokdad et al., 1999). Rates of obesity for both sexes were almost equal at 18\%. For ethnic and racial groups, African Americans reported the highest rates of obesity at 27\%. Hispanic-Americans marked the steepest increases. Among Hispanic men, the prevalence increased from 10\% to 18\%, and for Hispanic women from 13\% to 23\% (Mokdad et al., 1999). A steady prevalence increase was noted in every state, however, increases in obesity were not uniform by geographical location.

Public health officials and news columnists now warn obesity could surpass tobacco as the United States' number one preventable cause of death and chronic disease in the near future (Satcher, 2001; Will, 2002). In a recent report entitled *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*, David Satcher (2001) was quoted as stating, "health problems resulting from overweight and obesity could reverse many of the health gains achieved in the U. S. in recent decades. . . . overweight may soon cause as much preventable disease and death as cigarette smoking" (p.1). As the second leading cause of preventable death in the United States today (McGinnis & Foege, 1993; Sherwood, 2000; Stern, 1998), overweight and obesity pose a major public health challenge that has not received the attention as other risks, like smoking (Sturm & Wells, 2001). Sturm and Wells
(2001) examined the comparative effects of obesity in a nationally representative telephone survey of adults \( n = 10,000 \) in 1998 and found that obesity was linked to very high rates of chronic illnesses (67%), higher than living in poverty (58%), smoking (25%), and heavy drinking (12%). Sturm and Wells noted that Americans have not given obesity the same attention as other risks, like smoking, but it is clearly a top health problem and one that is on the rise in all segments of the population. More effective clinical and health approaches are needed to slow down the pending obesity epidemic. If current trends continue, obesity will overtake tobacco use as the number one cause of death and disability (Satcher, 2001; USDHHS, 2001; Will, 2002).

*Longitudinal Surveys: The National Nutritional Surveys*

How do we know that we are in the midst of a childhood obesity epidemic? The United States has been measuring overweight and obesity in children since the initiation of the National Health Examination Survey, Cycle II (NHES II) in 1963. The NHES II survey was a longitudinal survey that was conducted for two years and established a baseline for adiposity in children. Prevalence of childhood obesity have skyrocketed when comparisons were made between the NHES II and the Third National Health and Nutrition Examination Survey (NHANES III), conducted more recently in 1994. During the past decade, the number of children above the 95th percentile for body mass has doubled and the number above the 85th percentile for body mass has increased by 40% (Mokdad et al., 1999; Troiano et al., 1995; USDHHS, 1997). Troiano et al. (1995) reported that the greatest increases have been among children 6 to 11 years of age.
Results of the NHANES III national survey suggest that ethnic groups with higher prevalences of pediatric obesity are African-American girls, Mexican American boys and girls, and American Indian boys and girls (NCHS, 2001; Schonfeld-Warden & Warden, 1997; USDHHS, 1997). Researchers (Morrison, Payne, Barton, Khoury, & Crawford, 1994) posit that the higher prevalence of obesity in African American girls may explain why the mortality rate from cardiovascular disease (CVD) in African American women is 2-4 times higher than in Caucasian women. Overweight and obesity are particularly high among African American girls, Hispanic Americans (Bar-Or, 2000), and American Indian boys and girls (NCHS, 2001).

Specifically, prevalence of obesity (triceps skinfold measurement > 85th percentile) among children 6 to 11 years old increased 54% in the years between the first National Health and Nutrition Examination Survey (NHANES I, 1971-1974) and the second survey (NHANES II, 1976-1980). In the same period, the prevalence of superobesity (triceps skinfold measurement > 95th percentile) increased 98% among children in the same age range (Gortmaker, Dietz, Sobol, & Wheeler, 1987; Troiano et al., 1995). Data from the National Health and Nutrition Examination Surveys (NHANES III, 1988-1994) reported prevalences of overweight for children and adolescents across all age and sex groups increased from 25% to 33% during the time frame (CDC, 1994; Troiano et al., 1995). Presently, estimates of childhood obesity, defined by a body mass index (BMI) exceeding the 85th percentile, range from 22% to 33% (Troiano et al., 1995), with 13.7% of children between the ages of 6 and 11 being above the 95th percentile (CDC, 1997). During the past decade, the number of children above the 95th percentile has doubled and the number above the
85th percentile has increased by 40% (Troiano et al., 1995). The greatest increases have been among children 6 to 11 years of age. Prevalence of childhood obesity in the United States varies from study to study (Parizkova & Hill, 2001, p. 3); however, despite variability between prevalence research, the condition is developing and appearing earlier in a child’s life (Parizkova & Hill, 2001, p. 3).

**Extrapolating Childhood Obesity Prevalence Rates: Cause for Alarm**

With the changing face of America, a trend of increasing pediatric obesity is particularly alarming. Keller and Stevens (1996) reported more Hispanic children (56%) and African-American children (41%) are obese than White children (28%). Kolata (1986) cites that prevalence of obesity in preadolescent Black children has increased almost twice as much as it has in preadolescent white children. In 1994, The National Task Force on the Prevention and Treatment of Obesity (NTFPTO) concluded “obesity tends to be more prevalent in minority populations (e.g., African-Americans, Hispanics, and Native Americans) and in individuals of low socioeconomic status” (p. 582). Furthermore, “cultural factors such as positive attitudes toward overweight in minority populations may enhance a genetic susceptibility in these groups” (p. 575). See Table 1. Consequently, NTFPTO (1994) recommended research be conducted to identify and better understand obesity development in minority groups.

**Persistence of Childhood Obesity into Adulthood**

Of American preschool children who are obese, it is estimated that 30% are destined to become obese adults (Serdula et al., 1993). In the same study, of the obese school-age children about half or (42- to 63- percent) became obese adults (Serdula et al., 1993). Lastly, of children who become obese adults, a majority will remain obese for the remainder of their lives (Dietz, 1993). Although, exact rates of
obesity persisting into adulthood is widely debated (Guo et al., 1994; Shapiro et al., 1984; Sherwood, 2000; Whitaker et al., 1997). Prevalence rates differ because of (a) differences in study designs, (b) the multitude of definitions of childhood obesity, (c) the ages at which subjects were measured, (d) the intervals between measurements, and (e) population and cultural differences (Serdula et al., 1993).

Persistence of childhood obesity into adolescence and then adult obesity depends on several factors, including age of obesity onset, severity of the obesity, and presence of obesity in one or both parents (Neito, Szklo, & Comstock, 1992; Sherwood, 2000; Whitaker et al., 1997). Overweight in a child under the age of three does not predict future obesity, unless at least one parent is also obese (Whitaker et al., 1997). The likelihood of persistence of obesity from childhood to adulthood is small (Sherwood, 2000). Less than 15% of overweight infants and 25% of overweight school children will remain overweight into adulthood (Guo et al., 1994; Whitaker et al., 1997). Obesity is more likely to persist if it is present when an adolescent is 15 to 17 years old (Sherwood, 2000).

However, some studies suggest age three is a critical time for a child. Whitaker et al. (1997) concluded that at the age of three, the likelihood that obesity will persist into adulthood increases with the advancing age of the child and is higher in children with severe obesity in all age groups. Once the obese child reaches the age of six years, the probability that obesity will persist exceeds 50% (Whitaker et al., 1997), and 70% to 80% of obese adolescents will remain so as adults (Epstein et al., 1998). Whitaker et al. (1997) do highlight that a child’s body weight before six years of age has very limited predictive power for the occurrence of obesity; however, researchers Dietz (1994) and Rolland-Cachera, Deheeger,
Table 1.

*Percent of Overweight Children and Adolescents, by Sex and Race/Ethnicity*

<table>
<thead>
<tr>
<th></th>
<th>Children (Aged 6-11 years)</th>
<th>Adolescents (Aged 12-17 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BMI Percentile 85th 95th</td>
<td>85th 95th</td>
</tr>
<tr>
<td>All Races</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1963-1970</td>
<td>15.2 5.2</td>
<td>15.2 5.2</td>
</tr>
<tr>
<td>1988-1994</td>
<td>27.2 13.6</td>
<td>26.6 11.5</td>
</tr>
<tr>
<td>Males, total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1963-1970</td>
<td>15.2 5.2</td>
<td>15.1 5.2</td>
</tr>
<tr>
<td>1988-1994</td>
<td>28.4 14.6</td>
<td>27.3 12.3</td>
</tr>
<tr>
<td>White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1963-1970</td>
<td>16.0 5.6</td>
<td>15.8 5.4</td>
</tr>
<tr>
<td>1988-1994</td>
<td>29.3 14.5</td>
<td>29.7 13.0</td>
</tr>
<tr>
<td>Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1963-1970</td>
<td>10.3 2.0</td>
<td>10.4 3.7</td>
</tr>
<tr>
<td>1988-1994</td>
<td>25.6 15.0</td>
<td>22.5 11.9</td>
</tr>
<tr>
<td>Mexican-American</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988-1994</td>
<td>32.7 18.5</td>
<td>32.2 14.5</td>
</tr>
<tr>
<td>Females, total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1963-1970</td>
<td>15.2 5.2</td>
<td>15.2 5.2</td>
</tr>
<tr>
<td>1988-1994</td>
<td>25.7 12.4</td>
<td>26.1 10.8</td>
</tr>
<tr>
<td>White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1963-1970</td>
<td>15.7 5.1</td>
<td>15.0 5.0</td>
</tr>
<tr>
<td>1988-1994</td>
<td>24.2 11.4</td>
<td>25.4 10.2</td>
</tr>
<tr>
<td>Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1963-1970</td>
<td>12.1 5.3</td>
<td>16.5 6.6</td>
</tr>
<tr>
<td>1988-1994</td>
<td>31.7 17.3</td>
<td>34.5 16.2</td>
</tr>
<tr>
<td>Mexican-American</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988-1994 only</td>
<td>33.2 16.2</td>
<td>31.3 13.8</td>
</tr>
</tbody>
</table>

From: "Understanding Childhood Obesity," by J. C. Smith, 1999. p. 28. Copyright 1999 by the University Press of Mississippi
Guilloud-Bataille, Avons, and Sempe (1987) stated that adiposity rebound earlier than six years of age increases the chance of adult obesity. For example, in one study, Whitaker et al. (1997) followed 854 full-term infants and their parents through age of 21 of the child and found that the 3-year-old children with non-obese parents had a risk level of only 8% of becoming an obese adult. In contrast, the very obese 3-year-old (BMI ≥ 95th percentile) with one obese parent had a risk level of 83% of becoming an obese adult (Whitaker et al., 1997). In summary, other researchers warn that children at greatest risk for developing obesity are children of obese parents, children from low-income families, and children of Hispanic origin (Christoffel & Ariza, 1998).

In another study conducted by Shapiro et al. (1984), obesity at age 2 for girls and age 3 for boys was a positive predictor for subsequent obesity at 6 years and 9 years. Although, it was noted that the length of this longitudinal study had limitations (Shapiro et al., 1984). Goran (1998) added “the persistence of obesity into adulthood increases quite dramatically as children go through the life span, so that by 10 to 13 years of age, the likelihood of persistence of obesity is 70 percent” (p. 23). Finally, Guo and Chumlea (1999) report that the risk of obese children (defined as BMI above the 95th percentile for weight) developing adult obesity (BMI > 28) is up to 80% at 35 years old. Notwithstanding accurate projections for future obesity, arguably there is a direct correlation between being obese as a child and sustaining obesity throughout adulthood (Whitaker et al., 1997).

History of Obesity as a Health Issue

Effects of excess weight on morbidity and mortality have been known since the time of Hippocrates during the third century B.C., who said, “sudden death is more common in those who are naturally fat than in the lean” (as cited in Bray,
1998). In 1952, the American Heart Association identified obesity as a chronic condition that was modifiable by eating a variety of foods and by being physically active (Harvard School of Public Health, 1952). During the industrial revolution and the half century that followed, federal agencies and private organizations developed guidelines to prevent chronic conditions like obesity by advising Americans to reduce caloric intake, increase physical activity, or do both to “maintain a healthy weight” (Nestle & Jacobson, 2000, p. 14). In 1977, the United States Senate released the landmark report on diet and chronic disease prevention entitled *Dietary Goals for the United States*; however, it failed to mention obesity as a nutritional disorder (Nestle & Jacobson, 2000). Consequently, since the 1952 American Heart Association release, the United States government in tandem with private health organizations has released over 40 public health policy guidelines aimed at improving the American diet and exercise patterns (Nestle & Jacobson, 2000); arguably, the guidelines have failed. Researchers have offered a variety of legitimate concerns regarding the failure of recommendations addressing both physical activity and dietary patterns; including: a lack of creativity in programming, utilizing individual behavior change theories when social change theory was thought to be better suited for the problem, a lack of focus on factors in society that were thought to contribute to obesity, and failure to examine the environment as a viable source for the development and maintenance of obesity (Nestle & Jacobson, 2000).

The seriousness of obesity in children has been widely debated in the literature and is not a new phenomenon. In response to a growing number of obese children in 1974, *The Lancet* published two editorial articles challenging the
international ideal height and weight standards for youth (Habicht, Martorell, Yarbrough, Malina, & Klein, 1974; Jelliffe & Jelliffe, 1974). Habicht et al. (1974) argued that physicians should not accept the paradigm “bigger is better” (p. 47), while Jelliffe and Jelliffe (1974) identified that the growth standards for children in the U.S. and Westernized countries were increasing. For example, Japan was identified as a country that exemplified an Americanized society in the 1970s. Jelliffe and Jelliffe (1974) stated, “. . . the latest generation of Japanese teenagers appear to be so much heavier, taller, and fatter than ever would have been imagined 25 years ago, and seemingly approximating to the Western overfed model” (p. 47). The development of childhood obesity varies in different populations, however it appears that the rest of the developing world is following the fattening trend initiated by U.S. youth during the 1980’s (Ebbeling et al., 2002; Taubes, 1998; WHO, 1998).

Since the 1970s, obesity’s prevalence has dramatically increased among American children, adolescents, and adults (Mokdad et al., 1999; Sherwood, 2000). Observing a need to implement obesity prevention strategies, in 1980 the United States Public Health Service and nine other federal agencies collaborated on the first of what were to become three 10-year plans. These included Promoting Health/Preventing Disease: Objectives for the Nation (U.S. Department of Health and Human Services, 1983); Healthy People: National Health Promotion and Disease Prevention Objectives (U.S. Department of Health and Human Services, 1990); and Healthy People 2010: Understanding and Improving Health (U.S. Department of Health and Human Services, 2000). The Healthy People 2010 Objectives have the overall goals of increasing the quality and years of healthy life
and eliminating health disparities (U.S. Department of Health and Human Services, 2000). See Appendix D for Healthy People 2010 objectives. There are 18 objectives in the obesity and nutrition category and 40 nutrition-related objectives in other sections of the document (Johnson, Eaton, Wahl, & Gleason, 2001). The goal of the obesity and nutrition category is to promote health and reduce chronic disease associated with diet and weight.

Despite national efforts to target overweight children and adults, physical activity levels of Americans changed little, if at all, from the 1970s through the 1990s (Must et al., 1999; U.S. Department of Health and Human Services, 1986). There is even evidence that the average amount of physical activity in children has dropped (MacKenzie, 2000; Styne, 1999); however, actual decline in physical activity has been debated (Pratt, Macera, & Blanton, 1999). For many reasons—fewer mandated physical education programs in schools, lack of safe areas to exercise in many inner-city neighborhoods, increased use of technology, number of hours a child spends watching television—physical activity levels are theorized to be lower in children now than they were 20 years ago (MacKenzie, 2000; Morbidity and Mortality Weekly Report, 1997; Sothern et al., 1999; Styne, 1999). Even more alarming is the fact that prevalence rates of obesity among all age, gender, and ethnic groups are predicted to rise (Bouchard, 2000, p. 14; Bray, 1998; Foreyt & Goodrick, 1995; Goran et al., 1999; James, 1995; Smith, 1999, p. 32; Taitz, & Wardley, 1989; Visscher, & Seidell, 2001).

In response to the obesity epidemic, the third PHS 10-year plan, Healthy People 2010 (U.S. Department of Health and Human Services, 2000), continues to
emphasize goals related to physical activity and balancing food intake; however, "the plan offers little guidance as to how the objectives are expected to be achieved beyond calling for a concerted public effort" (Nestle & Jacobson, 2000, p. 16).

Recent History: Making the Childhood Obesity Epidemic a Priority

Most of the increases in percentages of overweight children, adolescents, and adults occurred after 1976-1980. Clearly something has happened since that period to cause these changes, and the evidence suggests that the environment, not our genes, is to blame (Smith, 1999, p. 30). The United States now has the highest obesity rate of any industrialized nation in the world (WHO, 1998). More than half of all American adults and about one quarter of all American children are now obese or severely overweight (Freedman et al., 1997; Troiano et al., 1995). However, the speed of the spread of the obesity epidemic was not equivalent. Troiano & Flegal (1998) noted that even though children and adults have shared a dramatic proportional increase in the overall amount of obesity in the U.S., speed at which obesity prevalence doubled in the past two decades, were greater in children than in adults (viz., while it took adults approximately forty years to double the amount of obesity in the U.S., childhood obesity prevalence rates doubled in just 20 years). While in the midst of our current obesity epidemic, a handful of researchers are stressing the need for fat acceptance and downplaying the seriousness of obesity as a health condition. For example, Ernsberger and Koletsky (1999) stated, "the direct medical hazards of obesity, although real, have been overstated" (p. 221). While noted researchers downplay the seriousness of obesity (Ernsberger & Koletsky, 1999), studies provide evidence that certain diseases are more common in obese individuals than in lean
individuals (Bray, 1996; Pi-Sunyer, 1993; WHO, 1998). Furthermore, studies suggest obesity has been associated with increased and subsequent morbidity and mortality in adulthood (Allison & Saunders, 2000; Nieto, Szklo, & Comstock, 1992).

Subsequent to the failure to address our culture or environment as a potential cause for the obesity dilemma in the U.S., obesity prevention in children and adults has historically received little attention (AOA, 2000; Hill & Peters, 1998; Hill & Trowbridge, 1998; MacD. Hunter et al., 1997; Seidell, 2000; Smith, 1999), and strategies designed to prevent obesity, have been poorly understood (Campbell, Waters, O'Meara, & Summerbell, 2001). Stephan Rössner, a leading obesity researcher in Sweden, has offered reasons why the U. S. has not moved forward in obesity prevention research by expressing concern regarding the failure to treat obesity. Rössner (1998) stated, “with this depressing attitude towards obesity treatment, it is easy to understand that this has never been a high priority area for scientists and clinicians who are anxious to work within areas where any progress can be observed” (p. 1). Coupled with poor treatment outcomes, and lack of prevention initiatives, the U.S. culture continues to provide Americans with an abundance of high fat foods at a low relative cost (Bouchard & Blair, 1999; Schlosser, 2002; Smith, 1999). Furthermore, cutbacks in mandatory physical education programs have contributed to overall decline in children’s physical activity levels (Fielding et al., 2002; Hill & Peters, 1998; Smith, 1999; Styne, 1999).

Identifying a need to address the issue of childhood obesity, on October 27, 1998, the United States Department of Agriculture, Center for Nutrition Policy and Promotion, sponsored a first-ever science and policy symposium targeting the
causes and prevention of childhood obesity in the United States. Fourteen distinguished practitioners and academicians, including Surgeon General David Satcher, stressed the need for our country to examine the contribution of diet and inactivity to childhood obesity. At the symposium, researchers pointed toward the NHANES Studies conducted by the Centers for Disease Control and Prevention (CDC) noting that the rate of American obesity had increased in every state and among both sexes, regardless of age, race, or education level (Mokdad et al., 1999). According to the study, in 1991, only four states had obesity rates of 15 percent or higher, in 1998, states with prevalence rates of 15 percent or higher numbered thirty-seven (Mokdad et al., 1999). With obesity rates on an upward trend, researchers are pushing for obesity prevention programs to be higher on the scientific and political agenda (Visscher & Seidell, 2001).

Cultural Factors and the Epidemic of Childhood Obesity

Although the current rise in obesity has a number of complex causes, genetics, as was surmised at the symposium, was not identified as a major contributor. The human gene pool has not changed enough to account for the sudden increase in American obesity (Hill & Peters, 1998; Price, 2002). What has changed is the nation’s way of eating and living. The amount of fast foods and carbonated soft drinks consumed in the U.S. has dramatically increased the past two decades (Nestle, 2002; Schlosser, 2002). According to researchers’ at the U.S. Department of Agriculture symposium, public health focus should be on an ailing environment that is conducive to inactivity and poor diet. Goran (1998) stated, “Although genetics has a modest influence on obesity, by far the largest amount of variance in body weight is due to environment. Genetics permits a person to become obese, but
the environment determines if a person becomes obese” (p. 27). Future research efforts clearly need to be focused on the environment, which influences excessive food intake and discourages physical activity (French et al., 2001). French, Story, and Jeffery (2001) emphasized the following environmental factors that have changed eating patterns over the past three decades:

- Increased availability and consumption of processed foods;
- Increased energy (food) availability and consumption;
- Increased availability of soft drink vending machines (soft drink contracts in schools doubled between 1997 and 1998);
- In school advertising for soft drinks has increased;
- The number of fast food restaurants increased 147% from 1972 to 1995;
- Foods available away from home are higher in energy and fat than at-home meals surveyed in 1995;
- The number of women in the workforce grew from 29% in 1950 to 60% in 1999;
- Portion sizes for soft drinks and fast foods have “super-sized” since 1988;
- Food manufacturers, retailers, and food service spent $11 billion on media advertising in 1997. The USDA spent $333.3 million on nutrition education, evaluation, and demonstration in the same year or roughly 3% of what the food industry spent in that year; and
- Food pricing is an environmental factor that influences food consumption. However the authors cautioned that differences in pricing and consumption were small.
Concurrent with the increase in caloric consumption, daily activity among children in the United States has decreased for several reasons, including increased reliance on motor vehicles, sedentary lifestyles, and the proliferation of television and computer technology (Blumenthal, Hendi, Marsillo, 2002). The National Center for Chronic Disease Prevention and Health Promotion (2001) notes that the percentage of students attending physical education classes decreased from 42 percent in 1991 to 32 percent in 2001. Notably, physical activity is critical to any consideration of obesity in children. Additional studies in youth confirm that participation in physical activity (i.e., outside of school) and time devoted to physical activity in physical education programs has fallen in recent years (Luepker, 1999). Tightening budgets, reduced facilities and other lost resources have combined with an emphasis on academic subjects to reduce the amount of time devoted to physical education (Luepker, 1999). Luepker highlights additional reasons for the decline in physical activity as it pertains to the current environment:

- Increasing trend to require regular classroom teachers to organize and program physical education (Luepker notes that the majority of regular classroom teachers are neither qualified or physically able to lead these activities).

- Much of the physical activity class time in lower grades is spent on management and organization with over half the class time devoted to non-exercise activity.

- As students move through the system, children who are most skilled receive the most attention when competitive sports dominate.

- When compared to European children, U.S. children spend less time
devoted to physical activity in school. (Luepker notes that European children are more likely to walk or bike to school, which he attributes to differences in geography (e.g., urbanization that promotes walking and biking) and less dependency on automobiles).

• Sedentary activities at home (e.g., television, computer games, Internet, and videos) are replacing traditional patterns of physical activity (e.g., outdoor play physical "pick-up" games etc.) and this trend has gradually permeated our society.

• At home, children rely on motorized transport and like their parents, utilize labor saving devices with unprecedented frequency.

• Parents as role models are failing to engage in physical activity themselves, therefore setting a poor example. (Luepker cites television watching as a prime example of sedentary activity).

The dramatic rise of childhood obesity, theorized to be largely a result of our environment, has researchers projecting into the future. Goran (1998) expressed concern over the persistence of the childhood obesity epidemic by stating:

Nutrition health risk in children in the next century and the next millennium are going to be much different. They are going to be mediated by obesity, and the dramatic increase in persistence tells us that more and more of the population are going to become overweight. Survival in the obesity promoting environment is going to be more and more difficult, increased food availability, decreased availability for physical activity. (p. 29)

Additionally, Goran (1998) elaborated on the decline of physical activity in youth by concluding:
Clearly, environmental and cultural changes during this century have dramatically decreased the need to be physically active. The priority to be physically active, because T.V. and computers are available, and also environmental changes have created concerns over safety. All of these factors have resulted in a tremendous secular reduction in physical activity, which has not been empirically documented, but . . . it is obvious to us all that not only are adults, but the children of today are much less physically active (p. 27).

Obesity is a major public health problem in the U.S. (Hill & Trowbridge, 1998; Sherwood, 2000; Wadden et al., 2002). The alarming increase in the prevalence of obesity over the last few decades among all populations and age groups has raised concerns about associated health risks for children, adolescents, and adults (Freedman et al., 1997; Story & Davis, 2000; Troiano & Flegal, 1998). Public health efforts need to be directed toward prevention of obesity, rather than treatment (Hill & Peters, 1998; Hill & Trowbridge, 1998). However Visscher and Seidell (2001) note that few prevention programs been developed or implemented, and success rates reported have been low.

A Cultural Phenomenon

There are some unique contributors to the childhood obesity epidemic in the United States. Researchers have compared the behavioral patterns between the U. S. population and other nations that have lower childhood obesity prevalence. Three cultural factors thought to contribute to the obesity epidemic are: 1) widespread fast food availability and increased consumption; 2) availability and increased consumption of carbonated soft drinks; and 3) an American lifestyle that has
become increasingly sedentary (Hill & Peters, 1998). Over the past forty years, per capita consumption of carbonated soft drinks has more than quadrupled (Schlosser, 2002). Today, a modern American diet is characterized by low total-caloric intake, high fat intake, high refined sugar intake, high palatability, high variety, and low relative cost (Jeffery, 1991). Low commodity prices on food sources have allowed fast food chains to greatly increase portion sizes without reducing profits. Marketing larger fast food meal portions as conveniently and as cheaply, have attracted larger numbers of fast food consumers over the course of several decades (Schlosser, 2002).

Jeffery (1991) noted that a sedentary lifestyle is modeled due to the near elimination of physical labor through the widespread availability and affordability of automated luxuries. Additionally, the amount of television viewing and the increase of fast-food consumption in U.S. families have researchers wondering if our culture is slowly being lulled into a sedentary lifestyle (Anderson et al., 1998; Jeffery & French, 1998; Robinson, 1999). Notwithstanding, Hill and Peters (1998) question whether our ability to alter the environment to encourage behaviors that prevent obesity is insurmountable due to the current American lifestyle. Summing up the urgency of the current obesity epidemic in the U.S., a journal article entitled “Obesity: A Time Bomb to be Defused” (Bray, 1998), published in The Lancet, stressed the need for prevention but raises concern over the plausibility of thwarting our current situation. Bray stated, “acceptance that the current epidemic of obesity is largely environmental, because of the mismatch between man’s ancient genes and his modern environment, will help direct preventive and therapeutic strategies” (p.160). More concisely, Peters, Wyatt, Donahoo, & Hill state, “the global obesity
epidemic is being driven in large part by a mismatch between our environment and metabolism” (2002, p. 69).

Even though contradictory opinions exist regarding whether childhood obesity is preventable in our food-rich society (Charney, 1998; Foreyt & Goodrick, 1995; Garrow, 1990; Smith, 1999, p. 81), it is undisputable that early prevention and intervention are essential to reduce the additional health risks that accompany childhood obesity (Bouchard & Blair, 1999; Bray, 1998; Dietz, 1986; Dietz, 1993; Douketis, Feightner, Attia, & Feldman, 1999; Epstein et al., 1998; Goran et al., 1999; Grundy et al., 1999; Hill & Peters, 1998; Kassirer & Angell, 1998; Mogan, 1984; Parizkova, 1996; Schonfeld-Warden & Warden, 1997; Story, 1999). Because parents are influential in shaping early eating patterns (Birch & Fisher, 1998), and physical activity (Sallis et al., 1992), parent involvement seems critical for successful obesity prevention. Addressing childhood prevention of obesity is challenging because children’s eating habits are formed early in life with parents providing both genes and the environment (Birch & Fisher, 1998; Schlosser, 2002). Emphasizing prevention, the assumption is that obesity should be easier to prevent than treat, and therefore should be more amenable to intervention during childhood when it is at an earlier premorbid stage (Charney, 1998). However, Charney warns, “the efficacy of current preventive or therapeutic strategies in childhood obesity remains more a hope than a reality” (p. 194).

Despite agreement as to the importance of preventing childhood obesity through public health efforts, this goal has not yet been achieved (Flegal, 1999; Mokdad et al., 1999). Even more alarming is the fact that the trend is predicted to worsen (Bouchard, 2000, p. 14; Bray, 1998; Foreyt & Goodrick, 1995; Goran et al.,
1999; James, 1995; Smith, 1999, p. 32; Taitz & Wardley, 1989). Foreyt and Goodrick (1995) argued that the increase in the prevalence of overweight and obesity across all age and racial groups is a side effect of modernization in the United States. At the current rate of increase, it is estimated that 100% of all U.S. adult citizens would be overweight or obese by the year 2230 (Foreyt & Goodrick, 1995). As Bray (1998) commented, “the time bomb of obesity is ticking” (p. 160).

Conceptually, the obesity epidemic stems, to a large degree, from the lack of knowledge of environmental factors, which have formative effects on the development of childhood obesity (Flegal, 1999; Grundy et al., 1999; Hill & Melanson, 1999). One theory given for the limited success in the treatment and prevention of childhood obesity is that despite considerable research and clinical experience in the area, all causes have not been satisfactorily explained (Parizkova & Hills, 2001).

There is increasing evidence that how health professionals view prevention of obesity is in flux. Flegal (1999) noted “it may be useful to focus less on the agents of diet and physical activity and more on the environment of social and economic organization and cultural values” (p. S512). Hill and Melanson (1999) concurred that our environment is primary reason for the obesity epidemic and highlight that dietary fat and total caloric intake may have in fact declined over the past few decades; this suggests that “decreases in physical activity are a major contributing factor” to the epidemic (p. S515). In addition to controversy surrounding diet, exercise, and environmental contributors to childhood obesity, medical practitioners are recognizing the current dilemma of childhood obesity and are citing need for an alternative paradigm for prevention and treatment. Medical
practitioners. Goetz and Caron (1999) stated, "Neither the biomedical or psychosocial approach, independently, has accrued consistent and sustainable success for intervening in youth obesity. This is most likely due the complex and multiple elements of causality contributing to the genesis of youth obesity" (p. S59).

Today emphasis in the modern western world is on slimness, leanness, and fitness in adults (Bray, 1998; Brownell & Steen, 1987; Kassirer & Angell, 1998; Melcher & Bostwick, 1998; Sobal, Nicolopoulos, & Lee, 1995). Cultural expectations are evident in the decreasing body weights of Miss America contestants since 1950 (Bray, 1998). Ironically, this concept of the ideal body image has developed in conjunction with an increasing prevalence of obesity in all age groups of the United States population (Brownell, & Steen, 1987; Dietz, 1998; Mokdad et al., 1999) and high prevalence rates of dieting for weight loss (Neumark-Sztainer, Butler, & Palti, 1996; Rolls, Fedoroff, & Guthrie, 1991). What is troublesome is that the upward trends of childhood obesity have persisted despite our nation's intense preoccupation with weight (Brownell & Steen, 1987; Brownell & Wadden, 1992; Neumark-Sztainer et al., 1997; Rodin, 1993; Story, 1999). Appropriately summing up the dilemma, the National Institute of Health (NIH) Technology Assessment Conference Panel (1993) stated, "a health paradox exists in modern America. On the one hand, many people who do not need to lose weight are trying to. On the other hand, most who do need to lose weight are not succeeding" (p. 764). Childhood obesity represents a threat to the health of the U.S. population that must be considered equal to that presented by AIDS, breast cancer, and teen pregnancy. Only when childhood obesity becomes high on the public agenda will the necessary research funds from government and private agencies become available (Hill & Trowbridge, 1998, p. 573)
Alarmingly, despite the toll taken in disease, disability, and death, obesity in children, adolescents, and adults has not received the attention this major public health problem deserves from the general public, the health care profession, the insurance industry nor the government (AOA, 2000; MacD. Hunter et al., 1997; Sturm & Wells, 2001). As recent past history illustrates, research has been severely limited by a shortage of funds, inadequate insurance coverage for prevention and treatment, and the continual discrimination and maltreatment of people with obesity in our culture (AOA, 2000; Dietz, 1998). For example, the proportion of government funded medical research on obesity pales in comparison to other areas of medicine. According to Stern (1998) obesity is eighth on the list behind: Cancer, HIV/AIDS, cardiovascular disease, diabetes, hypertension, stroke, and colon-rectal cancer.

**Collaboration and Communication Difficulties Across Disciplines**

The complexity of obesity development among individuals and pending epidemic has fueled efforts to find viable prevention strategies and treatments. However, trends in prevention and treatment of obesity have been futile (Colvin, 1983; Ebbeling, Pawlak, & Ludwig, 2002; Ernsberger & Koletsky, 1999; Nestle & Jacobson, 2000). For example, Goetz and Caron (1999) state, "neither the biomedical or psychological approach, independently, has accrued consistent and sustainable success for intervening in youth obesity" (p. S59). An increased awareness, understanding, and openness towards different multidisciplinary philosophical perspectives surrounding childhood obesity is a prudent first step when viewing prevention and treatment protocols (Neumark-Sztainer, 1999). Notwithstanding the multi-disciplinary challenge of addressing obesity as a health
issue, there has been considerable speculation and disagreement about reasons for
the childhood obesity epidemic (Aronne, 2001; Babcock, 1999; Egger & Swinburn,
1997; Gable & Lutz, 2000; Goetz & Caron, 1999; Neumark-Sztainer, 1999;
Ritenbaugh, Kumanyika, Antipatis, Jeffery, & Morabia, 1999; Story, 1999); yet,
solid data identifying its causes are lacking (Aronne, 2001; Flegal, 1999; Goran,
Reynolds, & Lindquist, 1999; Keller & Stevens, 1996; Schonfeld-Warden &
Warden, 1997). When viewed across all disciplines with a stake in preventing
childhood obesity, the literature identifies three specific behaviors as having been
implicated or associated with obesity development in children: (a) consumption of a
high-fat diet, (b) over-consumption of energy; and (c) physical inactivity (Dwyer et
al., 1998; Hill & Trowbridge, 1998; Schmitz & Jeffery, 2000; Sherwood, 2000;
environmental influences on behavior and subsequent development of obesity, all
factors must be considered concurrently.

Researchers stress the difficulty with widespread diffusion of information
concerning childhood obesity prevention stems from a lack of communication
across disciplines concerned with obesity in children (Neumark-Sztainer, 1999). In
addition to communication differences, there is a paucity of research addressing the
environment as a serious contributor to the overall problem of obesity (Flegal, 1999;
Jacobson, 2000; Neumark-Sztainer, 2000; Sallis & Owen, 1997; Schmitz & Jeffery,
of communication across disciplines to the terminology used in applying theory to
the field of health education. Specifically, terms used to label behavioral science
variables have been described as a foreign language in various health education programs (Hochbaum et al., 1992; van Ryn & Heaney, 1992).

One can speculate that lack of communication and information among researchers in different academic fields may partially account for the present status of research identifying environmental antecedents thought to contribute to childhood obesity. Another problem posited is the notion that practitioners' use of theory and practice are in separate realms, creating a disconnect between practice and what is known regarding environmental antecedents (D'Onofrio, 1992). Practitioners van Ryn and Heaney (1992) suggested a strategy for enhancing theory-informed practice. Namely, when choosing a theory, select a theory specific to the unit of practice (e.g., individual, school, community, or society) (Jackson, 1997). Knowledge, attitudes, and values do affect behavior in children (Jackson, 1997); however, Sallis and Owen (1997) stressed there has been an over-emphasis on utilizing the person-centered approach in health education (e.g., relying on improving children's knowledge and expecting a positive health behavior to follow). Durlak (1995) notes the assumption of increasing students' knowledge on a health subject area to change behavior “...has proven to be a false assumption” (p. 15). In short, school health education programs with the most general success have been multi-component interventions that combine classroom-based skills training with environmental change strategies (Booth et al., 2001; Durlak, 1995). To develop effective public health prevention strategies in response to the childhood obesity epidemic, research is required to expand the link between environmental conditions, health promotion policies, and individual behaviors (Booth et al., 2001; Dietz et al., 2002; Swinburn, Egger, & Raza, 1999).
Similarly, Hochbaum et al. (1992) encouraged practitioners to select theories that match the unit of practice with attributes of the targeted behavior. Two principles derived from behavioral science theories and models commonly used in health education research are worthy of mention when researchers set out to identify attributes of behavior:

a) Social relationships and social norms have a substantial and persistent influence on the way people behave.... and,

b) Behavior is not independent of the context in which it occurs; people influence, and are influenced by, their physical and social environments (Jackson, 1997, p. 148).

While a tremendous variety of environmental antecedents have been investigated in relation to a child's environment, there is at present no one inclusive, empirically based model of the environmental precursors to childhood obesity (Berg, 2001; Dietz & Gortmaker, 2001). Rather, a wide variety of multidisciplinary initiatives and frameworks have been proposed in an effort to prevent childhood obesity (Berg, 2001; Booth et al., 2001; Grundy, 1998; NTFPTO, 1994).

*Childhood Obesity Causes: Environment vs. Heredity*

Several theories of the development of childhood obesity are reported in the literature (Babcock, 1999; Egger & Swinburn, 1997; Gable & Lutz, 2000; Goetz & Caron, 1999; Ritenbaugh et al., 1999; Story, 1999). There is agreement among researchers that obesity is a multi-disciplinary problem with both genetic and environmental causes (Bouchard, 1991; Dietz & Gortmaker, 1984; Leibel et al., 1993; Rosenbaum & Leibel, 1998). While genetic predisposition for childhood obesity has been identified in the literature (Bouchard, 1991; Halawa, 2001; Hill &
Melanson, 1999; Keller & Stevens, 1996; Stunkard et al., 1986), environmental contributions to childhood obesity are stressed to a greater degree (Berg, 2000; Birch & Davison, 2001; Booth et al., 2001; Egger & Swinburn, 1997; Flegal, 1999; Goetz & Caron, 1999; Halawa, 2001; Hill & Melanson, 1999; Hill & Peters, 1998; Ludwig & Ebbeling, 2001; Rosenbaum & Leibel, 1998; Shannon, Peacock, & Brown, 1991). Contradictory opinions exist regarding the genetic contribution to obesity. According to Hill and Melanson (1999), the genetic contribution to obesity lies somewhere between 25 and 70%; studies of monozygous twins suggest this may be on the order of 50–70%, but familial studies suggest that this may be closer to 25 – 50%. Hill and Melanson (1999) also suggest that “... environmental factors may be overwhelming our genetic defenses against obesity” (p. 8515).

While many researchers contend that there needs to be an approach to examine the factors that affect energy balance in children (Berg, 2000; Bouchard, 2000, p. 13; Dietz & Gortmaker, 2001; Ludwig & Ebbeling, 2001), it is unclear what foci for preventive efforts need be emphasized (Bouchard, 1991; Rosenbaum & Leibel, 1998; Schonfeld-Warden & Warden, 1997; Ward & Evans, 1995; Whitaker et al., 1997). Dietz and Gortmaker (2001) argue that reducing the overall amount of television viewing time a child partakes in, is a legitimate intervention target because the act of watching television directly affects both energy intake and energy expenditure. Currently, without a clear distinction between prevention and treatment for obesity, researchers are stressing the importance of a healthful diet and a physically active lifestyle be emphasized for all children (Ludwig & Ebbeling, 2001).
The direct cause or causes of childhood obesity and the dramatic rise in prevalence rates remain unclear (Aronne, 2001; Flegal, 1999; Goran et al., 1999; Keller & Stevens, 1996; Mogan, 1984; NTFPTO, 1994; Parizkova & Hill, 2001, p. 307; Schonfeld-Warden & Warden, 1997; Ward & Evans, 1995). What is clear is that obesity has multiple causes (Allison et al., 1996; Birch & Davison, 2001; Booth et al., 2001; Gortmaker et al., 1990; Herskind, McGue, Sorenson, & Harvald, 1996; Stouffer & Dorman, 1999) and that there are different levels of obesity (Bouchard, 1991; NIH, 1985; Parizkova & Hills, 2001, p. 308). To say that childhood obesity is multifactorial presumes physiologic, biochemical, genetic, environmental, cultural, socioeconomic, and psychological participation (NIH, 1993). Furthermore, the increase in childhood obesity has emerged with an increase in dietary fat content and with a decrease in physical activity (Grundy et al., 1999; Hill, Rogers, Peters, & Blundell, 1995; Prentice & Jebb, 1995). However, surprisingly little evidence exists to support the hypothesis that obesity is caused by overeating in children (Hill & Melanson, 1999; Jebb & Moore, 1999; Rolland-Cachera & Bellisle, 1986; Stefanick, Heald, & Mayer, 1959; Sunnegardeth, Bratteby, & Hagman, 1986). In order to adequately address the childhood obesity epidemic, Bouchard (2000) has called for more detailed research on effective ways of modifying behaviors associated with these environmental risk factors.

Lastly, Rosenbaum and Leibel (1998) concluded that due to the rate at which the prevalence of childhood obesity soared over the past 40 years, this phenomenon provides tacit evidence that there is a need to manipulate the environment through thoughtful public health policy (e.g., encouraging both healthful diet and increased physical activity). Koplan and Dietz (1999) concurred, citing that successful
prevention strategies at the individual and societal level must address both diet and physical activity.

Historically, epidemics are controlled only when environmental factors are included in the resolution interventions and the ensuing public health actions. The childhood obesity epidemic needs a similar environmental approach to complement the educational and behavioral prevention strategies. Timmreck (2000) stated:

Primary prevention involves halting any occurrence of a disease or disorder before it happens. Health promotion, health education, and health protection are three main facets of primary prevention. Lifestyle changes; community health education; health screening; school health education; health activation; good prenatal care; good behavioral choices; proper nutrition; safety and healthy conditions at home, school or the work place are all primary prevention activities. . . . The leading factors contributing to the causes of death are smoking and tobacco use, alcohol and substance abuse, accidents, diet, lack of physical fitness, emotional and mental health problems, and environmental health concerns. . . . In the future less focus should be given to treatment and health care by physicians, and should be replaced with a major effort in primary prevention including adequate economic support for prevention programs and activities. (p. 19)

Undeniably, the genetic make-up of children can, and often does, contribute to the etiology of childhood obesity (Price, 1987; Smith, 1999, p.64; Stunkard et al., 1986). More recently, however, public health officials are urging communities to focus efforts on identifying factors that promote an obesogenic environment. Specifically, the environmental factors that contribute to obesity are addressed and
summarized in the *Health and Human Services Press Release: The Surgeon General’s Call to Action to Prevent and Decrease Overweight and Obesity in the U.S.* (U.S. Department of Health and Human Services, 2001). In this document, DHHS Secretary Tommy G. Thompson aptly phrased; “our modern environment has allowed these conditions [obesity] to increase at alarming rates and become a growing health problem for our nation” (¶3). In the same press release, Surgeon General David Satcher proclaimed, “overweight and obesity may soon cause as much preventable disease and death as cigarette smoking” (¶4).

While controversy abounds regarding where future prevention efforts should intervene (viz., genetics vs. environment) as cited in two studies (Allison et al., 1996; Herskind et al., 1996), there is general consensus that a child with a genetic predisposition towards obesity who lives in a social environment in which caloric-dense food is accessible and whose family is sedentary is at increased risk for obesity (Neumark-Sztainer, 1999; Rosenbaum & Leibel, 1998). Bouchard (1994) supported the notion that the overall contribution of our environment to the childhood obesity epidemic outweighs genetic manifestations. The American gene pool has not changed radically in the past few decades, what has changed is the way Americans eat and live suggesting a need to examine why children are eating more or moving less (Bouchard, 2000; Schlosser, 2002). Parizkova and Hill (2001) added, “the speed with which obesity has worsened . . . suggests that environmental causes are more likely to have been responsible for change rather than genetics. Therefore, particular attention must be paid to lifestyle changes” (p. 308). Further supporting the notion that behavior is affected by environment and vice versa, Jeffery (1991) states:
The high prevalence of obesity in the United States relative to other countries could be attributed to population differences in susceptibility, effectiveness of medical care systems in treating the condition, or population-wide behavioral patterns that contribute to caloric imbalance. Of these three possibilities only the last is credible. (p. 1621S)

Furthermore, there tends to be overwhelming agreement in the literature that childhood obesity has been exacerbated by a culture that promotes a reduction in energy expenditure coupled with an over-consumption of food, particularly high in fat content (Bouchard & Blair, 1999; Bray & Popkin, 1998; Grundy et al., 1999; Hill & Peters, 1998; Hill & Trowbridge, 1997; Jebb & Moore, 1999; NTFPTO, 1994; Rosenbaum & Leibel, 1998). James (1995) reported that whatever the basis for susceptibility to high-fat diets, the "genetically prone" can be expected to have a higher BMI than the general population (p. S40). Although, it has been noted that the exact contribution of a high-fat diet to the current obesity epidemic remains controversial (Grundy et al., 1999; Jebb & Moore 1999; Seidell, 1998; Willett, 1998).

Three Scenarios Behind the Epidemic

Bouchard (2000) stated that one or a combination of the following three scenarios could explain increases in the prevalence of obesity theoretically:

1. a large proportion of the population is consuming more calories than individuals of past generations with no change in daily energy expenditure;
2. a decrease of daily energy expenditure with no change in caloric intake, or;
3. caloric intake has declined compared to previous generations, but daily expenditure has decreased even more. (p. 11)
Bouchard (2000) pointed to the nutrition surveys conducted over the past three decades and argued that scenarios two and three are more likely to have played a larger role in the epidemic (p. 11). Hill and Melanson (1999) concurred that since genes haven't changed substantially over the past two to three decades, there has been either a slight decrease or a very modest decline in total energy and fat intake, decreases in physical activity are a "major contributing factor" (p. S515).

Jebb and Moore (1999), after examining the ecological variables in total, concluded that the increase in prevalence of obesity is more strongly related to lower levels of physical activity than higher energy intakes, but warned "there is a paucity of pertinent data from cross-sectional or prospective studies" (p. S534).

Positive Energy Balance and Multiple Theoretical Antecedents of Obesity

Bouchard (1991) argues that we do not have a clear understanding of all of the complex interactions that affect energy intake and expenditure. In some cases, studies report that sedentary individuals with high-energy intake do not appear to be accompanied by positive energy balance (Hill et al., 2000; Jebb & Moore, 1999), and in other studies, low dietary energy intakes in sedentary people translate into positive energy balance and weight gain (Hill et al., 2000). This paradox of logic has some researchers questioning the methods of scientists to measure energy intake and expenditure with a high degree of validity (James, McNeill, & Ralph, 1990; McNeill, McBride, Smith, & James, 1989; Schoeller, 2000). The key concept, according to Hill et al. (2000), is that factors in our environment promote a positive energy balance (see Appendix E), especially in people who are consuming a diet high in fat and have a low habitual level of physical activity. What is certain is that a positive energy balance determines individuals who become obese over a
relatively long period of time (Bouchard, 1991). Bouchard listed the most common correlates for obesity (see Appendix F), but warned that not all factors need be present for positive energy balance (e.g., weight gain) in individuals.

Studies from a variety of disciplines regarding prevention of childhood obesity (e.g., pediatric medicine, nutrition, exercise and sport science, health education, and psychology) demonstrate that childhood obesity is not caused by one factor; rather, obesity develops from a complex interaction of multiple factors. For instance, (a) small family size and low socioeconomic status (De Spiegelaere, Dramaix, & Hennart, 1998; Jacoby, Altman, Cook, Holland, & Elliot, 1975; Mei et al., 1998; Ravelli & Belmont, 1979; Rolland-Cachera & Bellisle, 1986; Sobol & Stunkard, 1989), (b) single-parent households and households in which parents work full time favor consumption of foods high in fat and sodium (Crockett & Sims, 1995), (c) parenting beliefs and practices (i.e., parental control of child eating) (Birch & Fisher, 1995; Birch & Fisher, 1998; Johnson & Birch, 1994; Lissau & Sorensen, 1994), (d) lack of social support (Dietz, 1983; Gerald, Anderson, Johnson, Hoff, & Trimm, 1994), (e) and increased child television viewing and decrease of physical activity (Anderson et al., 1998; Ross & Pate, 1987) have all evidenced associations with behaviors that can lead to the development of early obesity in children.

Additionally, in line with household and parental characteristics described thus far, child food intake and activity involvement do not occur in isolation. Parents presumably contribute to children’s food intake (e.g., availability of foods in the home), arrange extracurricular activities (e.g., team sports, clubs, religious
education), and monitor the amount of time children spend watching television (Gable & Lutz, 2000).

Underscoring the complexity of the development of childhood obesity, contrary to what many lay people believe, several clinical studies concluded that obese children do not consume significantly more calories than their thin peers (Dietz, 1993; Nicklas, Webber, Srinivasan, & Berenson, 1993; Schlicker, Borra, & Regan, 1994). These findings suggest that direct and indirect forces are at work to determine if a child will become obese. Researchers (Dietz & Gortmaker, 2001; Locard et al., 1992; Robinson & Killen, 1995; Schlicker et al., 1994) indicate that children's behaviors (e.g., physical activity, extent of television viewing, and food intake) all show significant relationships with obesity development.

A review of the scientific literature suggests that there has been a shift in thinking about the key etiological factors over the past 20 years, with more emphasis being placed in the interaction between genetic predisposition towards obesity and environmental factors that provide increased opportunities for overeating and under-exercising, and less being placed on the psychological factors that place a child at greater risk for obesity (Neumark-Sztainer, 1999). The emergence of genetic research over the past 20 years and the changing nature of obesity (viz., childhood obesity occurring at earlier ages) appear to be key factors leading to this shift in thinking. Conceptually, the predominant viewpoint among researchers concerning childhood obesity etiology is that multiple factors contribute to the age of onset and the progression through adulthood (Allison et al., 1996; Herskind et al., 1996; Gortmaker et al., 1990; Sherwood, 2000).
Studies largely support the theory that childhood obesity is the result of energy imbalance, an excess of energy intake “over-eating” relative to energy output “under-activity” (Kraemer et al., 1990; NTFPTO, 1994; Pinhas-Hamiel et al., 1999), yet some studies have shown that caloric intake and activity level are only weakly correlated with obesity (Keen, Thomas, & Jarrett, 1982; Ku, Shapiro, Crawford, & Huennemann, 1981; Shapiro et al., 1984). Sherwood (2000) from the University of Minnesota’s School of Public Health, Division of Epidemiology, sums up the issue well. Sherwood stated, “obesity and overweight are multi-determined chronic problems resulting from complex interactions between genes and environment characterized by energy imbalance due to sedentary lifestyles and ready access to an abundance of food” (p. 2).

The influence of bottle-feeding or early introduction of solid foods to the infant diet on risk of childhood obesity is unclear (Fomon, Rogers, Ziegler, Nelson, & Thomas, 1984), as are the relative contributions of genetics and environmental influences, such as parental modeling. Similarly, the extent to which the style of eating, such as speed or chewing rate, may be implicated in the development of childhood obesity is unclear (Barkeling, Ekman, & Rossner, 1992).

According to nutritional surveys conducted in the U.S., there appears to be a correlation between the degree of obesity and the amount of fat consumed (Morton & Guthrie, 1998; Strauss & Knight, 1999). While traditional patterns of the family eating at the kitchen table may still be our image of usual practice, eating patterns for children have changed (Crockett & Sims, 1995; Johnson, Eaton, Wahl, & Gleason, 2001). Almost half of family food expenditures (46%) are for food and beverages served outside the home, with 34% of total food dollars spent on fast
foods (Johnson et al., 2001; Rosenstock, 1990). Fast-foods typically have 45%-55% of their calories from fat, which warrants further concern and investigation (MacKenzie, 2000).

Popular theory suggests that the current epidemic of childhood obesity is caused largely by existing in a culture that promotes excessive food intake and discourages physical activity (Grundy et al., 1999; Hill & Peters, 1998; Hill, Wyatt, & Melanson, 2000). Hill and Peters (1998) described the U.S. culture as an aberration, one that is conducive to obesity and more recently detailed how the environmental forces in our society have promoted weight gain in children. Refer to Appendix E. Although humans have evolved excellent physiological mechanisms to defend against body weight loss, they have only weak physiological mechanisms to defend against body weight gain when food is abundant. Control of portion size, consumption of diet low in fat and energy density, and regular physical activity are behaviors that protect against obesity, but it is becoming difficult to adopt and maintain these behaviors in the current environment (Hill & Melanson, 1999).

Psychosocial Determinants of Obesity

Just as the physical child grows and develops in sequential fashion, so does the psychosocial person (Creswell, Newman, Anderson, 1985). The nonphysical aspects of emotional development are the products of a person's psychological makeup and the continuing interaction of that child with society (Creswell, Newman, & Anderson). Because psychosocial development has unique characteristics, behavior based on development can vary greatly. Despite diversity and unique character of children in our society, there are generally accepted descriptions of normality based on: family, society, culture, and the individual
(Creswell, Newman, & Anderson). Hence, psychosocial development is heavily reliant on shared experiences in culture and determined largely by a dominant cultural group or groups in any given area.

Overweight and obesity are stigmatized conditions in the United States (Bray, 1998; Ernsberger & Koletsky, 1999; Gortmaker, Must, Perrin, Sobol, & Dietz, 1993; Wadden & Stunkard, 1985). Restated, overweight and obese children often experience discrimination and stigmatization by society and their peers, which contributes to psychological stress and low self-esteem (Ernsberger & Koletsky, 1999; Smith, 1999). However, psychosocial problems in obese children cannot be generalized to whole populations nor have studies comparing obese and non-obese persons consistently found significant differences in psychological functioning (e.g., depression or anxiety) (Friedman & Brownell, 1995). Recent findings prompted Smith (1999) to state, “Many obese young people as well as adults seem perfectly happy with themselves, appearing to be confident, sociable, and well liked by peers. They have accepted their obesity as a fact of life” (pp. 12-13).

On the contrary, Gortmaker et al. (1993) followed overweight adolescent males and females who subsequently became obese adults and found that there were profound psychosocial consequences of being obese. Dietz (1998) claimed that the most prevalent consequence of childhood obesity is psychosocial. While there are widespread examples of discrimination against people of all ages that are obese, the most potentially damaging consequence may be the psychological well-being of obese children (Davison & Birch, 2002; Friedman & Brownell, 1995; Neumark-Sztainer et al., 1997). Of great concern is that obese children may be at risk for lower self-esteem and higher depression (Neumark-Sztainer et al., 1997; Strauss,
2000), yet several studies show weak or inconsistent associations (French, Story, & Perry, 1995; Friedman, Wilfrey, Pike, Stiegel-Moore, & Rodin, 1995; Strauss, 2000). However, in one study among virtually all ethnic groups, obesity was associated with a poorer attitudinal body image (Friedman & Brownell, 1995).

Examples of psychosocial antecedents include social stigmatization, psychopathology, binge eating, and body image perceptions. There is little consensus among researchers regarding the etiology of these problems (Colditz & Mariani, 2000; Parizkova & Hills, 2001; Strauss, 2000). Although, studies have shown a clear association between obesity and low self-esteem, especially in adolescents (Braet, Mervielde, & Vandereycken, 1997; French et al., 1995), the causal relationship remains speculative (Strauss, 2000). Differences in age, race, and income among studies may account for discrepant findings (Strauss, 2000). For instance, in one study, low-self esteem is not characteristic of obese inner-city black children (Kaplan & Wadden, 1986).

There are claims that psychosocial antecedents in children are innate, while other studies point to the notion that obesity is caused by through social pressures to be thin (Parizkova & Hills, 2001). It has also been theorized that children who accrue stress in the family and at school have a higher propensity for overeating, especially with foods that contain a high proportion of fat and sugar (Parizkova & Hills, 2001). What is certain is that in mainstream America, eating tends to be a focal point in people's lives, and the comfort foods of childhood may provide a safe haven from social pressures. Food has been described as a "mood regulator" (Riebel, 2001). Furthermore, Dalle Grave, Oliosi, Todisco, and Vanderlinden (1997) contended that food effectively numbs and distracts from life's disappointments, to
the point for some individuals that the act of eating can be considered a form of
dissociation from everyday life.

In American and other Westernized societies, there are powerful social
messages that people, especially women, should be thin and that to be overweight is
a sign of poor self-control (Bray, 1998; Garn, 1986; Parizkova & Hills, 2001; Smith,
1999). Although in other cultures, a large body size is desirable and considered a
symbol of wealth, robustness, and prestige (Parizkova & Hills, 2001; Smith, 1999).
What's troubling, especially for children, is that the body shape considered ideal in
the U.S. is not necessarily one that is biologically determined or for many reasons is
"not biologically attainable" (Parizkova & Hills, 2001). However, as Parizkova and
Hills point out, children learn what constitutes a socially desirable body shape very
early in life, and due to biological differences, only a few "individuals will meet
societal expectations" (p. 186).

There is some evidence that members of other racial and ethnic groups are
less harsh in their evaluation of obese individuals (Kumanyika, Wilson, & Guiford-
Davenport, 1993; Melnyk & Weinstein, 1994). In Samoa, for example, where large
body size is prevalent, people do not have as strongly negative a view of obesity as
is common in the United States (Brewis, McGarvey, Jones, & Swinburn, 1998). An
additional study assessed 213 Puerto Rican immigrants to the United States and
found a wide range of acceptable weights among them (Massara & Stunkard, 1979).
In yet, another study, Crandall and Martinez (1996) found that Mexican students
were significantly less concerned about their own weight and were more accepting
of other obese people than were U. S. students.
Negative attitudes about the obese have been reported in children and adult subjects (DeJong, 1993; Garn, 1986; Smith, 1999; Yuker & Allison, 1994), in health care professionals (Bray, 1998; Bray, York, & DeLany, 1992), and in salespersons (Pauley, 1989). The general public's negative attitudes about the obese, especially women, have translated into discrimination in employment (Gortmaker et al., 1993; Pingitore, Dugoni, Tindale, & Spring, 1994; Smith, 1999), paying for college (Crandall, 1991), job earnings (Frieze, Olson, & Good, 1990; Gortmaker et al., 1993); housing (Karris, 1977), and opportunities for marriage (Gortmaker et al., 1993; Smith, 1999; Sonne-Holm & Sorensen, 1986). As one researcher pointed out, "the negative attitudes of nonobese children toward those who are obese or otherwise 'different' are formed early in life" (Smith, 1999, p. 12). Smith states, "[C]hildren as young as 6 years of age rated obese children as 'less likable' than those who aren't, and rated obese kids even more negatively than children having facial disfigurement or missing limbs" (Smith, 1999, p. 12).

When researchers (Hare, Price, Flynn, & King, 2000) examined exercise professionals' perceptions of the cause of obesity, 52% responded that psychological problems played a major role. Psychological problems ranked fourth behind sedentary lifestyle (89%), poor eating behaviors (84%), and excessive calorie consumption (70%). Obesity is a complex and increasingly prevalent disorder that can confer a number of medical, social, and psychological difficulties which differ in severity between individuals (Faith, Fontaine, Cheskin, & Allison, 2000).
Theoretical Framework, Epidemiology, and Childhood Obesity

Historically, since early epidemiology focused on outbreaks of diseases with infectious origins, the idea of a single cause was effective for the control of disease (Gordis, 1996). With the advent of chronic conditions of noninfectious origin (e.g., childhood obesity etiologies), modern epidemiology has been forced to move from a single-cause conceptualization of causality to one that identifies the presence of multiple causes (Gordis, 1996). The concept of multiple cause is particularly applicable to noninfectious, chronic conditions like obesity (Gordis, 1996; Sowan, 1996). The host-agent-environment model is basic to public health analyses of infectious diseases, but it can also be applied to chronic diseases (McLeroy et al., 1988).

Multiple theories from multiple disciplines need to be called upon to examine all interdependent factors that relate to the phenomenon under study, due to the multi-factorial nature of obesity (De Spiegelaere et al., 1998; Goetz & Caron, 1999; Jacoby et al., 1975; MacD. Hunter et al., 1997; Mei et al., 1998; Neumark-Sztainer, 2000; Ravelli & Belmont, 1979; Rolland-Cachera & Bellisle, 1986; Sherwood, 2000; Sobol & Stunkard, 1989). The concept of interdisciplinary integration is central to advancing individual and population health behavior change in research and practice, according to Glanz (1997).

Based on epidemiological concepts of risk, susceptibility, and causality (Timmreck, 1998), the ecological model, delineated several decades ago byBronfenbrenner (1979), identifies conceptual levels of environmental integration (Glanz, 1997). In this epidemiological model, factors are explored in terms of their interplay, and both direct and indirect causes of a problem like obesity can be identified (Clark, 1996; Neumark-Sztainer, 2000). Exposure to multiple causal
factors may have an additive or multiplicative effect. For children, the evidence is clear that multiple factors promote or inhibit development of obesity (De Spiegelaere et al., 1998; Jacoby et al., 1975; Mei et al., 1998; Neumark-Sztainer, 2000; Ravelli & Belmont, 1979; Rolland-Cachera & Bellisle, 1986; Sherwood, 2000; Sobol & Stunkard, 1989). Genetic predisposition is biological and therefore cannot be changed (at least not to date). Other factors, such as diet, physical activity, stress, judgment skills, interpersonal communication skills, and self-esteem, are subject to manipulation (Goran, 1998; Haus, Hoerr, Mavis, & Robinson, 1994; Rosenbaum & Leibel, 1998a).

The ecological approach allows mapping of interrelationships among environmental causal factors and assists in determining pathways by which obesity prevention in children will be the most feasible and effective (Glanz, 1997; Sallis & Owen, 1997). Behavioral changes in diet and physical activity require interventions at multiple levels (Booth et al., 2001; Neumark-Sztainer, 1999). Effective interventions to disrupt causal pathways and prevent childhood obesity are often possible without a complete understanding of all causal elements and their interrelations (Stanhope & Lancaster, 1996; Timmreck, 1998). Causal factors affecting childhood obesity can be divided into genetic host factors and environmental host factors. Styne (1999) reported that the epidemic of childhood obesity is not caused by a change in the gene pool, but rather by changes in our environment.

*Children, Environments, and Health Behavior: Reciprocal Determinism*

Our environment can be thought of in terms of social and physical dimensions. The term *environment* refers to an objective notion of all factors that can affect a person's
behavior but that are external to that person (Baranowski, Perry, & Parcel, 1997; Sallis & Owen, 1997) or beyond the individual (Durlak, 1995; Lindheim & Syme, 1983). People are an essential part of the environment; and their interactions with other people and with places significantly influence their health and well-being (Lindheim & Syme). A healthy environment is one that provides a range of opportunities for its inhabitants to shape the conditions that affect their lives in a positive manner (Lindheim & Syme). A child’s social environment may include: family members, friends in the neighborhood, a child’s teacher, a child’s coach, acquaintances, and friends at school. A broader view of the social environment can include: groups to which we belong, neighborhoods in which we live, the organization of our schools, and policies we create to order our lives.

The physical dimension of the environment includes aspects of our surroundings, which are identifiable by our senses. For example, the physical environment might include the size and temperature of child’s classroom, availability of certain foods in a school cafeteria, location of a soda machine in a high traffic area, or presence of media marketing in a child’s neighborhood. Physical and social environments do not exist independently of each other; any environment is the result of continuing interaction between natural and man-made components, social processes, and relationships between individuals and groups (Syme, 1992). There have been recent reports in the literature that social environment is associated with disease and mortality risks, independent of individual risk factors. These findings suggest that the social environment influence disease pathways. Yet much remains to be learned about the social environment, including how to understand, define, and measure it. The relationship between one’s environment and personal health is not simple or linear (Lindheim & Syme, 1983).
In Social Cognitive Theory, behavior is dynamic, depending on aspects of environment and the person, all of which influence and guide each other simultaneously (Bandura, 1978). The continuing dynamic interaction among the characteristics of child, behavior of that child, and environment within which behavior is performed is coined "reciprocal determinism" (Baranowski et al., 1997, p. 158). Conceptually, Bandura (1978) reported that behavior is not simply the end result of environment and the child, just as environment is not the result of the child and the action. Instead, environment, child, and behavior are continually interacting with one another on a dynamic level (Bandura, 1986). Recognizing the need to expand on Bandura's model and illustrate how the forces interact, Maibach and Cotton (1995) developed an illustration that depicts the avenues of influence. See Appendix G for a diagram of reciprocal determination of behavior, person, and environment.

**Environments and Situations in Children**

According to Baranoski et al. (1997), the environment is an objective notion that accounts for the sum of all elements that can affect a child's behavior but are physically external to that child. Environmental domains pertinent to an obese child have traditionally been grouped as individual, peer, family, school, community, national/state, and international factors (Davison & Birch, 2001; Dietz & Gortmaker, 2001; Neumark-Sztainer, 2000; Ritenbaugh et al., 1999). Although some variation of the domains exist based on discipline (Grzywacz & Fuqua, 2000), teasing out the subcomponents of the domains will elucidate theoretical environmental antecedents for predicting childhood obesity. The coding procedure
is simplified by allowing the researcher to tailor pertinent categories to research questions (Fraenkel & Wallen, 2000).

As cited by Grzywacz and Fuqua (2000), the environment can be further segmented into two distinct categories (i.e., physical and social). Examples of the social environment include, but are not limited to, family members, friends of the child, and classmates at school. Examples of a child’s physical environment include, but are not limited to, availability of healthy foods at school and home, safety in neighborhood, exercise equipment in the home, and availability of walking paths or recreational opportunities in the neighborhood. Situation is a child’s perception of the environment (e.g., place, time, physical features, activity, participants, and his or her own role in the situation). This concept of situation corresponds to Lewin’s (1951) notion of life space. Bronfenbrenner (1977) expanded on Lewin’s concept of life space and coined the term microsystem. From an ecological perspective, in order to understand a child’s behavior, one must understand a child’s environment and situation (Parraga, 1990).

Conversely, the environment, according to Moos (1976), can affect behavior without the child’s awareness (e.g., if fresh fruits are made available in the child’s environment, the child will probably learn to include those foods in his or her daily diet). The same argument can be true for any food source, including fat. However, foods high in fat constitute a unique problem. Schlosser (2002) notes, once a taste for fat is acquired in childhood it is difficult to lose as an adult. Although, it has been noted by Baranowski et al. (1997) that a child’s cognitive awareness of his or her own social or physical environment is key to behavior. Simply, when a person is not aware of important opportunities in the environment, the influence of the
environment on behavior will be correspondingly limited (Baranowski et al., 1997). Situation, on the other hand, has been shown to guide and limit certain behaviors (Rotter, 1954). More specifically, the social situation and physical situation provide cues in a child's life about acceptable behaviors (e.g., if skim milk is not merely available at school but is also perceived by the child as a food product that is accepted by classmates as healthful, the child may begin to drink it, too). Booth et al., refer to these situations as behavior settings and define behavior settings as "physical and social settings in which physical activity and eating behaviors take place and choices are made" (p. S24).

Characteristics of environment are usually the result of personal and behavioral interactions between people in the child's life. An illustration of this concept is highlighted when family members make healthy foods available in the home and discuss with their child(ren) the importance of making healthy foods a routine. A model of family reciprocal determinism (Taylor, Baranowski, & Sallis, 1994; Baranowski, 1996) illustrates the complexities of the habitual patterns of family conversation which directly link and influence the child's social environment (e.g., when family interactions are characterized as conflictual in nature, whether and how the family members seek information or assistance from one another characterizes a supportive or non-supportive household climate). Within reciprocal determinism, behavior is a function of a child's shared environment with other family members and their behaviors and personal characteristics, all of which function within a larger environment (Grzywacz & Fuqua, 2000). In theory, reciprocal determinism acts on a child's preference for healthy foods, if he or she
will eat those foods (Domel et al., 1993), and what foods are available in the home, including certain prompts to eat those foods (Iannotti, O’Brien, & Spillman, 1994).

The environment has become increasingly important in both health behavior change and in the promotion of a healthy U. S. lifestyle (Booth et al., 2001; Durlak, 1995; Schmitz & Jeffery, 2000). For evidence of this phenomenon, one need only look at declining prevalence rates of adult cigarette smokers in America. Recently, national, state, and worksite policies restricting cigarette smoking, increased state taxation, and restrictive advertisement regulations have had a positive impact on decreasing the overall numbers of adult smokers in the United States (Biener, Abrams, Follick, & Dean, 1989; Blumenthal, Hendi, & Marsillo, 2002; CDC, 2002; Booth et al., 2001). In comparison, the absence of healthy foods in the home negates their increased consumption among children and their families (Kirby, Baranowski, Reynolds, Taylor, & Binkley, 1995). Increasing availability of low-fat meals in schools is a proven method of increasing student consumption of healthy meals (Simons-Morton, Parcel, Baranowski, Forthofer, & O’Hara, 1991). Utilizing an ecological framework to identify a child’s current social and physical environment appears to be paramount if we are to influence his or her behaviors toward preventing pediatric obesity.

**Difficulty in Targeting Environmental Factors**

One explanation for absence of an established multi-disciplined ecological model for preventing obesity in children centers around the dilemma of measuring social and environmental variables thought to contribute to the condition of obesity. Sallis and Owen (1997) argued that difficulty in studying environmental and social variables may discourage researchers from pursuing investigations based on
ecological models. Additionally, the challenge of altering or removing environmental antecedents often requires shifting the behavioral change target from the individual to policy makers in communities and government (Sallis & Owen, 1997). The challenge does not end there. Fielding et al., (2002) posits that policymakers are placed into non-traditional roles as health behavior change advocates, which may or may not be championed and/or advocated by their constituencies. Booth et al., (2001) recommends that since strategies aimed at changing the environment are less familiar, partnerships “...outside traditional health domains” may need to be called upon for additional ecologic support (p. S21). Lastly, Sallis and Owen (1997) stated, “the very fact that environmental variables are ubiquitous and can have wide-spread effects on a population makes them difficult, if not impossible, to study” (p. 420). Durlak (1995) offers other reasons why targeting environments for behavior change is difficult:

- Implementation of environmental change outside the classroom is difficult (i.e., student level approach easier to implement)
- Involving parents in school health program is challenging, and
- Currently we lack a good taxonomy of environments, making it difficult to identify what and how things should be changed and how such changes should be measured for success (p. 80).

Glanz (1997) suggested that utilizing an ecological approach model examines health and behavior at multiple levels. Glanz stated, “this ecological perspective emphasizes two main options: change people or change the environment. The most powerful approaches will use both of these options together” (p. 447).
Epidemic of Childhood Obesity Forces Paradigmatic Shift in Health Behavior Theory

In light of the rising obesity prevalence rates in the U.S., health policy makers and researchers are stressing the need to reexamine the fundamental conceptual approach to primary prevention of obesity (Battle & Brownell, 1996; Davison & Birch, 2001; Goetz & Caron, 1999; Horgen & Brownell, 2002; Nestle & Jacobson, 2000; Schmitz & Jeffery, 2000). One approach to prevention of obesity is to examine public policy as a means for changing diet and activity (Blumenthal, Hendi, & Marsillo, 2002; Horgen & Brownell, 2002; Nestle & Jacobson, 2000). Policy proposals as a means to change diet and exercise are in their "...infancy, and are largely untested, but they are worthy of further discussion and testing" (Wadden et al., 2002, p. 519). Policy initiatives to prevent childhood obesity were suggested by Horgen and Brownell (2002):

1. Regulate food advertising aimed at children
2. Prohibit fast foods and soft drinks from schools
3. Subsidize the sale of healthy foods in small controlled environments
4. Tax unhealthy foods, and
5. Provide resources for physical activity

Researchers stress that policy initiatives may not be acceptable to the public, nor may they be effective (Wadden et al. 2002). However, Wadden et al. (2002) support policy research, based on viewing obesity as a public health issue, encourage funding and state that the issues “...become a central area of study in the obesity field" (p. 520). In accordance with a public health view, researchers have urged the U.S. to move towards an ecological prevention paradigm (i.e., sometimes also called environmental interventions) over a person-centered approach (Booth et al., 2001; Flegal, 1999; Hill &
Melanson, 1999; James, 1995; Nestle & Jacobson, 2000; Neumark-Sztainer, 2000) and stress the need to consider childhood obesity as a public health issue that merits greater attention (AOA, 2000; Bar-Or, 2000; Dietz, Bland, Gortmaker, Molloy, & Schmid, 2002; Kohl & Hobbs, 1998). It has been concluded that future research needs to adopt a broader conceptual approach (e.g., ecological paradigm) in order to understand and intervene against the processes leading to the development of obesity in children (Blumenthal et al., 2002; Davison & Birch, 2001). A working definition of ecological models posits that behaviors are influenced by intrapersonal, social, cultural, and physical environmental variables continually acting on an individual. The defining feature of an ecological approach is that the model takes into account the physical environment’s relationship to people at the individual, interpersonal, organizational and community levels (Lévesque, Richard, & Potvin, 2000; Sallis & Owen, 1997). According to DiNitto and McNeese (1996), models provide a set of theoretical proposals and assumptions based on theory for how the world works. Models further provide a set of heuristics and links between theories that researchers can use to explain human behavior and attempt to change that behavior (DiNitto & McNeese). Conceptually, the philosophical underpinning is that behavior does not occur within a vacuum. Specifically, ecological models are comprehensive health promotion models that are multi-faceted, concerned with environmental change, behavior, and policy that help individuals make healthy choices in their daily lives (Glanz, Lewis, & Rimer, 1997). Strengths of implementing an ecological approach to prevention of childhood obesity are: (a) potential exists to reach a greater number of a target population, (b) prevention program impact is maintained, and (c) parents become instrumental in the continual support and reinforcement for a child’s healthy behavior (Durlak, 1995).
Ecological Approach: California and the Tobacco War

Cigarette smoking is the leading cause of lung and bronchus cancer and currently is the number one preventable cause of death in the United States (US Department of Health and Human Services, 1990; 2001). Historically, public health approaches to reduce tobacco use emphasized interventions aimed at the individual smokers (US Department of Health, Education, & Welfare, 1979). However, the results of numerous studies indicated that too few individuals were reached for such a strategy to effect a measurable reduction in the number of people using tobacco (National Cancer Institute, 1992). Practitioners’ and researchers’ recognized a need for a new approach (Lévesque et al., 2000), that reflected an important paradigmatic shift from an individualized approach to a comprehensive view of health promotion (Lévesque et al). The ecological approach was selected as the approach that called for research and interventions that target multiple facets of a person’s environment: interpersonal, organizational, community, and public policies (Blumenthal et al., 2002; Lévesque et al). Examples of more environment-related strategies that are believed to have had substantial impact on tobacco use include the non-smokers’ rights movement, which is changing the image of the smoker and restricting the number of locations where smoking is permitted, and the increase in taxes on cigarettes, which is creating a financial disincentive to smoke (Blumenthal et al., 2002; Moskowitz, Lin, & Hudes, 1999). These approaches reflect a growing understanding of environmental influences on the smoker, but even more important, they acknowledge the necessity of approaching the control of tobacco use through an ecological paradigm.

The best example of an ecological approach that was successful at reducing population smoking prevalence started in 1988, when California voters passed
Proposition 99, which mandated a 25-cent increase in the state excise tax on each pack of cigarettes, with part of the proceeds spent on reducing tobacco usage in the state (Pierce, Gilpin, Emery, White, Rosbrook, & Berry, 1998). Specifically, tobacco funds generated by the excise tax (viz., $294 million) were spent on anti-tobacco health education activities, a state-wide mass media-led anti-smoking campaign, health education programs in schools, and community wide smoking cessation programs (Pierce et al., 1991). Other measures were considered important to change social norms regarding tobacco use, including: limiting exposure to tobacco advertising; protecting people from secondhand tobacco smoke; revealing and countering tobacco industry influence; reducing youth access to tobacco products; and providing cessation services (CDC, 2000).

By 1993, over 120 new local clean air ordinances in communities across California were enacted, and by 1994 a state law (viz., California’s 1994 Smokefree Indoor Workplace Law) was passed prohibiting smoking in most California workplaces (U.S. Department of Health and Human Services, 1993). Despite a multi-million dollar tobacco-industry public relations campaign to provoke bar owners to resist the Smokefree Indoor Workplace Law, the anti-tobacco constituency succeeded in thwarting efforts in the legislature to revoke the law. Henceforth, on January 1, 1998, smoking in California bars and gaming clubs officially became illegal (CDC).

Analysis of trends in per capita cigarette consumption indicated that the start of the California Tobacco Control Program in 1989 was associated with a 50 percent more rapid rate of decline that was unique to California (Pierce et al., 1998). Furthermore, during 1988-1997, per capita cigarette smoking in California declined
more than twice as rapidly compared with the rest of the country (Pierce et al., 1998). However, smoking rates in California were declining more rapidly than the rest of the country since the late 1980’s (CDC, 2000). Following the California model, aggressive and comprehensive tobacco-control programs have been implemented in other states, including Arizona, Florida, Maine, Massachusetts, and Oregon (CDC).

**Examples of Other Successful Ecological Models**

Disciplines utilizing the ecological model vary widely, and are documented in journals with a major focus on: public health, school health, health promotion, nutrition, sociology, psychology, ecological psychology, and political science. For example: the following journals specifically published programs utilizing an ecological approach with varying degrees of success.

- *American Journal of Community Psychology*
- *American Journal of Public Health*
- *Exceptional Children*
- *Health Education Quarterly*
- *Social Forces*
- *The Journal of Rehabilitation*
- *The Journal of Social Issues*

Five examples of programs utilizing an ecological approach include:


Borland and associates examined the effects of imposing a ban of cigarette smoking on 391 smokers in a workplace setting. Individual behavior was changed by altering
the environmental conditions in the workplace and results showed a reduction of cigarette smoking by more than 25\% (Borland et al., 1990).

The value of environmental and policy interventions to control tobacco use and prevent cardiovascular disease was established in the Brownson et al., study. Interventions included; clean air acts, tobacco taxes to fund public health programs directed at smoking, and urging state and local health departments to collaborate with other entities. Results showed that interventions such as clean air acts encourage change in individual behavior based on changes in the environment (Brownson et al., 1995).

Coulton (1996) utilized an ecological model to examine how urban life impacted and fostered certain patterns of risk behavior in children. The effects of urban decline including racial segregation, consequences, neighborhood characteristics, and individual behavior were all measured by applying an ecological model (Coulton, 1996). By recognizing the physical environment and the risks an urban setting may pose on young children, Coulton concluded that efforts to alter the environment may prevent risk taking behavior in children.

Project Northland (Perry et al., 1996) was a community based alcohol use prevention program directed at reducing adolescent alcohol use. The program utilized social behavioral programming in the schools, peer education, parental and community involvement, and community task forces to reduce adolescent alcohol consumption. The project aimed at changing individual behavior and the environment (or accessibility) in regards to alcohol use. After three years, results indicated that prevalence and onset of alcohol use in targeted communities had decreased (Perry et al., 1996).
Lastly, Lesar (1995) utilized the ecological model to examine how caring for children with HIV affected the family unit. Lesar measured family functioning, parenting stress, and social support of caregivers. The ecological model was applied specifically to analyze how the HIV infected children affected family functioning and enabled behaviors and coping styles of family members to be measured (Lesar, 1995).

Traditional Dimension of Health Education: Knowledge, Attitudes, and Skills

School-based prevention is a relatively young science with 74% of all published research occurring after 1979 (Durlak, 1995). Psychological theories and models that place primary attention on the individual-level beliefs, attitudes, and values (Glanz, Lewis, & Rimer, 1997) typically have been the driving force of health education and health education research (Watts, Donahue, Eddy, & Wallace, 2001). An indirect, but significant limitation of focusing solely on an individual is the potential for victim-blaming (Lévesque et al., 2000; Minkler, 1994; Neumark-Sztainer, 1999).

Recent studies have argued that historically too much emphasis in health promotion programming was placed on person-centered knowledge and skill acquisition (Allensworth, 1993; Lévesque et al., 2000; Sallis & Owen, 1997) without targeting the environment (Booth et al., 2001). The current environment favors an imbalance between food intake and physical activity, which potentially contributes to obesity and a host of chronic diseases (French et al., 2001; Hill & Peters, 1998; Wadden et al., 2002). As Blumenthal et al., (2002) aptly phrased, “attempts to decrease obesity that focus primarily on changing individual behavior have been ineffective” (p. 2178). An ecological approach therefore emphasizes
external interactions with the world (i.e., transactions between the individual and the environment at the interface or point which they meet), which is different from focusing on fixing or curing the individual (Kirst-Ashman & Hull, 1993).

The focus of improving knowledge with hope of favorable behavior change has not been effective in most areas tried (e.g., HIV/AIDS and sex education, drug-use prevention, pregnancy prevention, and health education in general) (Durlak, 1995). For example, studies measuring knowledge, attitude and beliefs on exercise, have consistently shown a weak or inconsistent correlation to behavior (Sallis et al.). Similarly, education-based programs have met with limited long-term success in changing eating behavior, owing in large part to a general lack of supporting environmental modifications (Bronner, 1996).

The contention is that most health education prevention programs failed because factors beyond the individual (viz., the environment) in most cases were ignored (Booth et al., 2001; Flegal, 1999; Grundy et al., 1999; Hill & Melanson, 1999; Nestle & Jacobson, 2000; Winett, 1995). According to Grzywacz and Marks (2001), “most health behavior research does not give adequate attention to notable contextual or ecological factors that may support or undermine participation in physical activity” (p. 206). Ecological models provide a mechanism for linking health education and health protection emphasizing a shared framework for change targeted at the individual behaviors and the environment. Although the promise of ecological models for improving people’s abilities to understand and improve health behavior is acknowledged, relatively little research attention has focused on environmental influences on health behavior (Sallis & Owen, 1997).
Environmental Antecedents of Childhood Obesity: Ecological Model

The current epidemic of obesity is caused largely by an environment that promotes excessive food intake and discourages physical activity (Battle & Brownell, 1996; French et al., 2001; Hill & Peters, 1998; Schmitz & Jeffery, 2000). The current study addresses childhood obesity as an ecological construct (Bronfenbrenner, 1979) that considers the development of obesity as a characteristic of individual development that is embedded in a system of interacting factors, which make both direct and indirect contributions to children’s health. Bronfenbrenner’s model posits that behaviors such as physical activity and eating behavior are influenced by a variety of factors from multiple ecological levels (e.g., individual, microsystemic, mesosystemic, and macrosystemic) and change as a function of developmental and historical time (Grzywacz & Marks, 2001). According to Sallis and Owen (1997), “the ecological perspective, as it has evolved in sociology, psychology, economics, and public health, focuses on the nature of people’s transactions with their physical and sociocultural surroundings. Thus, ecological refers to models, frameworks, or perspectives rather than specific variables” (p. 403).

The ecological approach to the childhood obesity epidemic is valued because the majority of health education programs implemented in schools or communities have focused on individual knowledge acquisition (e.g., what is a low-fat diet and what is physical activity) rather than on focusing on the environments that reinforce negative health behaviors, (viz., mass availability of fast food leading to poor diet or the reduction of physical education classes in schools prohibiting activity in children) (Flegal, 1999; Grzywacz & Fuqua, 2000; Hill & Peters, 2000; Nestle & Jacobson, 2000; Sallis & Owen, 1997; Stokols, 1992).
Conceptually, by utilizing an ecological approach, scholars can integrate a wide variety of known environmental antecedents to physical activity and eating behaviors into a prevention model (Grzywacz & Marks, 2001). Specifically, several studies (Birch & Davison, 2001; Flegal, 1999; Golan & Weizman, 2001; Hochbaum, 1981; James, 1995; McLeroy et al., 1988; Nestle & Jacobson, 2000; Neumark-Sztainer, 1999; Ritenbaugh et al., 1999; Schmitz & Jeffery, 2000) have suggested an ecological approach to preventing childhood obesity through examples of discipline specific models, frameworks or initiatives. Utilization of such models or frameworks can identify barriers to behavior, which can be addressed through social change or an environmental health policy initiative. As Stokols (1992) pointed out, "the delineation of specific environmental leverage points for health promotion at each level of analysis remains an important task" (p. 7).

Utilization of an ecological model is of paramount importance because it allows investigators to identify all of the antecedents known and hypothesized to contribute to a specific health issue (Grzywacz & Marks, 2001) or as in the case with obesity in children (Neumark-Sztainer, 2000). The etiology of childhood obesity is multi-factorial (De Spieghelaere et al., 1998; Jacoby et al., 1975; Mei et al., 1998; Neumark-Sztainer, 2000; Ravelli & Belmont, 1979; Rolland-Cachera & Bellisle, 1986; Sherwood, 2000; Sobol & Stunkard, 1989) and the ecological approach allows public health researchers to address the multiple antecedents and design multiple interventions appropriate for each domain (e.g., social norms/national policies, community factors, school factors, interpersonal factors, and intrapersonal factors). See Figure 2. for definitions of each level of influence.
<table>
<thead>
<tr>
<th>Concept</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Norms/National Policies</td>
<td>Local, state, federal policies and laws that regulate or support healthy actions and practices for disease prevention, early detection, control, and management.</td>
</tr>
<tr>
<td>Community Factors</td>
<td>Social networks and norms, or standards, which exist as formal or informal among individuals, groups, and organizations.</td>
</tr>
<tr>
<td>Institutional Factors (School)</td>
<td>Rules, regulations, policies, and informal structures, which may constrain or promote recommended behaviors.</td>
</tr>
<tr>
<td>Interpersonal Factors: (Social Interactions)</td>
<td>Interpersonal processes, and primary groups including family, friends, peers, that provide social identity, support, and role definition.</td>
</tr>
<tr>
<td>Intrapersonal Factors: (Personality)</td>
<td>Individual characteristics that influence behavior, such as knowledge, attitudes, beliefs, and personality traits.</td>
</tr>
</tbody>
</table>

*Figure 2. An Ecological Perspective: Levels of Influence*


Specifically, the ecological niche according to Birch and Davison (2001) includes: family and individual which are embedded in larger social contexts including: community, societal factors at large, cultural norms and laws. The reciprocal
approach highlights the importance of considering the child as part of the environment and vice versa.

Smith (1999) noted that many factors in a child’s environment and metabolic factors interplay and directly impact on the evolvement of obesity development. According to Neumark-Sztainer (2000), an ecological approach to viewing the problem of childhood obesity is valued because the approach emphasizes the multifactorial etiology and necessity for multi-tiered interventions that can address each risk factors. Risk factors associated with childhood obesity developed by Neumark-Sztainer (2000) are illustrated in Appendix H. Furthermore, the ecological approach correctly distinguishes the large role that society, community, and school factors play, and thus averts the possibility of victim blaming (Becker, 1986; Neumark-Sztainer, 2000).

According to Neumark-Sztainer (2000), the five domains of obesity correlation are broken into distal and proximal factors that correlate to obesity development in children. Distal factors are (a) social norms and national policies, (b) community factors, and (c) school factors. Proximal factors are (d) individual/interpersonal factors and (e) individual/intrapersonal factors. Interpersonal and intrapersonal processes are important sources of influence in health-related behaviors (McLeroy et al., 1988). According to McLeroy et al. (1988), interpersonal relationships, or processes, directly involve family, friends, neighbors, contacts at school, and acquaintances. Intrapersonal processes, according to McLeroy et al. (1988), involve the psychological models of the past, including (a) value-expectancy, (b) attitude change, (c) health belief, (d) theory of reasoned action, (e) social learning, (f) locus of control, (g) psychology of control, (h) stress
and coping, (i) attribution, (j) personality, (k) decision making, and (l) operant conditioning with incentives.

Referring to Appendix H the larger arrows (e.g., moving from the top to bottom), according to Neumark-Sztainer (2000), represent the more influential distal ecological factors pertaining to childhood obesity. Those more powerful distal factors are (a) social norms/national policies, (b) community factors, and (c) school factors. For example, the availability of fast foods in our community is likely to influence food intake patterns of families (e.g., high-fat, high-salt, high-sugar food items and large portion sizes, indicative of fast food restaurants). However, there are also smaller arrows going in the opposite direction suggesting a bi-directionality of influence (e.g., family practices of eating out at fast-food restaurants will lead to fast-food restaurant proliferation in the community) (Neumark-Sztainer, 2000).

Social Norms/National Policies

The ecological approach emphasizes the importance of the broad social/physical environment of children and the environmental influence on children’s health-related behaviors and conditions (McLeroy et al., 1988; Smith, 1999). Smith (1999) noted that there has been “an explosion of labor-saving technologies” that has led to a decrease in physical activity and to an increase in sedentary work habits (p. 70). Additionally, Neumark-Sztainer (2000) noted that technological advances have contributed to the increased prevalence of childhood obesity via increases “in food availability, changes in the types of available foods, and steep decreases in the amount of physical activity that is needed for survival” (p. 4). However, the decrease in children’s physical activity levels over past 30 years is not well documented (Goran et al., 1999; Lindquist, Reynolds, & Goran,
Battle and Brownell (1998) elaborate on cultural norms theorized to decrease physical activity by stating:

Wonders of modern civilization such as central heating lessen the energy cost of maintaining body temperature, and air conditioning makes it much more comfortable on hot summer days to stay inside and watch television or play computer games than to engage in outdoor activities. (p. 19)

Nevertheless, the environment in which we live is gradually changing to one that requires less physical activity and promotes a sedentary lifestyle (Booth et al., 2001; Haskell, 1996). While technological advances are unlikely to be reversed, other factors in our society that contribute to childhood obesity are modifiable (Neumark-Sztainer, 2000).

In one study, Gortmaker et al. (1996) implicated the sedentary behavior associated with excessive television viewing as a cause of obesity. The average child watches television for 21-23 hours a week (Gortmaker et al., 1996). Among children aged 8-16 years examined in NHANES III, 61% reported watching two or more hours of television per day. Controlled studies on children’s choices have consistently shown that children exposed to television advertising choose advertised food products at significantly higher rates than do those not exposed (Coon & Tucker, 2002; Smith, 1999). Additionally, purchase request studies have documented associations between number of hours of television watched and number of requests for the child to the caretaker for specific food items, as well as presence of those items in the home (Coon & Tucker).

As reported by Pratt et al. (1999), television watching is a major marker for sedentary behavior in children and “may be an important health promotion target”
Several studies (Anderson et al., 1998; Coon & Tucker, 2002; Dietz & Gortmaker, 1985; Durant, Baranowski, Johnson, & Thompson, 1994) report a positive association between the number of hours of television watched and indices of body fat and weight in children. According to Coon and Tucker (2002), "the combination of lifestyle factors that accompany heavy television use appear to place children at risk for obesity and poor nutritional status" (p. 423). The Nielsen 1998 Report on Television, reports that by the time an average child graduates from high school, the time devoted to watching television will exceed the hours spent in school (Nielsen Media Research, 1998).

The food industry in the United States annually spends $199 billion to influence consumer spending on foods (Sampat, 1999). Nearly 70 percent of food advertising is for convenience foods, candy and snacks, alcoholic beverages, soft drinks, and desserts, whereas just 2.2 percent is for fruits, vegetables, grains, or beans (Gallo, 1999). According to Nestle (2002), food companies exert disproportionate influence on government nutrition policy through food lobbies and lobbyists. Soft drink companies aim advertising campaigns at children in efforts to develop lifetime brand loyalties and capture market shares (Nestle). It is estimated that the average U.S. citizen is exposed to 254 advertisements a day (Sampat). Food advertising on television often targets children, urging them to consume foods high in sugar, high in fat, and high in total calories (Coon & Tucker, 2002; McCarty & Connelly, 1993; Nestle, 2002; Smith, 1999). Policy and national norms have created a U.S. food industry has had an impact of what and how we consume our meals. As Nestle (2002) notes:
The U.S. food industry is the remarkably successful result of twentieth-century trends that led from small farms to giant corporations, from a society that cooked at home to one that buys nearly half its meals prepared and consumed elsewhere, and from a diet based on ‘whole’ foods grown locally to one based largely on foods that have been processed in some way and transported long distances (p. 11).

James (1995) adds that there has been observable marked change in the way people eat that has been influenced by our culture as a result of marketing practices in the U.S. James reports that three features dominate; they are as follows:

1. There has been a substantial increase in eating outside the home;
2. The move to what is termed ‘grazing’ (viz., continuous snacking or frequent, light eating behavior throughout the day) rather than meal eating; and
3. A shift in the time of day when maximum energy is ingested (e.g., eating the largest daily meal in the evening is conducive to weight gain because exercise levels are normally reduced, thus negating a greater energy output which is apparent when food and exercise happen together) (p. S39).

According to Smith (1999), (a) children eat more frequently today as compared to the 1960s, (b) children eat more of their total kcals from fat-containing snacks, (c) children eat more meals outside the home (not including schools), commonly in fast-food outlets, and (d) more families carry food home that has been prepared in fast food restaurants. For example, in 1989 an estimated 200 people in the U.S. ordered one or more hamburgers in a restaurant every second
(Massachusetts Medical Society Committee on Nutrition, 1989). In 1994-1995, 57 percent of Americans of all age groups and 71 percent of adolescent boys consumed meals and snacks away from home on any given day, up from 43% in 1977 (Smith, 1999). Especially alarming, according to Borrud (1997), is that 40% to 55% of kcals in most fast food meals are derived from fat.

Community Factors

It is argued that Americans live in an environment that does not favor balance between physical activity and food intake. A wide range of community characteristics may influence an individual’s ability to practice behaviors related to health (Cheadle et al., 1999). Our current society is structured so that most people do not need to be physically active during a typical day (Booth et al., 2001; Hill & Peters, 1998). For example, land use policies not only facilitate dependence on automobiles, but also hinder alternative modes of transport that demand more physical activity, like walking or cycling (Booth et al., 2001; Egger & Swinburn, 1997). When acted upon and changed, the socio-environmental factors frequently bring about more sustainable change in individual and population health behavior (Green & Krueter, 1999; Stokols, Pelletier, & Fielding, 1996). Community factors may be key explanatory factors for the large disparities between youth of different socioeconomic, demographic, and racial backgrounds (Neumark-Sztainer, 2000). Neumark-Sztainer states, “an important community-level factor that may decrease the level of activity among youth is the actual, or perceived, safety level of being outside” (p. 4).

Parents who perceive their community is unsafe may be less likely to permit their children to play outside and opt for the safer activity of television watching
(Nestle & Jacobson, 2000; Smith, 1999). Other community factors that may negatively impact exercise levels that have been identified are low availability of recreational programs, lack of inexpensive and accessible fitness facilities, lack of sidewalks in neighborhoods, high levels of traffic in community, and high levels of perceived crime in neighborhood (Nestle & Jacobson, 2000; Neumark-Sztainer, 2000).

Local food stores and restaurants have been theorized to influence the types of foods consumed by youth (Neumark-Sztainer, 2000). Children from lower socioeconomic backgrounds have increased levels of obesity (De Spiegelaere et al., 1998). Communities with predominately lower socioeconomic backgrounds may have more fast food restaurants in the community and inadequate amounts of fresh fruits, vegetables, and complex carbohydrates available (Smith, 1999).

School Factors

Millions of school children are exposed to programs with a preventive focus each year (Durlak, 1995). School based prevention takes many forms. Primary prevention consists of person- or environment-centered programs involving all children, only those at risk, or only those undergoing life transitions (Durlak). The school is an important site for instituting obesity prevention initiatives and programs because large portions of all children attend school and a large portion of eating and exercising is carried out in school (Gill, 1997; Story, 1999). More than 95% of American youth, aged 5 to 17 years, are enrolled in school, and no other institution has as much continuous and intensive contact with children during their first two decades of life (Resnicow, 1993). Although parental control influences what children largely eat, a school environment conducive to providing high-calorie, low-
nutrient soft drinks and other snack foods impacts consumption patterns to a greater
degree (Fried & Nestle, 2002). Furthermore, students in schools that provide access
to soft drinks and snack foods are less likely to consume fruits, juice, milk, and
vegetables than students who do not have such access (Cullen, Eagan, Baranowski,
Owens, & deMoor, 2000). Soda availability and consumption is of special concern,
because students who habitually consume soda take in fewer nutrients, but more
calories; and they are more likely to be overweight or obese after adjustment for
anthropometric, demographic, dietary, and lifestyle factors (Ludwig, Peterson, &
Gortmaker, 2001).

Factors within schools have been theorized to contribute to the childhood
services are often forced to rely on revenues from vending machines and a la carte
cafeteria food options that are not regulated for nutrient composition (as are school
food meals)” (p. 5). Concern exists that schools are continually providing meals
with excessive amounts of saturated fat and total fat (Zive et al, 2002). Other factors
theorized to contribute to the childhood obesity epidemic are (a) vending machines
that serve only high-fat/high-calorie food; (b) pricing strategies between junk food
vending machines and nutritious vending machines; (c) decline in physical
education requirement; (d) lack of opportunities for obese students to be active in
school; and (e) lack of focus on lifelong and fun physical activity within physical
education classes at school.

Recently, concern has been expressed over the quality and amount of
physical education in schools (Hill, Wyatt, & Melanson, 2000; U.S. Department of
Health and Human Sciences, Public Health Service, 1997). For example, while
progress is slowly shifting the focus of physical education away from sports and athletic ability toward the goal of health-related fitness, relatively little time is devoted to moderate or vigorous physical activity (Story, 1999). Additionally, most children do not engage in appropriate or recommended levels of physical activity, and the majority of their physical activity takes place outside of school. (Sallis et al., 1992).

Story (1999) stated that the primary goal of health education for obesity prevention should be to help children and adolescents adopt healthy eating behaviors and engage in regular physical activity (p. S47). Emphasis should be on helping students develop the knowledge, attitudes, and behavioral skills they need to establish and maintain healthy eating and a physically active lifestyle (U.S. Department of Health and Human Sciences, Public Health Service, 1997). Key learning concepts outlined by Story (1999) include the following:

- The physical, social, and emotional health benefits of physical activity and healthy diet;
- Social influences on eating and physical activity;
- Components of health-related fitness and healthy diet;
- Portion-size estimation;
- Healthy and safe weight management techniques; and,
- The development of safe and effective individualized physical activity programs.

However, school based prevention strategies based solely on the dissemination of information with hopes of changing student behavior have been proven to be ineffective (Booth et al., 2001; Durlak, 1995). According to Durlak, a
major shift has occurred in the focus of prevention research to include skills training (e.g., assertiveness, communication, self-control and self-management, decision making and goal setting). Many school health education programs including skill-based components have been effective (Allensworth, 1993), yet there are limits on the successes of these programs if only individual factors are targeted (Booth et al., 2001; Durlak, 1995). The second shift that has occurred involves extending the focus of school health education prevention from individual to environmental factors. Peers, parents, aspects of the school and classroom environment, the media, and social norms are all environmental influences on health behavior that have been studied (Durlak, 1995). Environmental change has been cited as a valuable component for reaching more children and for maintaining health education impact (Neumark-Sztainer, 2000). For instance, once a school food service introduces healthier foods in the cafeteria, most if not all, children are affected. Similarly, if parents select healthier foods at home, they can become a continual support and reinforcement for their children’s eating habits.

Interpersonal Factors

Research indicates that people, largely parents or guardians, have been theorized to significantly impact children’s eating practices and participation in physical activity (Gable & Lutz, 2000). Moreover, parenting itself is multiply determined and exists within an ecological framework (Belsky, 1984). The impact of family is key throughout infancy, childhood, and adolescence while the potential impact of peer norms increases as a child enters adolescence. Food availability and accessibility within the home and family meal patterns have been identified by adolescents as strong influences on eating behaviors (Neumark-Sztainer, Story,
Perry, & Casey, 1999; Smith, 1999). In one study (Oliveria et al., 1992), children having one parent who habitually ate foods with high total fat content were twice as likely to eat similar foods than were children whose parents had low total fat intakes. Additionally, when both parents consumed high fat foods, the probability of their children having high fat intakes was 3 to 6 times greater than in children whose parents had normal intakes (Oliveria et al.).

Over controlling infant and child feeding patterns that discourage internal regulation of energy intake may also increase a child's risk for obesity (Battle & Brownell, 1996; Birch & Fisher, 1998; Johnson & Birch, 1994; Smith, 1999). Although these studies illuminate parental over-control, an under-controlling attitude towards children's nutrition may also lead to overweight or obesity (Petit & Bates, 1989). Specifically, whether children learn to appreciate the role of healthy foods in their own physical and emotional well-being and to recognize their bodies' signs of hunger and fullness is integrally linked to the nutrition and mealtime environment created by parents (Gable & Lutz, 2000). Birch (1998) stated, "Children's preferences are shaped by the quantity and quality of children's experience with food, and as a result of many eating occasions in which foods are associated with the social contexts of eating" (p. 408S). Watching television, playing video games, and using a computer are widely considered sedentary activities. Decreased parental physical activity and increased television viewing have been theorized to contribute to increased obesity in children (Dietz, 1998c; Jeffery & French, 1998).
Intrapersonal Factors

Even though genetics has been shown to influence obesity onset (Commuzie & Allison, 1998), increased obesity prevalence suggest that environmental factors interacting with genetic factors may be key (Neumark-Sztainer, 2000). For example, a child with a genetic predisposition towards obesity, raised in a family in which high-fat foods are commonly consumed and within a community that is considered unsafe, is likely to become overweight (Neumark-Sztainer, 2000).

Eating behaviors that may put a child at increased risk for developing obesity are binge-eating, consumption of fast foods that tend to be high in calories, meal skipping, and excessive consumption of soda pop and snack foods (Neumark-Sztainer, 2000). Although widely believed to be true, obese kids have not been shown to eat more than non-overweight youth (Wishon, Bower, & Eller, 1983). It has been posited that obese children have under-reported their actual calorie intakes (Schoeller, 1990). Research has more consistently shown that low levels of physical activity are associated with higher BMIs in children (Epstein, 1995).

Content Analysis as a Research Method

Content analysis is one of the fastest-growing techniques in quantitative research (Neuendorf, 2002). However, if the technique is utilized for interpretive analysis, whereby the focus of the content to be analyzed is on the formation of theory from the observation of messages, the research qualifies as qualitative (Neuendorf, 2002). When a researcher (viz., content analyst) is in a constant state of discovery and revision, the technique falls into a qualitative research paradigm (Neuendorf, 2002). Duncan (1989) sums it up best by stating “content analysis is a
technique which lies at the crossroads of qualitative and quantitative methods” (p. 27).

The notion that “many words of text can be classified into much fewer content categories” (Weber, 1985, p. 7) is a central idea in qualitative data analysis. Content analysis has generally relied on examining the data to identify patterns, to develop categories, and to aggregate the content into discernible constructs (Insch, Moore, & Murphy, 1997). Berg (1995) states that quantitative research “refers to counts and measures of things” (p. 3), while Tesch (1992) defines qualitative research as “predominantly or exclusively using words as data” (p. 56). Several researchers have recommended combining methodologies in the study of the same phenomena to achieve triangulation and to improve study design (Denzin, 1978, Fielding & Fielding, 1986; Patton, 1990). Utilizing this combination process, theory emerges from a systematic examination of the data and is based on or grounded in the data (Tesch, 1995). Thus, in a grounded theory approach, the process of open coding allows the discovery of categories, their properties, and their dimensions, and category labels are derived from the words and phrases by the informants themselves (Glaser & Strauss, 1967). According to Gray and Densten (1998), theory guides coding decisions until the document is saturated with repetitious codes.

Content analysis of published research, as a recognized endeavor, received major impetus in the later part of the 1930s with the work of Harold D. Lasswell and associates. During World War II, Lasswell and his associates analyzed radio broadcasts of occupied European countries to better understand and predict events within Nazi Germany (Duncan, 1989). Later in the 1950’s, Lasswell and his associates analyzed The New York Times and The Los Angeles Times for social and
political changes in American society (Danielson & Lasorsa, 1997). Specific examples of themes (i.e., symbolic condensations of textual units) addressed include the rise and fall of Communism as a threat; the perception of change in American society; and the increasing importance of the executive branch of government (Danielson & Lasorsa).

In recent years, content analysis has been popular in communication-related disciplines (Weber, 1990). Content analysis has a long history of use in communication, journalism, sociology, psychology, and business. As a research method, content analysis, Krippendorff (1980) argued, provides a synthesis of communication content in terms of frequency or intensity of relevant social characteristics. In terms of a research design, Krippendorff noted that for content analysis, more so than for other technique, the research design as a whole must be appropriate to the context to which data are analyzed.

Kerlinger (1986) defined content analysis by stating “Content analysis is a method of studying and analyzing communications in a systematic, objective, and quantitative manner to measure variables” (p. 477). Systematic implies: (a) that “all relevant content is to be analyzed in terms of all the relevant categories” in order to collect unbiased information for the hypotheses being tested (Berelson, 1954, p. 489); (b) that analyses must be designed to secure data relevant to a scientific problem or hypothesis (Holsti, 1965). Objectivity stipulates that the procedure be explicit, on that can be replicated by other analysts (Budd, Thorp, & Donohew, 1967). Borg and Gall (1989) stated:

Objectivity in content analysis depends largely upon the classification procedures used. Specific and well-defined categories must be developed if
the content analysis is to be objective. These procedures must have a high level of reliability so that different research workers of comparable skill could use the procedures independently and obtain very similar results. (p. 257)

According to Babbie (1998), content analysis methods may be applied to virtually any form of communication. Among the possible artifacts for study are books, speeches, letters, laws, and constitutions (Babbie). Content analysis methods have also been applied to such nonverbal social artifacts as paintings, photographs, and silent motion pictures (Duncan, 1989). Because content analysis can be applied to examine any piece of writing or occurrence of recorded communication, content analysis is currently used in many disciplines, ranging from marketing and media studies, to literature and rhetoric, ethnography and cultural studies, gender and age issues, sociology and political science, psychology and cognitive science, and health sciences (Colorado State University, 2002; Duncan, 1989).

The simplest definition for content analysis is found in North, Holsti, Zanovich, and Zinnes (1963), who described content analysis as a research technique used for systematically collecting, analyzing, and making inferences from messages. In favor of analyzing journal publications, Krippendorff (1980) stated:

Educational material, long has been the focus of attention by social scientists, became recognized as a rich source of data both to make inferences about processes of reading . . . and to understand larger political, attitudinal, and value trends to be found in its text. (p. 18)

Kerlinger (1973) noted that content analysis is more than a tool of analysis; it is a technique of observation. Instead of observing people's behavior directly, or
asking them to respond to scales, or interviewing them, the investigator takes the communications that people have produced and asks questions of the communications (Kerlinger, 1973).

The purpose of content analysis, like all research methods, is to provide knowledge, new insights, a representation of facts and a practical guide to action (Krippendorff, 1980). To social scientists, facts are relevant in the context of social situations in which they occur and to the institutions within which they are exchanged, or to the culture within which they play a role (Krippendorff, 1980).

Content analysis can be utilized for many purposes. The following list highlights a few notable examples (Berelson, 1952; Weber, 1990, p. 9):

- Content analysis can compare media or “levels” of communication;
- Content analysis can audit communication against objectives;
- Content analysis can code open-ended questions in surveys;
- Content analysis can detect the existence of propaganda;
- Content analysis can reflect cultural patterns of groups, institutions, or societies;
- Content analysis can trace the development of scholarship;
- Content analysis can reveal the focus of individual, group, institutional, or societal attention; and
- Content analysis can describe trends in communication content.

There have been numerous applications of content analysis in health education research. Content analysts have examined both visual and written messages. In health education for example, analysts have applied content analysis to: textbooks and supplemental educational material to identify health objectives;
graffiti in public restrooms to determine the frequency of sexual themes, HIV/AIDS references, and expressions of homophobia; popular magazines to count the number of cigarette advertisements geared toward specific age and gender segments; Sunday comic strips to count the number of health-related topics covered; and selected health education journals to determine the type of research published, to name a few (Duncan, 1989).

Content Analysis Methodology

The foundation of content analysis lies in the coding process. As noted by researchers (Babbie, 1998, Krippendorff, 1980; Weber, 1990), these procedures must be carefully planned and documented so that different researchers at different times can apply the coding procedures and produce comparable results. Kang, Kara, Laskey, and Seaton (1993) stated:

A major methodological issue in content analysis is the consistency of the interpretation and categorization of the objects of interest . . . . The concern here is the categorization is ‘reliable’ in that coders place a given object consistently into the same category. The techniques used to assess the consistency of such coding are subsumed under the title intercoder agreement. (p. 17)

As for the method of content analysis, the first step is to “define the universe that is to be analyzed” (Kerlinger, 1973, p. 528). The universe of documents for a content analysis is analogous to the population in more ordinary statistical studies. As Duncan (1998) described “the universe is the whole body of documents which the researcher wishes to generalize about” (p. 30). In order to achieve representativeness, two elements are necessary: first, the universe must be explicitly
defined; secondly, the sample must be random (Beardsworth, 1980). For example, the universe for this study was defined by four steps: (a) the five disciplines to be studied were based on J. Clinton Smith's book; (b) the disciplines were then matched to subject headings listed in the *Journal Citation Reports: Science and Social Sciences* Editions, 1999); (c) Journals were then selected based on citation impact factor rankings (viz., *Journal Citation Reports: Science and Social Sciences* Editions, 1999); and (d) journals selected for analysis were the top three cited journals in each of the five disciplines.

The universe is then partitioned into categories and subcategories according to the purpose and research focus of the investigator. As categories are the basic method of data analysis, each category must be specifically designed in terms of specific problem/s under study. The specifics, often, are to describe the categories into substance (trends, themes, international comparisons, research operation), form (readability, style, propaganda technique), audience of communication (social setting and cultural patterns), and sometimes effects upon the content (attitudinal and behavioral responses) (Berelson, 1952). It is for this reason, Berelson argued, that an analysis of research literature with the help of content analysis can go further than subject matter categories and can indicate change of concepts, viewpoints, activities, or growth of the field over time.

Categories often require specific subdivision to represent the content under study and are generally subdivided into subcategories (e.g., units of analysis), (a) to clarify the content under analysis and (b) to go into the specifics of the study. The main objective of category formation is to ensure that categories adequately express the content under investigation and the units of analysis adequately express the
categories (Berelson, 1952). Logical exclusiveness, according to Weber (1985), is another precondition for category formation. Categories should be mutually exclusive in the sense that if a unit of analysis can be classified under more than one category, it should be classified only in that category which seems to be most logical and appropriate. When creating and defining the categories, Weber (1985) emphasizes the importance of well-constructed operational definitions for the categories and determination of the breadth and depth of each category.

Two Content Analysis Designs: Manifest Content Analysis and Latent Content Analysis

Analysis of data has been described as a "...process of bringing order, structure, and interpretation to the mass of collected data" (Marshall & Rossman, 1999, p. 150). To conduct a content analysis of any text, the text is coded, or broken down, into manageable categories on a variety of levels—word, word sense, phrase, sentence, or theme—and then examined using one of content analysis' basic methods: (a) conceptual or manifest analysis and (b) relational analysis or latent analysis (Colorado State University, 2002). Researchers conducting a content analysis can code either or both the manifest and the latent content of a communication (Fraenkel & Wallen, 1990). The two types of content are analogous to surface (e.g., words directly accessible to the naked eye) or deep (e.g., concepts or meanings not shown) structure of language (Fraenkel & Wallen). Both types of content have their roots in Freud's interpretation of dreams. The dream as reported was termed by Freud the manifest content, and the dream's underlying thoughts and wishes Freud called the latent content (Gregory, 1987).
Authors Babbie (1998) and Fraenkel and Wallen (1990) substitute manifest content analysis for conceptual analysis and latent content analysis for relational analysis. Manifest content is the visual, tangible content. The majority of content analysis literature has concentrated on manifest content, the “elements that are physically present and countable” (Gray & Densten, 1998, p. 420). An example of manifest content would be the total number of times a phrase, such as “lack of neighborhood sidewalks,” appears on the page. Manifest content lends itself to higher degrees of reliability since other researchers will know exactly how the content was measured and the procedure could be duplicated (Fraenkel & Wallen, 2000). However, researchers warn, when tabulating frequencies of manifest content (i.e., specific words, phrases, or sentences), care must be taken when identifying words. Roberts (1989) stated, “meanings inherent in words’ contexts may be lost” (p. 148). A computer program, for instance, will identify a word or phase in the overall frequency tabulation, but the computer cannot determine the context in which the word was used (Roberts, 1989).

In contrast, latent content analysis refers to the underlying meaning of the coded material. Latent content also consists of unobserved concept(s) that “cannot be directly but can be represented or measured by one or more . . . indicators” (Hair, Anderson, Tatham, & Black, 1998, p. 581). Although this content type is better suited for inferences and validity measures, reliability and specificity typically are less than that of manifest content (Fraenkel & Wallen, 2000).

Units of Observation and Units of Analysis

Babbie (1998) reminds researchers of the difference between the units of observation and the units of analysis. Holsti (1969) defined a recording unit (i.e.,
unit of analysis) as “the specific segment of content that is characterized by placing it in a given category” (p. 116). The units of analysis (Krippendorff 1980) substitutes the term *recording units* are analogous to the *what* or *whom* that is being studied. In contrast, the units of observation (Krippendorff [1980] uses the term *sampling units*) are the independent units with physically identifiable boundaries. For example, the unit of observation is the “body of material surrounding the coding unit” (Budd et al., 1989, p.36). Failure to differentiate between the two may result in sampling error (Babbie, 1998; Krippendorff, 1980).

Neuendorf (2002) stated “although the researcher is the boss, so to speak, there might be pragmatic or methodological reasons for choosing one type of unit over another” (pp. 72). For example, Gottschalk (1995) and colleagues have found the verbal clause to be the best unit of data collection. In their case, using the clause was found to be the smallest identifiable unit for which they could reliably code for in the study. Furthermore, the unit of analysis should be large enough to well represent the phenomenon under investigation (Neuendorf). Virtually all content analysis studies have utilized one of five units. (Holsti, 1969) (e.g., the single word or symbol, theme or assertion, a character or character portrayal, a sentence or paragraph, and the whole item or text).

**Steps for Conducting Manifest Content Analysis**

Manifest content analysis begins with identifying research questions and choosing a sample or samples. Once chosen, the text must be coded into manageable content categories. The process of coding is basically one of selective reduction. By reducing text to categories consisting of a word, set of words, or phrases, a researcher can focus on, and code for, specific word patterns that are indicative of
the research question (Colorado State University, 2002). A typical process to conduct a content analysis is provided by Neuendorf (2002). (See Appendix I).

**Systems of Enumeration**

All content variables are quantifiable or else they do not fit the definition of variables (Holsti, 1969). In deciding how to analyze data and present findings, the analyst needs to determine which contextual unit (e.g., word, sentence, paragraph, theme, character, or item) to quantify, and the system of enumeration (e.g., the procedure of counting units) to be utilized (Holsti, 1969). Selection of the units rests upon two considerations. First, which unit of analysis will best meet the requirements of the research problem? And secondly, which units will give satisfactory results with efficient use of resources? (e.g., time, money, and level of difficulty in coding data and analyzing data) (Holsti, 1969). For selecting a system for enumeration, the researcher need be aware of the purpose of the research question(s) and how results will be analyzed and reported. For the purpose of analysis and reporting, the most widely used method of measuring characteristics of content is frequency, in which every occurrence of a unit is tallied (Holsti, 1969). Stone (1997) refers to frequency tabulation as intensity, as researchers attempt to assess the presence or absence of themes in text. Holsti (1969) points out that researchers who utilize frequency measures assume that each unit of content should be given equal weight, permitting direct comparison (e.g., valid indicator of concern, focus of attention, intensity, value, importance etc.). However, much of the qualitative-quantitative debate in content analysis ultimately concerns disagreement about the validity of frequency measures (Weber, 1990).
Another method of conducting content analysis often called nominal or qualitative content analysis. Simply, the researcher is faced with a simple dichotomous decision, (viz., Does the content unit appear or not?) (Holsti, 1969). This method has several advantages when interpreting results. Qualitative content analysis usually can be conducted with ease and with high reliability because the coder is not faced with frequency counting, intensity, and/or ambiguous subjective measurements (Holsti, 1969).

Advantages of Utilizing Content Analysis as a Research Tool

Clinicians, anthropologists, journalists, market researchers, and humanists are among the varied professionals who have looked for themes in text (Stone, 1997). Examples of identified themes include: folk tales, newspapers, focus-group transcripts, letters, poetry, speeches, and bathroom stall graffiti. As a tool, content analysis is simple, easily learnable, and applicable to virtually any social science (North et al., 1963, p. viii). Additionally, the most important advantage is that content analysis yields unobtrusive measures (Weber, 1990, p. 10). Specifically, it is a process that will not interfere with the behavior of the phenomena being assessed. Issac and Michael (1997) termed this measurement nonreactive, whereby “that which is being measured . . . does not introduce stimulus factors to which the subject might otherwise react” (p. 96). “Hence there is little chance that the measurement itself will act as a force for change that confounds the data” (Weber, 1990, p. 10). As such, the method has less chance to introduce errors into the data (Krippendorff, 1980, p. 553). However, Issac and Michael (1997) point out that sampling bias and other non-representative distortions can mitigate and influence the data collection.
Holsti (1969) contended that content analysis is a useful methodological tool when data accessibility is a dilemma and the research is limited to documents in existence. That is, when in research there is no method to measure, assess, or analyze other than available materials at hand, content analysis becomes a reliable research technique (Krippendorff, 1980). As Berelson (1952) notes, the most valuable application of content analysis is in the study of trends and changes in content because:

> Such trend studies provide a valuable historical perspective. The classification into single set of categories of similar samples of communication content taken at different times provide a concise description of content trends in terms of relative frequencies of occurrences. (p. 31)

Among other advantages of content analysis are precision, reliability, and readily understandable format in the form of tabulations. Such tabular form is easily understood by the reader and lends itself to more manageable analysis of data. However, Roberts (1989) warned that if a researcher codes in a subjective manner whereby the assignment of the units of analysis into the categories is based on his/her latent contextual meaning of words, reliability may be called into question.

**Disadvantages of Utilizing Content Analysis as a Research Tool**

Content analysis is not without problems. Two of the serious drawbacks are viewed by Berelson (1952). First, most content analyses rely on a single source of data or a small group of sources over a period of time. Also, there is a possibility that a few general journals may not contain a valid sample of the research literature of a given field over a long time because the later addition of more subject specific journals representing branches of the field and that “changes of content of relatively
few journals in a field may reflect changes in editors or editorial policies rather than
genuine, broadly recognized shifts in interests in the field itself' (Berelson, p. 34).
Borg and Gall (1989) contend that the three mistakes often made by graduate
students when utilizing content analysis as a research method:

1. Student selects content that is easily available but does not represent an
   unbiased sample of all content related to research objectives;
2. Student fails to determine the reliability of his/her content analysis
   procedures; and
3. Student classification categories are not sufficiently specific and
   comprehensive.

Any systematic thematic text analysis risks alarming scientists who worry
whether the text analysis can do justice to a text’s intended meaning. According to
(Stone, 1997) even Plato was suspect of written texts, he argued “[How]…could
readers surmise the intentions and context from which they were generated?” Lastly,
the possibility of throwing away information can occur if the analyst isn’t careful
when deriving measures. (Stone, 1997).

Measurement Problems

The use of such easily computable quantities as indices (Krippendorff, 1980)
is not without problems (Weber, 1990). In content analysis, measurement consists of
counting the occurrences of the units of analysis, such as specific words, phrases,
using percentages (or proportion) transformation to control for document length and
counting each occurrences of a word is a practice that requires attention (p. 71).
Counting the occurrence of two units of analysis equally engenders two problems.
First, the placement of two units in the same category may or may not reflect that
category to the same extent (p. 72). Secondly, subsequent mention of a category or
topic may require greater effort than the first few mentions (p. 72). Ways around
these problems are to count the units of analyses just once in the sample article and	

\[
\text{tabulate frequency in terms of the universal sample. In spite of the disadvantages}
\]
listed above, if proper precautions are taken, content analysis can become “a useful
tool for describing the composition and development of scholarly and scientific
fields” (Berelson, 1952, p. 35). In mass communications research, Krippendorff
(1980) cited three indices that have had a long history of use:

1. The frequency with which a symbol, idea, or subject matter occurs in a stream of
messages tends to be interpreted as a measure of importan\text{t}, attention, or emphasis.

2. The balance in numbers of favorable and unfavorable attributes of a symbol, idea,
or subject matter tends to be interpreted as a measure of the direction or bias.

3. The kind of qualifications made and associations expressed toward a symbol,
idea, or subject matter tends to be interpreted as a measure of the intensity or
strength of a belief, conviction, or motivation. (p. 40)

Summary

The United States is in the midst of a childhood obesity epidemic and experts
warn that prevalence rates will continue to rise. While public health attempts to
slow down or reverse the epidemic have been ongoing, practitioners and academians
emphasize that until we view childhood obesity as a public health and/or
environmental issue, the nation will continue to see obesity rates escalate. Fueled by
the marked increase and availability of high-fat or energy dense foods, coupled with
labor saving devices and the reduced need for required daily physical activity, an
ecological paradigm has been recommended to target a variety of obesity producing behaviors.

Obesity is a serious ubiquitous health issue, not without physical, emotional, psychological, and economic consequences. Since a wide variety of health professionals are required to work collaboratively to address prevention of obesity, there has been disagreement as to which environmental factors constitute the greatest concern. Content analysis as a research method can be utilized to identify environmental factors in a grounded manner and in the process of identifying environmental factors across disciplines, can validate a multi-disciplined ecological model to combat childhood obesity.
CHAPTER THREE

METHODS

Introduction

Currently, a childhood obesity epidemic plagues the United States and industrialized nations of the world (Campbell et al., 2001; WHO, 1998). As shown by previous research, the development of childhood obesity involves a complex set of factors from multiple contexts that interact with each other to place a child at risk (Bouchard, 1991; Davison & Birch, 2001; Sherwood, 2000). This multifaceted system can be conceptualized by an ecological framework or paradigm and utilized to study and understand important precursors or antecedents of childhood obesity. An ecological approach to preventing childhood obesity has been emphasized in the scholarly literature as a means of directing effective health policy (Booth et al., 2001; Davison & Birch, 2001; Dietz et al., 2002; Neumark-Sztainer, 2000; Swinburn et al., 1999). In efforts to reduce childhood obesity, identifying critical causal environmental antecedents is important for at least 2 reasons: 1) knowing critical environmental antecedents can lead to the development of more effective programs aimed at reducing childhood weight (e.g., those antecedents identified as having the greatest causal impact upon eating and activity behaviors can be more intensely targeted to change behavior), and 2) Environmental antecedents identified as critical can also be utilized to identify those children who are at greatest risk (Kirby, 2001).
Measuring social and environmental variables in an ecological context has been regarded as a challenging process, and may even discourage researchers from pursuing investigations based on ecological models (Sallis & Owen, 1997). Currently, there is a lack of an accepted multi-disciplined model to prevent childhood obesity (Berg, 2001; Campbell et al., 2001), even though most obesity experts agree that obesity prevention should have high priority, there is a paucity of research in this area (Muller, Mast, Asbeck, Langnase & Grund, 2001). Furthermore, the research base that identifies specific important environmental and policy variables is limited (Booth et al.). Nevertheless, because obesity is difficult to treat, researchers emphasize identifying environmental solutions and prevention strategies are key to stagnate, halt, and reverse, the current epidemic (Wadden et al., 2002).

The purpose of this study was to build a comprehensive, multi-disciplinary, ecological, childhood obesity model by examining past theory and research in 25 journals covering five disciplines over the course of a decade. Through the process of content analysis of leading scholarly journals, a grounded or emergent process of variable identification allows for an inductive process of building a theoretically based model (Glaser & Strauss, 1967). Models provide a set of heuristics and links between theories that researchers use to explain human behavior and attempt to change that behavior (DiNitto & McNeese, 1996). An important step in conducting a content analysis was to develop an *a priori* coding scheme that identified and described all measures (e.g., reoccurring themes of environmental antecedents in text) as factors related to a predetermined research problem. The face validity of
qualitative data relies on the fit between the data and the concepts developed (Dey, 1993). To demonstrate how the concepts and connections identified as environmental antecedents were grounded in the data, an expert panel prior to coding reviewed validity of operational definitions.

Essentially then, a researcher starts from scratch (i.e., a blank page) and then builds broad based categories from a review of the literature (e.g., a codebook to measure recurrent themes embedded in text) that are determined by theoretical stances on a particular problem. Although largely descriptive, a content analysis of professional journals that were dominant, widely circulated, and read in their respective disciplines can serve to inform the research agenda, and add to the role of identifying leverage points for environmental interventions against obesity in children. At this point in time, few researchers are working on the prevention of obesity because of funding and priorities (Wadden et al., 2002). Selection of scholarly journals was based on citation impact rankings published in Journal Citation Reports: Science and Social Sciences Editions (ISI, 1999). Specifically, the top journals in each of the professions will be sampled for articles concerning obesity.

**Research Questions**

The methods of this study were structured with the intent of addressing the following research questions:

Question 1. What environmental antecedents of childhood obesity (ages 3 to 14), if any, are presented in multi-disciplinary health-related journals from 1993-2002?
Question 2. To what extent (frequency) are environmental antecedents of childhood obesity covered in selected journals from 1993-2002?

Question 3. What are major trends and differences of frequencies of theorized environmental antecedents to childhood obesity among the five disciplines in selected journals from 1993-2002 as presented in theoretical articles versus empirical studies?

Research Design

This study utilized a non-experimental descriptive design utilizing the research technique of content analysis. To date, the common approaches to content analysis may be categorized as "descriptive, inferential, psychometric, and predictive" (Neuendorf, 2002, pp. 53). Proponents of descriptive content analysis design list clarity and parsimony of variables as reasons for conducting such research. However, descriptive researchers must be careful to limit their conclusions to the content being studied and not anticipate outcomes of the messages, introducing researcher bias.

Methodologically, another drawback of conducting a descriptive design content analysis is meeting standards of the scientific method (Bird, 1998; Klee, 1997). Neuendorf (2002) states that descriptive design researchers are "targets for those who question the scientific importance or sophistication of content analysis as a method" (pp. 53). However, by most definitions of the scientific method, descriptive content analysis fits the positivism paradigm of social research (Gunter, 2000).
Isaac and Michael (1997) stated that the purpose of conducting descriptive research is fourfold: (a) to collect detailed factual information that describes existing phenomena, (b) to identify problems or justify current conditions or practices, (c) to make comparisons and evaluations, and (d) to determine what others are doing with similar problems or situations and benefit from their experience in making future plans and decisions (p. 50). Descriptive statistics can be utilized to summarize, describe, and compare a set of sample observations in a population sample (Babbie, 1997).

The descriptive part of the study consisted of conducting simple mathematical procedures, such as tabulating frequencies and percentages of the environmental antecedents present in each of the 25 journals over the course of a decade (1993-2002). An analysis was conducted to verify if there were any topic variations of the environmental antecedents between the five disciplines during the decade. Prior to antecedent tabulation, qualitative procedures employed were: a) identification of environmental antecedent themes in ecological models, b) collapsing and/or combining antecedent themes, c) assigning themes to ecological theory categories, d) expanding or narrowing antecedent theme(s), and e) analytic induction. Lastly, examination and tabulation of antecedent themes (i.e., most frequently mentioned themes exhibited as a final model) were collapsed to present sub-themes for conclusions, discussion, and recommendations. Figure 3 outlines the research questions and statistical information used to answer each question.

**Study Sample**

A non-probability purposive sampling design was utilized. Journals selected are representative of disciplines involved in prevention and treatment of childhood obesity.
### Research Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What environmental antecedents of childhood obesity (ages 3 to 14), if any, are presented in multi-disciplinary health-related journals from 1993-2002?</td>
<td>Content analysis</td>
</tr>
<tr>
<td>1a. All identified environmental antecedents in applied/theoretical articles will be added to the final model.</td>
<td></td>
</tr>
<tr>
<td>1b. All identified environmental antecedents in data-based/empirical articles will be added to the final model. Exception: antecedents with a reported significance (&lt;.05) will not be reported.</td>
<td></td>
</tr>
<tr>
<td>2. To what extent (frequency) are environmental antecedents of childhood obesity covered in multi-disciplined journals from 1993-2002?</td>
<td>*Frequency &amp; **Frequency percentage</td>
</tr>
<tr>
<td>2a. Environmental antecedents related to childhood obesity appearing more frequently in the sample will be indicated as having more weight in the final model. This represents a quasi-statistical approach that reflects the importance of the data.</td>
<td></td>
</tr>
<tr>
<td>3. What are major trends (uniform distributions) of environmental antecedents to childhood obesity among the five disciplines in selected journals from 1993-2002 as presented in theoretical articles versus empirical studies?</td>
<td>*Frequency &amp; **Frequency percentage</td>
</tr>
</tbody>
</table>

*Figure 3. Research Questions and Statistical Information Used to Answer Each Question*

*Frequency equals unique environmental antecedent themes occurring in an article. Unique themes tallied once per article. Otherwise known as "absolute frequency" (Krippendorff, 1980, p. 109)

**Frequency percentages equal unique themes divided by total number of articles. Otherwise known as "relative frequency" whereby the unique theme is represented by a percentage of the sample size (Krippendorff, 1980, p. 109).
Patton (1990) noted that the power of purposeful or judgmental sampling lies in selecting information-rich cases for study in depth—cases from which one can learn most about issues central to the purpose and needs of the investigator.

Content of all childhood obesity articles appearing in the 25 multidisciplined journals (five journals in 5 disciplines) spanning 10 years was analyzed. The rational for selecting this decade was to identify recent changes and differences in presence and frequency of the foci of environmental antecedents theorized to contribute to childhood obesity. At a glance, selection of the years 1993 to 2002 may seem restricted; however, based on the broad scope of the research questions and the universe of relevant variable or domain identification, the researcher felt selection of this decade was sufficient to achieve the goals of this study (Holsti, 1969). In content analysis, it is appropriate to analyze text over time, within different contexts, to set anchor points that allow the researcher to compare frequencies of units of analysis from past to present (Bud, Thorp, & Donohew, 1967; Roberts, 1989).

Scholarly literature published from 1993 to 2002 was chosen for analysis and is considered a valid time segment to include in this study for two reasons: 1) There has been a recent shift in the prevention paradigm concerning childhood obesity to the recommended application of the ecological model, and 2) Recent research is recommending further studies be conducted to explain eating behaviors and physical activity levels (Booth et al., 2001; McLeroy et al., 1988; Sallis & Owen, 1997; Wadden et al., 2002). Despite hypotheses that environmental antecedents are strong influences on physical activity and eating behavior, few studies have investigated
these influences (Booth et al., 2001). Additionally, environmental antecedents of
eating (Glanz et al., 1995) and physical activity (Dishman & Sallis, 1994), although
important, have not been completely understood (Sallis & Owen, 1997).

**Discipline Categorization and Journal Sample Selection**

Selection of the five disciplines to be studied was based on J. Clinton
basic science researchers [health educators], dietitians, exercise physiologists,
psychologists, and physicians as "...serious students of childhood obesity" (1999, p.
xi). Disciplines highlighted by Smith (1999) were matched with subject category
listing in *The 1999 Journal Citation Reports – Social Science Edition* (e.g.,
Medicine, Nutrition and Dietetics, Psychology, Public, Environmental, and

Selection of journals was based on citation impact factor rankings published
in the 1999 *Journal Citation Reports (JCR): Social Science Edition*. There are
several ways to calculate impact factor rankings (Garfield, 1972), however, *JCR*
calculates the average number of times recent articles in a specific journal were
cited in the *JCR* cover year. For *JCR* impact factors recent articles are those
published in the two years preceding the (*JCR*) cover year (ISI, 1999). Selection of
this method of narrowing journals for content analysis is unique in that the *Journal
Citation Reports: Social Science Edition* is the only reference tool that
quantitatively compares journals in both multidisciplinary and international scope
(ISI, 1999).
Journal Selection: An Applied Approach to Compliment Citation Index Factor Rankings

Twenty-five journals in five disciplines (i.e., five in each category) with high impact factor rankings were selected for inclusion in this study. Despite the strengths of the citation factor index-ranking scheme, the author, along with the dissertation committee felt it was necessary to include additional journals for relevancy purposes. The dissertation committee, made up of faculty from diverse professional fields (e.g., nutrition, education, and health education), systematically nominated and discussed possible journals for relevancy where categories didn’t match professional readership. For example, in the health education category the top three journals (e.g., Annual Review of Public Health, American Journal of Epidemiology, and American Journal of Public Health) were questioned as journals truly representative of the discipline of health education.

Consistent with the prior process of adding journals to the sample included the category of medicine. Journal Citation Reports (1999) listed (n=182) journals listed in the category of medicine. The top three journals (n=182) ranked high by citation impact factor within the category of “medicine” were: New England Journal of Medicine, Journal of the American Medical Association (JAMA), and The Lancet. After a manual review of the top three journals, it was deemed necessary to include two additional journals that would focus on prevention and childhood obesity. Two Medical journals selected for relevancy on the topic of childhood obesity included: Pediatrics and The Journal of Pediatrics.
Another notable exception occurred in the selection of the journals in the sample solely by the organization of the hierarchy of citation impact factor rankings. In the disciplines of nutrition, health education, and psychology, three journals ranked highly by the citation impact factor index (e.g., *Annual Review of Nutrition*, *Annual Review of Public Health*, and *Annual Review of Psychology*) were later omitted from the study due to the concern over original works being re-published. Therefore, the selection of additional journals was based on relevancy and complimented by a review of key literature. In accordance and agreement of the author's dissertation committee, an asterisk in Table 2. notes additional relevant journals that were included in the sample.

*Framework to Identify Ecological Models for Content Analysis:*

First, the researcher identified existing multi-disciplinary, theoretical ecological models thought to meet requirements of precision, exhaustion, mutual exclusivity, and appropriateness of the level of measure for this study. Ryckman (1994) provides six criteria for evaluating a scientific theory: comprehensiveness, precision and testability, parsimony, empirical validity, heuristic value, and applied value. Weber (1985) emphasizes the importance of well-constructed operational definitions for the breadth and depth of each category. Based on construct validity, operationalized definitions, requirements for conducting a content analysis, and completeness of detail to published theory; a compilation of theoretical ecological models identified in the literature was utilized for coding procedures. Thus, a constant comparison method suggested by Glaser and Strauss (1967) involved
Table 2.

Journal Sample by Citation Index Factor Rankings

(Medicine) Subject Category: Medicine, General, Internal and Pediatrics
2. *Journal of the American Medical Association*
3. *The Lancet*
* 4. *Journal of Pediatrics*
* 5. *Archives of Pediatrics and Adolescent Medicine*

(Nutrition) Subject Category: Nutrition and Dietetics
1. *American Journal of Clinical Nutrition*
2. *Obesity Research*
3. *Critical Reviews in Food Science and Nutrition*
4. *International Journal of Obesity*
5. *Nutrition Reviews*

(Psychology) Subject Category: Psychology and Clinical Psychology
1. *Psychological Bulletin*
2. *Psychological Review*
3. *Journal of Clinical Psychiatry*
4. *Journal of Consulting and Clinical Psychology*
5. *Psychological Medicine*

(Health) Subject Category: Health Education (including) Public, Environmental, and Occupational Health
1. *American Journal of Epidemiology*
2. *American Journal of Public Health*
* 3. *Health Education Quarterly/Health Education and Behavior*
* 4. *Journal of School Health*
* 5. *American Journal of Health Behavior*

(Sport Sciences) Subject Category: Sport Sciences
1. *American Journal of Sports Medicine*
2. *Medicine and Science in Sports and Exercise*
3. *Journal of Applied Physiology*
4. *Journal of Sport and Exercise Psychology*
5. *Journal of Physical Education, Recreation, and Dance: (Not listed)"

examining patterns in data and classifying data into categories. A similar approach has been used where key words or phrases were extracted from qualitative data to form descriptive units or propositions (Chen & Meindl, 1991). The prepositional descriptions were then grouped into larger super-ordinate theme categories (Chen &
Meindl). According to Weber (1985), the best content analytic studies utilize both qualitative and quantitative operations on text by including the calculation of frequencies and percentages of frequencies of text coded in each category. In order to have precision and be testable, a model must have defined its concepts and set forth clear relational statements that are refutable. Once developed, a model can be tested empirically and advise the work of those in the field (DiNitto & McNeese, 1996).

To build an ecological model to prevent obesity in children, all environmental antecedents across the sample of health-related literature must attain a high level of measurement (i.e., categories are exhaustive and mutually exclusive). Two techniques were employed through this process according to Neuendorf (2002): 1) Using theory and past research for variable collection (viz., model construction with consideration for a universe of variables utilizing existing models) and 2) through the process of content analysis a grounded or emergent process of variable collection will occur (e.g., coding to build model and validate the explanatory power of the ecological model). Justification for adding additional variables (e.g., environmental antecedents) to the instrument are outlined by Neuendorf (2000): Although the content analyst should consult both scholarly literature and commercial research and use theory as a guide whenever possible, he or she is, in fact, the boss, the final authority on what content needs to be examined and what variables ought to be tapped. (p. 95)
Identifying Ecological Models for the Framework of this Study

The following databases: ERIC, 1993 to present; psychINFO, 1993 to present; EBSCO, 1993 to present; CINAHL (Webspirs), 1993 to present; HealthInfo, 1993 to present; MEDLINE, 1993 to present; and SportDiscus, 1993 to present were utilized to identify ecological models across the five disciplines concerned with childhood obesity (e.g., medicine, health education, psychology, nutrition sciences, and sport sciences). A working assumption is that understanding, identification, and treatment of childhood obesity must draw on multiple disciplines and on the diverse views within the given disciplines (Durlak, 1995; Goetz & Caron, 1999; Hill & Peters, 1998; NTFPTO, 1994; Smith, 1999).

Identification of the ecological models designed to prevent obesity began with a computer database search utilizing a thesaurus of descriptors to locate articles that referenced childhood obesity models. Certain words, (viz., and/or) called Boolean operators enable retrieval of terms in various combinations. For example: *The Thesaurus of ERIC Descriptors* suggested using childhood obesity and ecological theory as word descriptors. The search strategy will be limited to articles in the English language. Search strategies to be employed are shown in Figure 4. The reference lists of all articles identified will be checked manually. Key terms entered into the databases were ecological, model or models, weight control or obesity, and child or childhood. Reference lists of all obtained studies were reviewed to locate additional studies. To be included, studies must have met two criteria: 1) the ecological model must have been described or illustrated, and 2)
broad ecological categories needed to resemble the ecological framework as defined by McLeroy et al., (1988), Sallis and Owen, (1997) and Neumark-Sztainer, (2000).

Data Bases: MEDLINE; EBSCO; PsychINFO; HealthInfo; ERIC; CINAHL; and SPORTDiscus

Boolean Operators

1. Ecological model or models
2. Weight control and/or obesity
3. Child and/or childhood
4. No. 1 or 2 or 3

*Figure 4. Search Strategies for Ecological Models*

According to Neuendorf (2002), the Boolean search must be precisely what the researcher wants and offers "a good validity check" (p. 222). Additionally, each journal article hit must be screened for relevance to the study. Neuendorf stated, "even the best-designed search criteria will result in some nonsensical hits" (p. 223).

*Developing a Coding Construct of Operational Definitions to Build an Ecological Model*

A Boolean search was conducted. The researcher delimited to the use of key words as the first step in the search for ecological models (e.g., see Figure 4). Results
produced 496 articles. Articles \((n = 496)\) were then screened for relevance to the study. After review, the vast majority of articles were not specific to obesity or articles specifically utilized an ecological approach for another health issue (e.g., smoking, discrimination issues, adolescent alcohol use, HIV care, and worksite health promotion, etc.). Therefore, 486 articles were discarded and 10 articles were retained for review. See Appendix J for the models used to develop codebook.

Ten ecological models met criteria for inclusion in this study based on precision, exhaustion, mutual exclusivity, and appropriateness of the level of measure. The theoretical ecological model highlighting risk factors developed by Neumark-Sztainer (2000) was thought best to operationalize environmental antecedents because the risk factors were specific to childhood obesity (see Appendix H) and therefore was selected as a theoretical base or guide to start building a model from. Operationalization, according to Neuendorf (2002), “is the process of developing measures” (p. 118). Babbie (1995) added, “it’s the construction of actual, concrete measurement techniques” (p. 5). According to Neuendorf (2002), in order to meet the standards of scientific inquiry, “all decisions on variables, their measurement, and coding rules must be made before observation begins” (p. 11). For coding text, operational definitions and the coding form must be constructed and established \(a \ priori\) (i.e., before the fact) (Neuendorf, 2002). However, when conducting a thematic text analysis, Stone (1997) cautions that even when a universe of models is generalized, \(a \ priori\) coding schemes may miss or uncover themes that may or may not be easily embedded into the coding scheme. When uncovering themes that an investigator didn’t anticipate, Krippendorff (1980) underscores that such findings should not be suppressed in order to further advance knowledge. To
permit mutual exclusivity and yet count themes or categories not anticipated, the other category is critical and must be accounted for in the coding scheme. Budd et al., (1967) note that although the other category is a necessary and valid classification for content, the category should account for only a small percentage of all the material analyzed.

**Process of Environmental Antecedent Identification and Model Building**

In order to prevent serious coding problems, as Neuendorf (2002) recommends, the researcher invited an expert panel to comment on the validity of the codebook of operational themes before the coding scheme was finalized and utilized in the study. Dey (1993) refers to this process (viz., face validity) as the fit between the data and the concepts developed. Failure to identify key variables in the coding scheme along with failure to develop a full understanding of the variables in their context will lead to trivial findings (Neuendorf). Since ecological models published in the literature are peer-reviewed and subject to scrutiny, the expert panel could not reject content elements contained within each of the five ecological domains. However, panel members were able to communicate concerns regarding environmental antecedents and their assigned definitions. Therefore, panel members were asked to make suggestions concerning: clarity, mutual exclusivity of units, precision of environmental antecedent thematic units (e.g., operational definitions), and the adoption of additional themes, if deemed plausible and deemed appropriate.

According to Neuendorf (2002), when designing categories or domains that will be used for the codebook or instrument, the researcher should try to achieve mutual exclusivity (i.e., there must be an appropriate code for each and every unit of analysis [viz., the environmental antecedents for childhood obesity]). If a domain or
environmental antecedent cannot be coded with the operational definitions comprised within the codebook, the investigator must have a predetermined plan of how to address other domains and variables (Neuendorf). Another concern when developing a coding scheme addressed by Budd et al., (1967) is that of excessive fractionation caused by creating too many coding categories. Budd et al., recommends reviewing research questions and ... “find[ing] the simplest schemes that will yield the data wanted” (p. 44). Therefore, expert panel members were asked to comment on possible theme overlap and determine if any other areas of theory needed to be added to the operational definitions.

The intent of this study through what Neuendorf (2002) describes as “grounded or emergent process of variable identification” (p. 102), will identify, quantify, and compare the representation of the environmental antecedents that are thought to promote childhood obesity presented in twenty five health-related journals across five disciplines (i.e., five journals per discipline) that appeared from 1993 to 2002. Thus, the strength of the grounded theory approach to developing a new model is in the process of open coding which allows for the discovery of new categories and their properties (Glaser & Strauss, 1967). The benefit of measuring and synthesizing environmental antecedents presented in five distinctly different health-related disciplines lies with the convergent variable validity that can accrue (viz., intensity or strength in communication pool across disciplines represents agreement) (Holsti, 1969; Neuendorf, 2002).

Examining texts longitudinally and retrospectively in time have two advantages according to Roberts (1989): (a) it allows the researcher to establish
anchor points that allow for comparison (e.g., frequencies of antecedents) expressed within the context of the message from past to present and (b) data that deviate from the anchor points can be identified freely.

Ecological Categories

An ecological approach may be used to present and discuss key factors associated with childhood obesity (McLeroy et al., 1988; Neumark-Sztainer, 2000; Sallis & Owen, 1997). The ecological approach to viewing childhood obesity has several practical benefits. Most notably, an ecological approach attenuates the possibility of victim blaming (Becker, 1986) by drawing attention to additional targets for intervention beyond the individual. When acted upon and changed, the socio-environmental factors frequently bring about more sustainable change in individual and population health behavior (Green & Krueter, 1999; Stokols et al., 1996).

Through literature review, ecological models were examined to determine if categories or domains were clearly defined, and units of analysis could be coded for (i.e., identified using a codebook). Most models fitting the ecological perspective defined environmental antecedents as being part of one of two broad categories (viz., distal factors and proximal factors). Distal factors (i.e., social norms/national policies, community factors, and institutional factors) and more proximal factors (i.e., intrapersonal [e.g., personality characteristics] and interpersonal factors [e.g., social interactions] are shown to be antecedents to childhood obesity (Neumark-Sztainer, 2000). Therefore, it was apparent that an ecological model that focuses on childhood obesity would include the following broad categories: (a) social
norms/national policies, (b) community factors, (c) school factors, (d) interpersonal factors, and (e) intrapersonal factors.

The ecological approach to the problem of childhood obesity is valued because the perspective stresses a multi-factorial etiology and recognizes the need for multi-tiered interventions. To meet the requirements of \textit{a priori} research design, a codebook (i.e., with all variable measures fully explained) is necessary to identify the emergent thematic elements of text (Neuendorf, 2002). After a literature review, environmental antecedents present in the literature were categorized by domain (e.g., social norms/national policies, community factors, school factors, interpersonal factors, and intrapersonal factors). Neuendorf (2002) notes that if variables are measured well, the categories must be exhaustive and mutually exclusive. Utilization of a codebook gives a researcher a platform to be able to identify and tally units of analysis. In this study, themes or assertions make up the unit of data collection. Because the estimated effects of the environmental antecedents can have a direct or inverse relationship to the development of obesity in children, relationships must be noted as such (e.g., lower socioeconomic status increases the probability of obesity in families, the presence of exercise equipment in home influences activity, or the presence of high calorie snacks encourages consumption). Nevertheless, as the number of risk factors in a given child’s life increases and the number of protective factors diminishes, the child’s chances of becoming obese increase (Kirby, 2002). When applied to an ecological framework the environmental antecedents represent risk, but should not be considered all-
inclusive. For examples of themes with direct (-) or inverse (+) relationships otherwise known as protective against obesity development refer to Figure 5.

<table>
<thead>
<tr>
<th>Environmental Antecedent</th>
<th>Estimated Effect (+) protective factor/ (-) risk factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Father's or Mother's BMI</td>
<td>(+/-)</td>
<td>Obesity is a genetic factor</td>
</tr>
<tr>
<td>Family size or number</td>
<td>(-)</td>
<td>Small family increases risk</td>
</tr>
<tr>
<td>Availability of healthy foods in home</td>
<td>(+)</td>
<td>Absence increases risk for obesity</td>
</tr>
<tr>
<td>Unsafe urban setting</td>
<td>(-)</td>
<td>Less recreation opportunities = risk</td>
</tr>
<tr>
<td>Availability of high-fat, calorie dense in home</td>
<td>(-)</td>
<td>Increased availability = greater risk</td>
</tr>
<tr>
<td>Hours of television viewing, games, or computer use</td>
<td>(-)</td>
<td>Increased hours increases risk</td>
</tr>
<tr>
<td>Absence of health education or physical education in school</td>
<td>(-)</td>
<td>Absence increases risk</td>
</tr>
<tr>
<td>Societal pressures to be thin</td>
<td>(-)</td>
<td>Dieting and binge eating theorized to increase</td>
</tr>
<tr>
<td>Presence of Exercise Equipment in home</td>
<td>(+)</td>
<td>Decreased tendency for risk</td>
</tr>
<tr>
<td>Discrimination experienced</td>
<td>(-)</td>
<td>Increased tendency for risk</td>
</tr>
<tr>
<td>Absence of sidewalks or parks</td>
<td>(-)</td>
<td>Increased risk for obesity (theorized)</td>
</tr>
<tr>
<td>Absence of calorie labeling in fast-food or other chain restaurants</td>
<td>(-)</td>
<td>Increased risk for obesity (theorized)</td>
</tr>
<tr>
<td>Higher % of black or Hispanic vs. white</td>
<td>(+/-)</td>
<td>Protective in some/risk in others</td>
</tr>
<tr>
<td>Children in families were both parents work</td>
<td>(-)</td>
<td>Children in charge of preparing meals</td>
</tr>
<tr>
<td>Higher self esteem</td>
<td>(+/-)</td>
<td>Studies do not agree if important</td>
</tr>
<tr>
<td>Higher family income</td>
<td>(+/-)</td>
<td>Studies do not all agree importance</td>
</tr>
<tr>
<td>Neighborhood design favoring activity</td>
<td>(+)</td>
<td>More sidewalks encourage walking</td>
</tr>
<tr>
<td>Depression</td>
<td>(-)</td>
<td>Most studies concur this is a risk</td>
</tr>
<tr>
<td>Positive parental modeling of eating</td>
<td>(+)</td>
<td>Over-controlling = risk</td>
</tr>
</tbody>
</table>

Figure 5. Estimated effects of varied environmental antecedents on the risk of becoming obese as a child

(+/-) = a protective factor in some studies and a risk factor in other studies
Text Inclusion, and Text Exclusion

Much of the qualitative-quantitative debate in content analysis is disagreement about the validity of text distribution, frequency, attributes, and location within the document (Holsti, 1969). In light of research questions posed by the investigator, two assumptions are critical to highlight. First, the frequency with which a theme appears in the message (viz., text of journal article) is a valid indicator of concern, focus of attention, intensity, value, and importance (Holsti, 1969). Second, the investigator assumes that each unit of content – word, sentence, or theme – should be given equal weight permitting aggregation or direct comparison (Holsti, 1969). This study examined themes or antecedents of childhood obesity.

Since the introduction section of an article and/or background text is commonly presented for foundational information, it is considered part of the intended communication. Although this information may or may not be part of the article’s focus, to ensure rigor of this study, the introduction section for both applied/theoretical and empirical/data-based articles was considered part of the analysis. Subsequently, text excluded or delimited by the investigator (viz., not analyzed) include five areas of the journal article: (a) title and author(s), (b) abstract, (c) author’s(-s’) affiliation or contact information, and (d) references. Therefore, all words, phrases, themes, or sentences contained in the mentioned four areas were not be measured as part of the analysis.

Once the research question has been established, the procedure for content analysis can be described in terms of nine steps (Duncan, 1989; Neuendorf, 2002):

1. Define units of analysis
2. Establish coding categories
3. Pilot or pretest coding categories on a sample of documents
4. Assess reliability of the coding
5. Revise coding categories if necessary and return to step 3
6. Draw the sample of documents
7. Code all units of analysis
8. Assess achieved reliability of the coding, and
9. Tabulate categories and cross-tabulate where appropriate. (p. 29)

As a form of scientific endeavor, content analysis should be conducted in line with procedures appropriate to good science. A flowchart for the typical process of content analysis research was developed by Neuendorf (2002) and will be utilized for this study (See Appendix I).

Criteria for Studies Included in Data Sets

All articles of the selected journals published between 1993 – 2002 (including endpoint years) were reviewed for articles pertaining to preventing childhood obesity. Journal articles were selected based on key words for inclusion into the study. Refer to Appendix K for sample selection scheme involving both manual and computer data-base searches. Both manual review and computerized data-base searches followed a process of locating key words (see Figure 6).

Databases including: ERIC, PsychInfo, EBSCO, CINAHL, HealthInfo, MEDLINE, and SportDiscus were utilized and limited to articles published from 1993 through 2002, including endpoint years. One hundred – sixty four articles matched for key words of “childhood” or “child” together with “obesity” within the year parameters
of 1993 to 2002. Of the 164 articles identified by this method, not one article in the field of psychology was identified. After consultation with dissertation committee members, it was agreed that the search would need to be expanded to the general key word of "obesity". A second database search yielded 874 articles from the twenty-five journals selected for this study.

1. Identify articles through database and manual search. Title and article key words will be reviewed. If the words: "obese" or "obesity" were present, the article was retained (vs., failure to locate key words, article rejected).

2. If the key words section is not present in the article, the investigator reviewed the abstract for the key words. Articles with "obesity" in abstract were included in the study.

3. If the article was an editorial or a commentary, and neither an abstract, nor key words text was present, the investigator reviewed the title and the skimmed the entire article for inclusion into the study.

Figure 6. Journal Article Sample: Methods for inclusion

Instrumentation

Unit of Analysis

In content analysis, a unit is an identifiable message or message component, a) which serves as the basis for identifying the population and drawing a sample, b) on which message units are measured, or c) which serves as reporting the analysis (Neuendorf, 2002). The unit of analysis can be words, phrases or sentences, themes,
paragraphs, story, as well as logical structure of expression (Krippendorff, 1980; Weber, 1990). It is the work of the investigator to narrow down messages according to his/her substantive interest (Budd et al., 1967; North et al., 1963). Neuendorf (2002) states pragmatic or methodological reasons for choosing one type of unit over another. According to Holsti (1969), the theme or assertion is the most useful, detailed, and sophisticated of all units of analysis for research purposes.

**Themes**

For purposes of this study, themes were selected, analyzed, and tabulated. Random House’s (Flexner & Hauck, 1987, p. 1966) unabridged dictionary defines a “theme” as the subject matter of a document, discussion, or meeting. The Oxford Press unabridged dictionary (Soanes, 2001, p. 947) gives an expanded definition of a “theme” stating “…an idea that is often repeated in a work…” For research purposes; Berelson (1952) defines a theme as “an assertion about subject matter. Thus, it is a sentence or sentence compound, usually a summary or an abstracted sentence, under which a wide range of formulations can be subsumed” (p. 138). Simply, themes are derived from content, but their categories need not be if an appropriate category system is available (Budd et al., 1967). Concerning the formulation of themes or assertions according to Budd et al., “the nature of the problem and the available resources determine the decision” (p. 148).

For this study, the framework introduced by Neumark-Sztainer (1999) was utilized as the base theory to build from. In a grounded theory approach, the process of open coding and the classification of latent variables can be viewed as a “sifting” or “top-down” process creating several layers of categories form the most general to
the most defined (Gray & Densten, 1998). When attempting to integrate quantitative and qualitative data (e.g., counts and measures versus predominately words as data), a “bottom-up” approach is inappropriate because there is no common theoretical structure (Gray & Densten). In contrast, the units of analysis (viz., qualitative latent themes) used to identify other themes for categorization will be based on conceptual frameworks of previous ecological models on preventing obesity.

Coding Scheme and Establishing Categories

The fundamental task in establishing a coding system for content analysis is to define the universe that is to be analyzed (Kerlinger, 1986, p. 489). One condition that Kerlinger stated is that “all categories must be exhaustive and mutually exclusive” (p. 489). To satisfy the exhaustiveness condition, one must define the universe of behaviors to be observed. A useful way to approach establishing a coding scheme and including critical variables, is to use theory as a guide whenever possible (Neuendorf, 2002). Since the term ecological refers to models, frameworks, or perspectives rather than specific variables (Sallis & Owen, 1997), the universe of behaviors was identified through consulting both scholarly literature on preventing childhood obesity and ecological theory as it pertains to eating and physical activity among children. Consistent with ecological theory, the epidemiological web of causation needed to be called upon to identify multiple ecological antecedents thought to be viable universal behaviors or conditions, which promote obesity.

Since the emphasis of this study focused on ecological theory, behaviors or conditions identified in the established ecological models (e.g., sedentary lifestyle, poor eating habits, excessive caloric intake, psychological problems, lack of self-
control, low socioeconomic status, lack of sidewalks, etc.), were identified as critical variables to assess. According to Kang et al., (1993), concepts of [ecological] elements are operationalized through the development of content typologies. To develop a typology, dimensions of content are first identified (e.g., ecological models) and then categories within each dimension were established (Kang et al., 1993). Units of analysis can then be partitioned into respective categories representing a coding scheme or matrix. As discussed earlier, the central necessity of content analysis is to define and select categories in which content units will be accommodated. Efforts were made to create mutually exclusive and independent categories and subcategories so that the coding instrument was precise and specific to the research criteria. For example, articles on physical activity often deal with lack of recreational space, limited opportunity to be physically active, or modeling exercise within the family. In such cases, each theme or phrase prevailing in each of the journal articles will be taken into account.

Utilizing a theory or past research is one of four recommended techniques for selecting variables in content analysis (Gray & Densten, 1998; Neuendorf, 2002). A codebook with operational definitions was developed to collect information on every journal article under study. In order to account for universal variables, specific units of analysis from other childhood obesity models were tapped and included in a codebook of operational definitions for coding purposes.

*Development of Two Data Collection Sheets A and B*

"Recording is one of the basic methodological problems in the social sciences and in the humanities" (Krippendorff, 1980, p.71). Two data collection
sheets were developed with the purpose of capturing environmental antecedents related to childhood obesity (see Appendix L). The nature of the research questions drove the necessity of having dual data collection sheets. Because this study represents both qualitative research (e.g., devising a valid and reliable method to analyze and classify ecological themes) and quantitative measures (e.g., counting and comparing the aggregate of theme frequencies), two data collection sheets were deemed necessary. The first data collection sheet (viz., Sheet A: Open Coding Sheet for Model Development) essentially developed into a final model. Ecological theory as it pertains to childhood obesity prevention (viz., Appendix H) and definitions of ecological domains guided coding decisions until the coding sheet was saturated with newly created, existing categories, or categorical dimensions all derived from themes identified in the sample.

Coding sheet A represented the broad domains of an ecological model and was utilized for all journal articles sampled. True to an open coding system, beneath the broad ecological categories, space was provided whereby environmental antecedents were written in as they appeared and assigned a sequential code. As environmental antecedents (e.g., themes present in sample) were identified, codes sequentially increased as variables emerged (e.g., I1 = first intrapersonal factor identified; F1 = first family/peer factor identified; S1 = first school factor identified; C1 = first community factor identified; N1 = first social norms/national policy factor identified, O1 = first other domain factor identified etc.).

The second data sheet (viz., Sheet B: Individual Journal Article Data Summary) acted as a quantifiable record of each coded journal article. Data sheet B
included: 1) author; 2) title; 3) name of journal; 4) year; 5) volume; 6) pages; 7) journal article focus (e.g., applied/theoretical or data-based/empirical); 8) research design; population/sample; 9) statistics; 10) ecological factors related to obesity development (e.g., individual, school, family/peers, community, and social norms and policies) and 11) previous works cited in meta-analysis comparisons. In the last example #11 - antecedents published in articles during the sample time frame (e.g., 1993-2002) but published prior to 1993 were included in the data collection and identified as such. Additionally, antecedents appearing in two or more articles (e.g., same data referenced twice – meta-analysis) were counted once.

Broad domains or major categories identified were assigned a letter and number corresponding to the nominal sequential theme and the domain carried over from data sheet A (e.g., I1, I2, I3, I4 etc., = intrapersonal; F1, F2, F3, F4, etc., = family/peer; S1, S2, S3, S4, etc., = School; C1, C2, C3, C4, etc., = community; N1, N2, N3, N4, etc., = social norms/national policies, 01, 02, 03, 04, etc., = other domain identified). Lastly, data sheet B included themes present in that particular article (e.g., I12, C1, I3, S5 and so on).

Final Model: Frequency and Rank

Concurrent with the development of data collection sheet A, frequencies of environmental antecedents reported were tallied according to article focus and ranked in hierarchical fashion according to broad ecological domain. In turn, these summary measures (viz., frequency and frequency percentage) represented the intensity of concern with each domain or category in a journal article (as described by Weber, 1990), establishing a quasi-statistical weighting system (See Figure 7).
Since frequencies of themes were sorted in order of descending frequency (Neuendorf, 2002), units or themes appearing more frequently across the sample achieved greater weight. Themes representing lesser consideration in the sample (i.e., lower frequency) were ranked in hierarchical fashion under the broad category or domain (e.g., individual, family/peer, school, community, social norms/policies).

Once basic quantification of ecological themes was completed, a basic trend analysis was conducted to determine differences (cf., categories during 10-year span, discipline, journal focus). Budd et al., (1967) describes a trend as “the increase or decrease of the frequency of given symbols or content over a period time” (p. 60).

![Ecological Model Diagram]

Figure 7. Example of Ecological Model

Legend: (T) = applied/theoretical articles; (E) = data-based/empirical articles
Content Validity

According to Berelson (1952) validity is not regarded as a major problem in content analysis. Careful definition of categories and proper selection of variables will help achieve validity in content analysis. Krippendorff (1980) argued that unobtrusive technique of measurement which does not interfere with the behavior of the phenomena being assessed, gives less chance to introduce errors into the data. However, Holsti (1969) argued, face validity is helpful to the investigator. Face validity refers to: whether the instrument (content of coding sheet) is capable of generating the data to answer specific research questions, and whether the information gathered is germane to the concept (North et al., 1963).

To ensure face validity of the instrument (i.e., the codebook and the two coding sheets), three recognized academians were contacted via email and invited to serve as members of an expert panel. Prerequisites for member selection included: 1) publication of at least three scholarly works pertaining to childhood obesity and ecological models in the past decade, and 2) willingness to participate in the study. Upon agreement to participate in the study, a codebook with operational definitions was sent electronically to the expert panel for a review and approval of content validity. Content validity is “...the degree to which a measure covers the range of meanings included within the concept” (Babbie, 1995, pp. 128). The face validity of qualitative data (e.g., operational theme definitions) relies on the fit between the data and the concepts developed (Dey, 1993). Since the codebook of operational definitions was essentially a compilation of previous ecological models, reviewers had the ability to approve categories and make suggestions for precision and clarity.
Since several ecological models during a review of literature were called upon to construct operational definitions, rejection of a concept by a member of the expert panel was not a plausible option. Therefore panel concerns consisted of improving theme precision, assignment, and addressing possible ambiguous contextual concerns.

**Expert Panel Recommendations**

In order to establish baseline codebook face validity a panel of experts were convened to review the codebook of operational definitions. Baseline codebook of ecological theory to prevent childhood obesity was developed (see Appendix M). Three academicians with ecological theory and childhood obesity expertise were called upon to evaluate operational definitions (i.e., codebook) for face validity. Panel members included an epidemiologist, a health educator, and a nutrition/obesity clinician. Face validity indicates whether an instrument, on the face of it, appears to measure what it claims to measure (Isaac & Michael, 1997). Panel experts were invited to participate in the study and promised a final copy of the research for their efforts. Panel members were mailed codebooks, coding sheets A and B, article focus definitions, and ecological domain definition sheets for review. Panel members where asked to evaluate each environmental antecedent theme for clarity, preciseness, and category placement. Additionally, panel members were asked to identify any or all themes, which needed to be revised or moved to another domain. After review of operational definitions (i.e., codebook) the following suggestions were electronically mailed back to lead investigator:

Professor of Epidemiology
[The tool] is comprehensive and exhaustive, with some overlap in domains of social norms and community ...“but that is the way it is in real life.” Social economic status is an example of some cross over and genetics is individual and family.

Additionally a model should represent causality with proximal and distal arrows (i.e., suggested using arrows in different directions to show that environmental antecedents can impact each other in new model).

Assistant Professor of Health Education

Question whether water availability is true environmental antecedent. Wondered if the presence of a water fountain would actually impact drinking water [instead of soda pop]? Suggest adding wheel chair availability/accessibility in large retail stores and/or grocery store in community domain. “Wheel chair availability or accessibility definitely would impact whether an obese child walks or rides.” Concern over where placement of liability issues are, (e.g., social norms, community, or school) at fault? “For instance, who takes care of, and liable for safety on a baseball diamond that is located on or near school property?” “What impact does obesity acceptability in society play?” Concerning school factors, training of physical education teachers, and methods of instruction of physical education (e.g., life sports versus team sports) are important antecedents to consider.

Associate Professor of Food and Nutrition

[The tool] is comprehensive and exhaustive. “Perhaps there are concerns about coding environmental antecedents in one or more category, but that is the way it is.” For example...“Fast food chains could fit in three domains (e.g., social norms, community, and school), it just depends on where they are located.” In addition, “…are they [fast food restaurants] freestanding, or located in a school cafeteria as an option other than school
Themes need to be defined indicating what type of material is and is not to be included. Themes need to be exhaustive and spelled out. Pay strict attention to detail in theme wording.

According to Budd et al. (1967), in trying to make category systems exhaustive, one must avoid excessive fractionation or the inverse, (e.g., too few categories) which may or will fail to answer research questions. To overcome excessive fractionation, Budd et al. states, “it is imperative that such definitions be written down before coding begins” (pp. 44). Following Neuendorf’s (2002) process of codebook construction, ambiguous themes would require adjustment for agreement attainment. Since expert panel members could not reject environmental antecedents, suggested wording alterations and definition improvements were made. The researcher electronically mailed comments and concerns between members until unanimous agreement was reached. Operational definitions for codebook and subsequent pilot study were approved (see Appendix N).

Face validity refers to whether the instrument and coding sheets are capable of generating the data to answer specific research questions, and whether the information gathered is germane to the concept (North et al., 1963). Face validity is often ensured if the categories are precisely defined and the coding has a high degree of reliability (Budd et al., 1967). Neuendorf (2002) recommends a consensus-building process as the codebook is to be revised. As mentioned before, concerning consensus-building, panel members independently electronically mailed suggestions and/or modification recommendations to the lead investigator, and then concerns were shared amongst the group via electronic mail. This consensus-building process was arduous and lengthy, (e.g., began September, 2003 and ended
in November, 2003). Once recommendations were received, revisions were made both on codebook and coding sheets.

**Reliability: Pilot Test**

Reliability refers to consistency and stability of measurement by a test (Isaac & Michael, 1997). A pilot test provided the possibility of making alterations in data collecting format so the study can be done more efficiently (Isaac & Michaels, 1997). Conducting a pilot test is considered a salient and necessary procedure to appraise data-collection methods prior to conducting the main study (Isaac & Michael, 1997). A pilot test was conducted by randomly selecting ten percent of the sample to assess the strength and weaknesses of the coding sheets and the process therein. A pilot test was deemed necessary because it 1) allowed an appraisal of the adequacy of materials needed for the research, and 2) it provided the possibility of altering the data collection format so the study could be done more efficiently (Isaac & Michaels, 1999). Specifically, McDermott and Sarvela (1999) state “the pilot test is the ideal opportunity to examine the appropriateness of the proposed data analysis scheme” (p. 196). However, prior to the initiation of data entry, the investigator needed to address how he/she will ensure data accuracy? One way of ensuring data accuracy according to McDermott and Sarvela is that 10% of the sample or subset of data be checked for accuracy with original data collection sheets. Neuendorf adds, “if the pilot test reveals serious problems, then the coding scheme may need to be changed. In that case, the pilot test data should not be included in the final data analysis…” (p. 146).
*Pilot Test Process*

The investigator coded 10% (n=87) of the entire sample (N=874) of childhood obesity prevention articles obtained through a computer data-base search and manual review. Stratified random sampling was utilized to divide the subset content into strata according to discipline (e.g., 17 journal articles in 3 disciplines and 18 journal articles in 2 disciplines). In order to ensure random selection, a sequential number was assigned to each journal article according to journal and chronological publishing date. For example, if there were four articles in *American Journal of Clinical Nutrition* published in 1993, (i.e., with a total of 75 published over 10 years) journal articles were coded AJCN1, AJCN2, AJCN3, and AJCN4 respectively, (i.e., AJCN1 through AJCN75). Every 4th journal article was sequentially selected chronologically (i.e., 1993 through 2002) until 17 articles were identified for pilot sample. Since two additional articles were required for pilot sample, all five disciplines were then shuffled and two articles were randomly selected. To be coded in pilot study journal articles had to meet the following requirements:

1. Journal article could be categorized as theoretical/applied or data-based/empirical.

2. All parts of the article were coded for: abstract, introduction, methods, results, tables and/or figures.

*Pilot Test Results*

The reliability of the coding sheet was obtained by having the lead researcher code the same set of data at different times (e.g., test – retest), in this case, eighty seven articles (e.g., 17 journal articles in medicine; 17 in nutrition; 17 in health; 18
in psychology; and 18 in sport sciences) were coded and then coded again one week later. Following analysis, themes with poor test–retest internal consistency (in this case, a few antecedents in the family and community domains) although acceptable in terms of reliability, were flagged or noted. Final decisions to eliminate a theme were based on theoretical model properties and comparability with previously published works. No theme was eliminated or altered at this point. Although antecedent cross-over (i.e., antecedents fitting into two domains; community and family domains) were noted to avoid coding error. For example, in eight articles socio-economic status was written as an antecedent that could be coded as “family,” and in three articles socio-economic status was referred to as a cultural phenomenon, aligning more into “community” domain. In both cases theme wording was examined and socio-economic status was retained as a family characteristic with “parents level of education” added to the antecedent theme. In addition, coding instructions were altered to clarify antecedent “socio-economic status” as a “family” category. Appropriateness and precision of the coding system was tested through inter-and intra-coder reliability tests described in the following sections.

Intra-coder and Inter-coder Reliability

When human coders are used in content analysis, inter-coder reliability or the amount of agreement among two or more coders is necessary to ensure reliability (Neuendorf, 2002). In other words, the same results need to be consistently reproduced in subsequent administrations of the instrument (Neutens & Rubinson, 1997). For this study, both intra- and inter-coder reliability tests were performed to
eliminate ambiguity and personal bias of the instrument. Neuendorf’s steps to ensure reliability will be followed. (See Appendix I).

**Intra-coder Reliability**

Similar to the test-retest method for assessing consistency reliability of a set of measures (Carmines & Zeller, 1979), the procedure for intra-coder reliability requires a coder to recode a set of units at a second point in time (Neuendorf, 2002). Although considered by Krippendorff (1980) as a weak form of reliability, Neuendorf notes that use of multiple coders is necessary to achieve an acceptable level of reliability.

**Intra-Coder Reliability Results**

One week following a pilot reliability on a sub-sample of eighty-seven articles or 10 percent of the total sample, \( n=87 \) of \( N=874 \); intra-coder reliability (i.e., test-re-test) was conducted on eighty-seven \( n=87 \) articles not included in the pilot study. Intra-coder reliability was set at 85 percent agreement. If agreement fell beneath .85, categories were clarified, rearranged and/or developed until .85 was reached or exceeded. The researcher then coded all journal articles in the sample. Once again, stratified random sampling was utilized to divide the subset content into strata according to discipline (e.g., 17 journal articles in 3 disciplines and 18 journal articles in 2 disciplines). If an article was selected for the pilot sub-sample, the next sequential article was selected for the sub-sample for intra-coder reliability. For intra-rater reliability results see Table 3. For complete data collection see Appendix O. Note: when the lead investigator assigned article focus there was 100 percent agreement.
Table 3.

*Intra-Coder Reliability Agreement in Percent (n=87 articles)*

<table>
<thead>
<tr>
<th>Domains</th>
<th>Factors identified</th>
<th>Percent Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test-Retest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Norms/Social Policies</td>
<td>80/85</td>
<td>94.1</td>
</tr>
<tr>
<td>Community Factors</td>
<td>29/34</td>
<td>85.3</td>
</tr>
<tr>
<td>School Factors</td>
<td>21/24</td>
<td>87.5</td>
</tr>
<tr>
<td>Family or Peer Factors</td>
<td>90/84</td>
<td>93.3</td>
</tr>
<tr>
<td>Individual Factors</td>
<td>91/88</td>
<td>96.7</td>
</tr>
<tr>
<td>Mean</td>
<td>-------</td>
<td>91.4</td>
</tr>
</tbody>
</table>

Note: Article focus (e.g., theoretical vs. empirical) agreement was 100%.

*Inter-coder Reliability*

Content analysis allows researchers to uncover and categorize underlying themes, patterns, values and perspectives that are contained in the objects of analysis (Kang, Kara, Laskey, & Seaton, 1993). A major methodological issue in content analysis is the consistency of the interpretation and categorization of the objects of interest. Specifically, categorizations of environmental antecedents are deemed *reliable* in that coders identify and place environmental antecedents in the same category. The techniques used to assess the consistency of such coding are subsumed under the title inter-coder agreement (Kang et al., 1993). What constitutes an acceptable level of inter-coder reliability for each variable is open to debate (Neuendorf, 2002). According to Miles and Huberman, (1984), 70 percent inter-coder agreement is considered satisfactory. If agreement failed to reach 70 percent,
categories were clarified, rearranged, and/or developed to provide consistency and precision of data gathering. Krippendorff (1980) contends that variables at .80 reliability or above allow for interpretation and study replication. Holsti (1969) recommends that in case of low reliability the content categories should not be rejected, instead categories should be redefined, redeveloped and made more specific. Therefore, for this study, an inter-coder agreement of .80 or higher was the standard. Failure to attain 80 percent inter-coder reliability resulted in examining inconsistencies and redefining operational definitions, if applicable.

According to Holsti (1969) “the goal of content analysis is to present a systematic and objective description of communication” (pp. 127). The Ph.D. program of Mass Communication and Media Arts is designed to produce scholars and teachers who can make significant contributions to the understanding and development of the mass media and their utilization (Southern Illinois University, 2002). A doctoral student from the Mass Communication and Media Arts Department was recommended to participate in this study. The student was identified as a person who possessed expertise in content analysis and coding processes. Coder B (Coder A – being the lead researcher) was asked to randomly select and code 10 percent of journal articles previously coded by the lead researcher. Agreement for environmental domains and environmental antecedents was captured. Prior to coding, a script was read aloud to Coder B including; a brief introduction of the study, a description of the study, purpose of study, an explanation of the two coding sheets, and a description and definition of the coding
protocols. Agreement of inter-coder reliability will be calculated using formula adapted from Holsti (1969):

\[ R = \frac{2M}{N_1 + N_2} \]

Where

\( M \) = Number of coding events (e.g., environmental antecedents) on which two coders agree

\( N_1 \) = Total number of coding events by first coder (Coder A)

\( N_2 \) = Total number of coding events by second coder (Coder B)

\( N_1 + N_2 \) = Total number of coding events (e.g., environmental antecedents) by two coders.

As discussed previously, an acceptable level of agreement was set at .80 or above. Failure to obtain .80 agreement resulted in re-examining operational definitions and mitigating data collection inconsistencies. Holsti (1969) contends that in the case of low reliability between two inter-rater reliability coders, content categories should not be rejected; instead categories should be redefined, developed and made more specific. As mentioned previously, conducting a pilot test, and intra-rater and inter-rater reliability tests were necessary to avoid the threat of internal validity.

**Inter-Coder Reliability Results**

Following pilot tests (i.e., initial and final) and intra-coder test-retest to address threats to reliability, efforts were then made to instruct coder B on possible ambiguities in antecedent themes. Once coder training was completed, key antecedent themes that were identified as “problematic” included: genetics (i.e., cultural, individual, and/or family), socio-economic status (i.e., cultural, community, and/or family), and fear of litigation for injury when utilizing public facilities (i.e., culture, community, and/or school).
Subsequent training of coder B included rewriting coding instructions to clarify measurement of "genetics" (i.e., individual, family and/or cultural), potentially can fit into all three domains, "socio-economic" status as belonging only to family domain, and "fear of litigation for injury when utilizing public facilities" as belonging to community domain. Again prior to conducting inter-coder reliability, protocol for filling out coding sheets, domain and theme definitions were read aloud to coder B with emphasis on clarity and definition. Complex wording and/or difficult theoretical concepts in codebook of operational definitions (i.e., themes having a protective factor or negative factor) were in some cases reviewed for coder B. It was decided that when a possible ambiguous word or theme arose, the coder would need to take the preceding paragraph in the article into account before coding. Inter-coder reliability is reported in Table 4. See Appendix O for more detail. Both types of reliabilities tests (i.e., intra-coder and inter-coder) were conducted to avoid the threat of internal validity of the instrument (codebook) by eliminating ambiguity and personal bias as much as possible.

**Data Collection**

**Systems of Enumeration**

In deciding how to analyze data and present findings, the analyst needs to determine which contextual unit (e.g., theme) to quantify, and system of enumeration (e.g., the procedure of counting units) to be utilized (Holsti, 1969). Selection of units rests upon two considerations. First, which unit of analysis will best meet requirements of the research problem? And secondly, which units will
Table 4.

*Inter-Coder Reliability Agreement of Coder A and B in Percent (n=87)*

<table>
<thead>
<tr>
<th>Domains</th>
<th>Factors identified</th>
<th>Percent Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Norms/Social Policies</td>
<td>85/96</td>
<td>88.5</td>
</tr>
<tr>
<td>Community Factors</td>
<td>34/36</td>
<td>94.4</td>
</tr>
<tr>
<td>School Factors</td>
<td>24/29</td>
<td>83.0</td>
</tr>
<tr>
<td>Family or Peer Factors</td>
<td>85/94</td>
<td>90.4</td>
</tr>
<tr>
<td>Individual Factors</td>
<td>88/97</td>
<td>90.7</td>
</tr>
<tr>
<td>Mean</td>
<td>-------</td>
<td>89.4</td>
</tr>
</tbody>
</table>

Note: Article focus theoretical vs. empirical resulted in 94.3% agreement give satisfactory results with efficient use of resources? (e.g., time, money, and level of difficulty in coding data and analyzing data) (Holsti, 1969). For selecting a system for enumeration, the researcher need be aware of the purpose of the research question(s) and how results will be analyzed and reported, hence frequency and percentages were selected.

**Quantitative Content Analysis**

For purpose of analysis and reporting, the most widely used method of measuring characteristics of content is frequency, in which every occurrence of a unit is tallied (Holsti, 1969). Stone (1997) refers to frequency tabulation as intensity, as researchers attempt to assess presence or absence of themes in text. Holsti (1969) points out that researchers who utilize frequency measures assume each unit of content should be given equal weight, permitting direct comparison
(e.g., valid indicator of concern, focus of attention, intensity, value, importance etc.). Quantitative content analysis was conducted by tallying environmental antecedent themes present in the articles.

Qualitative Content Analysis

Another method of conducting content analysis often called nominal or qualitative content analysis. Simply, the researcher is faced with a simple dichotomous decision, (viz., Does the content unit appear or not?) (Holsti, 1969).

This method has several advantages when interpreting results. Qualitative content analysis usually can be conducted with ease and with high reliability because the coder is not faced with frequency counting, intensity, and/or ambiguous subjective measurements (Holsti, 1969). However since content analysis is at the cross-roads of research (i.e., qualitative and quantitative), according to Weber (1985) the best content analytic studies utilize and combine qualitative and quantitative modes of analysis. Content analysis coding and other fundamental procedures associated with grounded theory development require qualitative assessment including conceptualization and operationalization involving the interaction of theoretical concerns and empirical observations (Babbie, 1998). In other words, content analysis procedure is more than counting themes in terms of frequencies and percentages. Qualitative procedures employed in this study were: a) identification of environmental antecedents themes in ecological models, b) collapsing and/or combining antecedent themes, c) assigning themes to ecological theory categories, d) expanding or narrowing antecedent theme(s), and e) analytic induction. Analytic induction defined by Glaser and Straus (1967) is a process of observation that goes
beyond description of variables (e.g., defining antecedent themes) to uncover patterns and/or relationships among variables (e.g., antecedent themes) and ultimately propose sub themes or patterns. Babbie highlights that utilizing this inductive approach to interpreting results "...allows a greater latitude for discovering the unexpected" (Babbie, 1998, p. 282). Trends of themes were examined and inductive analysis was employed whereby collapsing crossover themes into new concepts according to percentage of presentation in sample. See Figure 8 for detailed explanation of the process for coding journal text.

Data Analysis

"In quantitative content analysis, the process of data analysis typically involves statistical procedures, tools that summarize data so that patterns may be efficiently illuminated" (Riffe et al., 1998, p. 150). Figures and statistics may be reported one variable at a time (univariate), or variables may be cross-tabulated in various ways (Neuendorf, 2002). As risk factors (i.e., environmental antecedents) emerged from the content analysis of the text, each theme was added to construct a new ecological model. All environmental antecedents related to obesity reported in both applied/theoretical and data-based/empirical articles were considered as data and delineated and noted as having been presented in either an empirical or theoretical article.

Weighing Environmental Antecedents in a New Model

The weighting scheme to construct a new model was based on frequency percentages defined by Krippendorff (1980). Krippendorff uses the term "relative frequency" to describe unique themes represented by a percentage of the sample size (p. 109). Although this method is a quasi-statistical approach to data analysis, factors (viz.,
a) Read article.

b) Identify and code for theme(s) present in the text through sentences.

c) Record themes on coding sheets A and B.

d) If a theme(s) was present (e.g., vending machines in schools) it was noted and tallied in appropriate domain, in this case under the heading “school” vending machine would be written in the blank space provided.

e) Themes appearing more than once were tallied once per article.

f) Themes appearing in the article not anticipated were coded in the “other“ category in the appropriate domain or category.

g) Once entire sample of journal articles were coded, frequencies of theme(s) were then tallied. Aggregate frequency comparisons between the journals are provided in the results section in Chapter Four.

Figure 7. Content Analysis Coding Procedures

sentences or themes deemed environmental antecedents) appearing more frequently in the sample reflected a higher degree of importance or weight in the final model. Concerning the utilization of frequency indices as a means to reflect weight as a measure, Krippendorff notes, “the frequency with which a symbol, idea, or subject matter occurs in a stream of messages tends to be interpreted as a measure of importance, attention, or emphasis” (p. 40).

Proximal and Distal Leverage Points

The design and appearance of existing ecological models can take a variety of shapes and forms (see Appendix J). Seven of the 10 models in Appendix J make
reference to proximal and/or distal leverage points. Distinctions between proximal and distal are relative to the influence of the condition (e.g., the risk for childhood obesity). Booth et al., (2001) defines proximal leverage points as, “the immediate controller of a given influence on physical activity or eating patterns within a behavior setting” (p. S29). Likewise, Booth and colleagues define distal leverage points as having “…indirect control over a given influence” (p. S29). Researchers tend to agree that the strength or intensity of distal leverage points tends to have greater levels of behavioral influence on obesity. For example, distal leverage points (e.g., government and/or community influences) are broad and pervasive but indirectly have substantial influence on behavior (Booth et al., 2001; Neumark-Sztainer, 2000).

Summary

Prevalence of childhood obesity in the U.S. has markedly increased over the past two decades, and is expected to gradually rise. The current epidemic of childhood obesity is caused by an environment that promotes excessive food intake and discourages physical activity.

Prior to answering the research questions, a review of ecological models, environmental antecedents related to childhood obesity was necessary. Results of a database search and manual review of article references produced four hundred ninety six articles pertaining to ecological theory and childhood obesity (n=496). Although multiple ecological theories existed for childhood obesity, not all theories found were equal in their abilities to link problems, processes, and provide intervention goals to practice. Ten (n=10) articles were retained based on: a) six criteria designed to evaluate scientific theory developed by Ryckman (1994), b) matching of operational definitions of
ecological theory provided by (McLeroy et al., 1988; Neumark-Sztainer, 2001 and Sallis & Owen, 1997), and c) interweaving theory, empirical reports, and qualitative data through review of literature. The product of grounded or emergent variable identification was an a priori codebook of theoretical childhood obesity antecedents grouped according to ecologic category.

Face validity check of codebook by expert panel, a pilot test, and both intra-rater reliability test, and inter-rater reliability tests were conducted. Computerized data-base search utilizing keyword “obesity” and manual analyses were conducted resulting in a sample of eight hundred and seventy four articles (N = 874). Content analysis methods including both qualitative and quantitative research methods were employed to extract environmental antecedents to build a new model of ecological antecedents. Trends of antecedents were calculated, tabulated and presented, and the use of inductive analysis was utilized to report antecedent patterns or sub-themes which cross-over ecological categories.

The rationale or task of identifying broader contextual, environmental, societal, and policy variables may improve our understanding of individual’s eating and physical activity behaviors. Uncovering themes present in the sample of journals served four important functions: 1) justification or staying power of environmental antecedents contained in previous models, 2) elucidation of new environmental antecedents not contained in old ecological models can give researchers additional platforms from which to investigate, 3) a weighing system can be derived from frequency or percentage results indicating agreement across disciplines, and finally 4) development of a new model could
serve as an important taxonomy derived from multi-disciplined literature to promote further investigation of the complex factors which promote obesity.

Finally, an ecological approach can allow investigators to identify all antecedents known and hypothesized to contribute to childhood obesity. Given the incidence and seriousness of childhood obesity, understanding, preventing, and treating its development would improve the lives of innumerable youth and potentially save millions of dollars in related health care costs.
CHAPTER IV

Results

The purpose of this study was to build a comprehensive, multi-disciplinary, ecological, childhood obesity model by examining past theory and research in twenty-five journals covering five disciplines over the course of a decade, 1993-2002. This chapter describes the study sample and summarizes the study's findings.

Previously Published Ecological Models

Prior to answering the research questions, a review of ecological models, environmental antecedents related to childhood obesity was necessary. Namely, what ecological models or frameworks designed for the prevention of childhood obesity, if any, were published in the literature? A Boolean search was conducted utilizing the key words of: "ecological" and/or "models" and "obesity" (i.e., the search resulted in articles with the key words of: "obesity," "ecological" alone, "models" alone, or both "ecological" and "model" in it). Results of the database search produced 496 journal articles. Articles \( n = 496 \) were carefully reviewed for research relevance. Criteria for model inclusion included identifying or matching models utilizing an ecological construct developed by Neumark-Sztainer (2000) and matching the ecological perspective definition provided by Sallis and Owen (1997). Although multiple ecological theories exist for childhood obesity prevention, not all of the theories found were equal in their abilities to link problems, processes, and goals to provide interventions for practice. Six criteria (i.e., comprehensiveness, precision, and testability, parsimony, empirical validity, heuristic value, and applied value) for evaluating scientific theory developed by (Ryckman, 1994) was utilized. Ecological
models were eliminated if they: 1) had poor or unreported psychometric properties, 2) were too complex in wording, 3) targeted adults, and not children, and 4) utilized other health conditions (i.e., not obesity as an example), and 5) were too closely resembled another model already selected. After subsequent review, ten (n=10) ecological models were retained for construction of an *a priori* codebook (See Appendix M). By interweaving theory, empirical reports, and qualitative data through review of literature, the researcher developed an initial list of topics for the operational definition codebook. The aim of the operational codebook was twofold: (1) to provide a detailed description of the ecological theories or models involving childhood obesity, and (2) have the ability to be categorized in five domains (i.e., national, community, school, family, and individual). Oldenburg, French, and Glanz (1999) stated “health behavior change programs should be based not only on relevant demonstrably effective strategies, but also on relevant theories or models” (p. 503). The potential for extension of the application of such theories from the multiple levels of influence signifies relevance and need for conducting a study of this nature.

*Study Sample*

Utilizing “obesity” as a key word, a total of eight hundred and seventy seven (N=877) articles were identified utilizing all of the following databases: MEDLINE; EBSCO; PsychInfo; HealthInfo; ERIC; CINAHL; and SPORTDiscus. As journal articles in the sample were collected, a manual review of all table of contents of each journal was completed to ensure that no articles were being missed from computer data-base search. Journal articles were identified and retained for the sample if the
keyword "obesity" was present in at least one of the following: a) keyword section, b) abstract, or c) the title of the article. Three articles were discarded for failure to meet criteria, therefore 874 articles were retained for the sample. Annual publication of journals (e.g., issues published per year) varied widely across the sampled journals. See Table 5 for journal profiles.

Table 5.

**Profile of Journals and Issues in Sample**

<table>
<thead>
<tr>
<th>Discipline/Title</th>
<th>Issues/Year</th>
<th>Articles/issue average</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(Medicine)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The New England Journal of Medicine</td>
<td>50</td>
<td>28</td>
</tr>
<tr>
<td>Journal of the American Medical Association</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>The Lancet</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>Journal of Pediatrics</td>
<td>12</td>
<td>38</td>
</tr>
<tr>
<td>Archives of Pediatrics and Adolescent Medicine</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td><strong>(Nutrition)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Journal of Clinical Nutrition</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>Obesity Reviews</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Critical Reviews in Food Science and Nutrition</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>International Journal of Obesity</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Nutrition Reviews</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td><strong>(Psychology)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological Bulletin</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Psychological Review</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Journal of Clinical Psychiatry</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Journal of Consulting and Clinical Psychology</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Psychological Medicine</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td><strong>(Health)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Journal of Epidemiology</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>American Journal of Public Health</td>
<td>12</td>
<td>35</td>
</tr>
<tr>
<td>H.E.Q./Health Education and Behavior</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Journal of School Health</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Health Values/American Journal of Health Behavior</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td><strong>(Sport Sciences)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Journal of Sports Medicine</td>
<td>6</td>
<td>35</td>
</tr>
<tr>
<td>Medicine and Science in Sports and Exercise</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>Journal of Applied Physiology</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>Journal of Sport and Exercise Psychology</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Journal of Physical Education, Recreation, and Dance</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>
Disciplines varied greatly on childhood obesity coverage (see Table 6). Journals in order of highest to lowest coverage were: 1) *The Lancet* (Medicine), 2) *International Journal of Obesity* (Nutrition), 3) *American Journal of Epidemiology* (Health), 4) *The Journal of the American Medical Association* (Medicine), and 5) *American Journal of Clinical Nutrition* (Nutrition). Journals representing disciplines psychology and sport sciences contributed the lowest percentage (10.1%) overall.

Of 3,559 issues (i.e., 334,000 articles) in the sample of 25 journals over a decade, 874 articles were published on obesity; representing less than 1 percent of all published articles. The highest number of articles published on obesity reported in the ten-year span was in *The Lancet* ($n=14.2\%$). *The Lancet* is a journal that is published 50 times a year with an average of twenty-five articles published per issue. Three journals (i.e., *American Journal of Sports Medicine*, and *Journal of Sport and Exercise Psychology* - both in Sport Sciences, and *Psychological Review* - Psychology) failed to publish a single article on obesity in the decade sampled. *The International Journal of Obesity* ($n=119/13.6\%$) and *American Journal of Epidemiology* ($n=110/12.6\%$) were second and third ranked journals for childhood obesity coverage. Table 7 demonstrates the frequency and percent of articles published on obesity by year beginning in 1993 to 2002. Results show that the number of articles written on childhood obesity has steadily increased over the decade sampled (e.g., 58 in 1993 to 133 in 2002).
### Table 6.

**Childhood Obesity Articles Published in Twenty-Five Health-Related Journals, 1993-2002.**

<table>
<thead>
<tr>
<th>Discipline/Title</th>
<th>Total Issues</th>
<th>Articles</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Medicine)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>The Lancet</em></td>
<td>500</td>
<td>124</td>
<td>14.2</td>
</tr>
<tr>
<td><em>Journal of the American Medical Association</em></td>
<td>500</td>
<td>102</td>
<td>11.7</td>
</tr>
<tr>
<td><em>The New England Journal of Medicine</em></td>
<td>500</td>
<td>50</td>
<td>5.7</td>
</tr>
<tr>
<td><em>Journal of Pediatrics</em></td>
<td>120</td>
<td>41</td>
<td>4.7</td>
</tr>
<tr>
<td><em>Archives of Pediatrics and Adolescent Medicine</em></td>
<td>120</td>
<td>25</td>
<td>2.9</td>
</tr>
<tr>
<td>(Nutrition)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>International Journal of Obesity</em></td>
<td>159</td>
<td>119</td>
<td>13.6</td>
</tr>
<tr>
<td><em>American Journal of Clinical Nutrition</em></td>
<td>168</td>
<td>75</td>
<td>8.6</td>
</tr>
<tr>
<td><em>Nutrition Reviews</em></td>
<td>138</td>
<td>28</td>
<td>3.2</td>
</tr>
<tr>
<td><em>Critical Reviews in Food Science and Nutrition</em></td>
<td>69</td>
<td>13</td>
<td>1.5</td>
</tr>
<tr>
<td><em>Obesity Reviews</em></td>
<td>10</td>
<td>8</td>
<td>0.9</td>
</tr>
<tr>
<td>(Psychology)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Journal of Consulting and Clinical Psychology</em></td>
<td>60</td>
<td>26</td>
<td>3.0</td>
</tr>
<tr>
<td><em>Journal of Clinical Psychiatry</em></td>
<td>120</td>
<td>9</td>
<td>1.0</td>
</tr>
<tr>
<td><em>Psychological Medicine</em></td>
<td>64</td>
<td>3</td>
<td>0.3</td>
</tr>
<tr>
<td><em>Psychological Bulletin</em></td>
<td>60</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td><em>Psychological Review</em></td>
<td>40</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(Health)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>American Journal of Epidemiology</em></td>
<td>148</td>
<td>110</td>
<td>12.6</td>
</tr>
<tr>
<td><em>American Journal of Public Health</em></td>
<td>120</td>
<td>36</td>
<td>4.1</td>
</tr>
<tr>
<td><em>H.E.Q./Health Education and Behavior</em></td>
<td>55</td>
<td>23</td>
<td>2.6</td>
</tr>
<tr>
<td><em>Journal of School Health</em></td>
<td>100</td>
<td>21</td>
<td>2.4</td>
</tr>
<tr>
<td><em>Health Values/American Journal of Health Behavior</em></td>
<td>60</td>
<td>10</td>
<td>1.1</td>
</tr>
<tr>
<td>(Sport Sciences)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Journal of Applied Physiology</em></td>
<td>120</td>
<td>23</td>
<td>2.6</td>
</tr>
<tr>
<td><em>Journal of Physical Education, Recreation, &amp; Dance</em></td>
<td>84</td>
<td>14</td>
<td>1.6</td>
</tr>
<tr>
<td><em>Medicine and Science in Sports and Exercise</em></td>
<td>133</td>
<td>13</td>
<td>1.5</td>
</tr>
<tr>
<td><em>American Journal of Sports Medicine</em></td>
<td>60</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Journal of Sport and Exercise Psychology</em></td>
<td>51</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>N = 3559</td>
<td>N = 874</td>
<td>100%</td>
</tr>
</tbody>
</table>

*H.E.Q.* = Health Education Quarterly

**Article Focus: Theoretical vs. Empirical**

Frequencies and percentages were calculated with SPSS statistic software for Windows version 11.0. When articles were tallied according to focus (e.g.,
theoretical/applied versus empirical/data-based), a greater proportion of the sample was empirically based (n=545) or 62.4%, indicating greater research efforts were being directed towards measuring interventions, conducting survey research, and/or measuring knowledge, attitudes or behaviors related to obesity (see Table 8). Conversely, theoretical articles focusing on viewpoints, commentary, general articles, teaching techniques, and/or guidelines were published less frequently during the decade examined.

Table 7.

Frequency and Percentage of Articles on Obesity by Year in all Journals Sampled
(n=25), 1993 – 2002

<table>
<thead>
<tr>
<th>Year</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>133</td>
<td>15.2</td>
</tr>
<tr>
<td>1999</td>
<td>123</td>
<td>14.1</td>
</tr>
<tr>
<td>2000</td>
<td>102</td>
<td>11.7</td>
</tr>
<tr>
<td>1998</td>
<td>94</td>
<td>10.8</td>
</tr>
<tr>
<td>2001</td>
<td>90</td>
<td>10.3</td>
</tr>
<tr>
<td>1996</td>
<td>87</td>
<td>10.0</td>
</tr>
<tr>
<td>1995</td>
<td>66</td>
<td>7.6</td>
</tr>
<tr>
<td>1994</td>
<td>61</td>
<td>7.0</td>
</tr>
<tr>
<td>1997</td>
<td>60</td>
<td>6.9</td>
</tr>
<tr>
<td>1993</td>
<td>58</td>
<td>6.6</td>
</tr>
<tr>
<td>Total</td>
<td>874</td>
<td>100</td>
</tr>
</tbody>
</table>

When article focus was compared to the number of actual environmental antecedents present in journal articles, empirical articles addressed ninety-four antecedents a total of 1127 times and theoretical articles addressed the identical ninety-four antecedents a total of 1263 times. The average number of environmental
antecedents in an empirical article equaled 2.3 factors, and a theoretically focused article produced a full factor more at 3.8. This finding mirrors what Kirby (2002) found in research concerning sexual behaviors; a large majority of empirical articles often examine the impact of a very small number of antecedents when compared to theoretical articles which tend to cover a wider range of antecedents or factors.

Table 8.

<table>
<thead>
<tr>
<th>Article Focus</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empirical/Data-based</td>
<td>545</td>
<td>62.4</td>
</tr>
<tr>
<td>Theoretical/Applied</td>
<td>329</td>
<td>37.6</td>
</tr>
<tr>
<td>Total</td>
<td>874</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Research Question 1

What environmental antecedents related to childhood obesity (ages 3 to 14), if any, are presented in multi-disciplinary health-related journals from 1993-2002?

Table 9 represents a breakdown of frequency of factors found in the sample according to domain or categorical representation. Of all articles published on childhood obesity (N=874 articles), three of five domains (e.g., national, individual, and family) accounted for a greater share of antecedents (e.g., n=39.5%; n=35.9%; and n=33.3% respectively). Community and school domains accounted for n=16.0% and n=14.0% of the total antecedents. When all articles were coded for, three antecedents not anticipated (e.g., default category) were identified. These three environmental antecedents were: (1) breastfeeding a protective factor against obesity (individual domain), (2) signs or
advertisements to encourage stair use (school domain), and (3) availability or accessibility of carts or motorized vehicles which discourage walking in shopping malls or retail stores (community domain). All three "default" antecedents were identified as such, then included in a final data tally in each of the respective domains. A total of ninety-four \( (n=94) \) antecedents resulted.

Table 9.

*Frequency and Percentage of Environmental Antecedents by Ecological Domain*

\( (N=874) \)

<table>
<thead>
<tr>
<th></th>
<th>National</th>
<th>Community</th>
<th>School</th>
<th>Family</th>
<th>Individual</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Present*</td>
<td>529.0</td>
<td>734.0</td>
<td>752.0</td>
<td>583.0</td>
<td>560.0</td>
<td>871.0</td>
</tr>
<tr>
<td>Frequency</td>
<td>345.0</td>
<td>140.0</td>
<td>122.0</td>
<td>291.0</td>
<td>314.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Percentage**</td>
<td>39.5</td>
<td>16.0</td>
<td>14.0</td>
<td>33.3</td>
<td>35.9</td>
<td>.3</td>
</tr>
</tbody>
</table>

*Number of journal articles failing to mention identified domain

**Percentage is calculated by Frequency / 874. Since each domain separately can appear in every article sampled, percentages are greater than 100 percent.

Research Question 2.

To what extent (frequency) are environmental antecedents of childhood obesity covered in selected journals from 1993-2002? For frequency of obesity articles and percentages with respect to the five disciplines see Table 10.

Journals from the discipline of medicine had the greatest combined frequency on obesity articles (e.g., 124; 102; 50; 41; and 25), totaling 342 or 39.2% of the sample. Journals from nutrition had the second most contributing articles (e.g., 119; 75; 28; 13; and 28), totaling 243 or (27.8%) of the sample. Health education by
discipline ranked third in obesity coverage with a combined frequency of 200 or (22.8%). Ranking respectively a distant fourth and fifth were sport sciences and psychology. Journals of sports sciences in the sample registered a frequency of 50 or (5.7%) of the sample and psychology as a discipline recorded the least amount of coverage at 39 or (4.4%).

Table 10.

*Journals in Sample*

<table>
<thead>
<tr>
<th>Journal</th>
<th>Discipline</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANCET</td>
<td>Medicine</td>
<td>124</td>
<td>14.2</td>
</tr>
<tr>
<td>IJOO</td>
<td>Nutrition</td>
<td>119</td>
<td>13.6</td>
</tr>
<tr>
<td>AJEPI</td>
<td>Health Education</td>
<td>110</td>
<td>12.6</td>
</tr>
<tr>
<td>JAMA</td>
<td>Medicine</td>
<td>102</td>
<td>11.7</td>
</tr>
<tr>
<td>AJCN</td>
<td>Nutrition</td>
<td>75</td>
<td>8.6</td>
</tr>
<tr>
<td>NEJM</td>
<td>Medicine</td>
<td>50</td>
<td>5.7</td>
</tr>
<tr>
<td>JOPED</td>
<td>Medicine</td>
<td>41</td>
<td>4.7</td>
</tr>
<tr>
<td>AJPH</td>
<td>Health Education</td>
<td>36</td>
<td>4.1</td>
</tr>
<tr>
<td>NR</td>
<td>Nutrition</td>
<td>28</td>
<td>3.2</td>
</tr>
<tr>
<td>JOCCP</td>
<td>Psychology</td>
<td>26</td>
<td>3.0</td>
</tr>
<tr>
<td>AOPAM</td>
<td>Medicine</td>
<td>25</td>
<td>2.9</td>
</tr>
<tr>
<td>HEQ/HB</td>
<td>Health Education</td>
<td>23</td>
<td>2.6</td>
</tr>
<tr>
<td>JAP</td>
<td>Sport Sciences</td>
<td>23</td>
<td>2.6</td>
</tr>
<tr>
<td>JOSH</td>
<td>Health Education</td>
<td>21</td>
<td>2.4</td>
</tr>
<tr>
<td>JOPERD</td>
<td>Sport Sciences</td>
<td>14</td>
<td>1.6</td>
</tr>
<tr>
<td>CRFSN</td>
<td>Nutrition</td>
<td>13</td>
<td>1.5</td>
</tr>
<tr>
<td>MSSE</td>
<td>Sport Sciences</td>
<td>13</td>
<td>1.5</td>
</tr>
<tr>
<td>HV/AJHB</td>
<td>Health Education</td>
<td>10</td>
<td>1.1</td>
</tr>
<tr>
<td>JOCP</td>
<td>Psychology</td>
<td>9</td>
<td>1.0</td>
</tr>
<tr>
<td>OR</td>
<td>Nutrition</td>
<td>8</td>
<td>0.9</td>
</tr>
<tr>
<td>PSYMED</td>
<td>Psychology</td>
<td>3</td>
<td>0.3</td>
</tr>
<tr>
<td>PSYCHB</td>
<td>Psychology</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>AJSM</td>
<td>Sport Sciences</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>JSEP</td>
<td>Sport Sciences</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PSYCHR</td>
<td>Psychology</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>874</td>
<td>100</td>
</tr>
</tbody>
</table>

The number of articles on obesity has gradually increased over the decade sampled. The lowest recorded frequency was 58 articles in 1993 (the first year
examined). The highest frequency was in 2002 (133 articles). For more detail see Table 10.

**Research Question 3.**

What are major trends and differences in frequencies of environmental antecedents to childhood obesity as presented in theoretical articles and/or empirical articles among the five disciplines in selected journals from 1993-2002?

**Trends**

As one examines the breakdown of environmental antecedents by domain (e.g., national policy/social norms, community, school, family, individual) (see tables 11, 12, 13, 14, 15) respectively, one will recognize that because obesity is multi-determined, and a wide variety of conditions and behaviors play a role. Ninety-four environmental antecedents were identified and are linked or associated to the problem of obesity. Most environmental antecedents are weakly or, in some instances, moderately related to behavior; and some of these antecedents are undoubtedly linked with one another. In particular, some of the more distal antecedents (e.g., social norms, community and school antecedents) affect proximal antecedents (e.g., genetic, individual, and family antecedents) and vice versa. For example, the greatest factor (i.e., distal force) was social norms regarding physical activity and eating (n=148; 16.9%), with a recognized need that as a culture, children need to improve diet and increase physical activity. The second largest factor (i.e., proximal force) was in the individual domain; children are more prone to sedentary lifestyle, as in the amount of television viewing, computer use, and/or video games (n=137; 15.7%). Another
proximal social norm ranking fairly high (number 5) was that of modern technology leading to decreased physical activity (n=80; 9.2%).

Results indicate that there tends to be agreement across the disciplines that kids need improvement in their exercise and eating habits, but several barriers (i.e., television, computers, video games, and/or automobile use for transportation) compete for time that would otherwise be reserved for exercise. Results across disciplines resonate and reflect that both genetic predisposition to obesity and social economic status (i.e., both proximal factors) are key factors in childhood obesity development. Genetic predisposition (i.e., which appears as three distinctly different themes in three domains) contributed as “individual predisposition with ethnic heritage” (n=110; 12.6%); culturally “with genetics in certain ethnic groups contributing” (n=72; 8.2%); and, family contribution “having one or more obese parents (n=59/6.8%). Articles with at least one genetic antecedent present appeared more frequently in empirical articles than theoretical articles (e.g., n=52.7% - individual; n=56.9% -national norm/policy; n=78% -family).

National Policy/Social Norm Antecedents

Five hundred twenty nine (60%) of the 874 journal articles failed to mention antecedents belonging to the conceptual category of national policy/social norms while three hundred forty five articles presented 20 antecedents equaling 1244 occurrences. Out of the five broadly conceived domains, national policy/social norm domain accounted for more antecedents than the other four domains. Social norms regarding physical activity/eating, labor saving devices such as the prominent use of cars, and the vast amount of readily accessible high fat/calorie convenience foods
available to children led all antecedents in this category.

National Policy/Social Norms Weighting and Theme Significance

Because frequency of a theme (or the number of times a theme was present in a journal article) could interject error in interpretation, it was necessary to justify importance, or weight in the model, by recording antecedent significance and statistical information on data collection sheet B. For example, an antecedent may have been emphasized in the literature but not found to be significant. Rarely is significance given in theoretical articles, however when measured, empirical articles often times do report antecedent significance. Recall that levels of significance are considered statistically significant if the probability that we are wrong (where we reject Ho and Ho is true) is less than .05. “Significant findings are substantial and not due to chance” (Coolidge, 2002, p. 107).

Results show (see table 15) that domain “national policy/social norms” had one theme (i.e., certain ethnic groups at risk for obesity) register 22 articles reporting significance when tested, even though it ranked fourth among all antecedents in the domain. Other antecedents reported in the sample with reported significance, yet lower rankings overall (viz., 5, 6, and 7) were; “culture over-values thinness” (17 themes reporting significance), “marketing poor nutritional foods towards children” (16 themes significant), and urbanization and industrialization (15 significant themes). Antecedents with the highest frequency in national policy/social norm domain ranked one, two, and three (e.g., “social norms regarding eating and exercise” (8 articles reporting significance); “labor saving devices resulting in reduced activity” (11 articles reporting significance) and “excessive plentiful food supply” (14 articles
reporting significance) were positioned higher, thusly present more frequently in the articles, however had less empirical support. Themes with reported significance (e.g., “obese kids feel uncomfortable exercising” and “food guide pyramid needs alteration” ranked very low, 18 and 19 respectively, yet had (5 articles) and (1 article) reporting significance whereas “food labeling” and “nutrition labeling laws” failed to report one article citing significance (see Table 11).

Table 11.

<table>
<thead>
<tr>
<th>Ecological Antecedents -NP/SN (Themes)</th>
<th>Frequency</th>
<th>Percentage*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articles without mention of national policy</td>
<td>529</td>
<td>60.5</td>
</tr>
<tr>
<td>Articles with mention of national policy</td>
<td>345</td>
<td>39.5</td>
</tr>
<tr>
<td>Improve social norms regarding eating/exercise</td>
<td>148³</td>
<td>16.9</td>
</tr>
<tr>
<td>Labor saving devices have reduced activity</td>
<td>80³</td>
<td>9.2</td>
</tr>
<tr>
<td>Excessive plentiful food supply - (high cal./fat)</td>
<td>74³</td>
<td>8.5</td>
</tr>
<tr>
<td>Certain ethnic groups at risk for obesity</td>
<td>72¹</td>
<td>8.2</td>
</tr>
<tr>
<td>Culture over-values thinness (bias or stigma)</td>
<td>54²</td>
<td>6.2</td>
</tr>
<tr>
<td>Marketing towards children (high cal./fat food)</td>
<td>47²</td>
<td>5.4</td>
</tr>
<tr>
<td>Urbanization and industrialization</td>
<td>40²</td>
<td>4.6</td>
</tr>
<tr>
<td>Ubiquity of televisions, computers, games etc.</td>
<td>31³</td>
<td>3.5</td>
</tr>
<tr>
<td>Obesity low priority in medical community</td>
<td>31³</td>
<td>3.5</td>
</tr>
<tr>
<td>Pricing strategies increases poor food selection</td>
<td>26³</td>
<td>3.0</td>
</tr>
<tr>
<td>Literature confusing and not -“best practice”</td>
<td>23</td>
<td>2.6</td>
</tr>
<tr>
<td>Food portion sizes have increased</td>
<td>21³</td>
<td>2.4</td>
</tr>
<tr>
<td>Perceived crime (socially) – reduced activity</td>
<td>13</td>
<td>1.9</td>
</tr>
<tr>
<td>Insurance fails to cover obesity/weight control</td>
<td>12</td>
<td>1.4</td>
</tr>
<tr>
<td>Cultural denial of being obese/over weight</td>
<td>10</td>
<td>1.1</td>
</tr>
<tr>
<td>(-) Impact labeling foods - “no fat” or “low fat”</td>
<td>10</td>
<td>1.1</td>
</tr>
<tr>
<td>(+) Nutrition labeling laws – “menu boards”</td>
<td>7</td>
<td>.8</td>
</tr>
<tr>
<td>Obese kids feel uncomfortable exercising</td>
<td>6³</td>
<td>.7</td>
</tr>
<tr>
<td>Food guide pyramid needs to be altered</td>
<td>6</td>
<td>.7</td>
</tr>
<tr>
<td>(-) National decrease in tobacco use = wt. gain</td>
<td>4</td>
<td>.5</td>
</tr>
<tr>
<td>Total</td>
<td>1244</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Percentage is calculated by Frequency / 874.
NP/SN = National Policy/Social Norms
¹ Antecedent significant in 20 to 30 articles
² Antecedent significant in 15 to 19 articles
³ Antecedent significant in 5 to 14 articles
Community Antecedents: Weighting and Theme Significance

One hundred forty journal articles or (16%) of \(N=874\) contained antecedents belonging to the conceptual category of community while seven hundred thirty four articles failed to mention an ecological antecedent from the community domain.

Community themes with highest frequency were “accessibility of areas for youth to be active,” “overall perceived or real safety of the immediate community,” with “lack of sidewalks” and “geographic location” as being the highest reported antecedents contributing to childhood obesity (see Table 12).

Table 12.

<table>
<thead>
<tr>
<th>Ecological Antecedents - Community (Themes)</th>
<th>Frequency</th>
<th>Percentage*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articles without mention of community factors</td>
<td>734</td>
<td>84.0</td>
</tr>
<tr>
<td>Articles with mention of community factors</td>
<td>140</td>
<td>16.0</td>
</tr>
<tr>
<td>Lack of places for youth to be active</td>
<td>50</td>
<td>5.7</td>
</tr>
<tr>
<td>Perceived safety of community – urban decay</td>
<td>35</td>
<td>4.0</td>
</tr>
<tr>
<td>Lack of sidewalks – presence or quality</td>
<td>27</td>
<td>3.1</td>
</tr>
<tr>
<td>Geographic location (e.g., winter and activity)</td>
<td>26</td>
<td>3.0</td>
</tr>
<tr>
<td>Obese youth and opportunity to be active</td>
<td>23</td>
<td>2.6</td>
</tr>
<tr>
<td>Lack of bike paths to school or work</td>
<td>22</td>
<td>2.5</td>
</tr>
<tr>
<td>Lack of access to parks, playgrounds etc.</td>
<td>20</td>
<td>2.3</td>
</tr>
<tr>
<td>Availability of physicians in community</td>
<td>20</td>
<td>2.3</td>
</tr>
<tr>
<td>Numerous fast food restaurants</td>
<td>19</td>
<td>2.2</td>
</tr>
<tr>
<td>Connectivity and quality of streets for walking</td>
<td>11</td>
<td>1.3</td>
</tr>
<tr>
<td>Vending machines - (quantity and location)</td>
<td>11</td>
<td>1.3</td>
</tr>
<tr>
<td>(+/-) Grocery stores and SES; offerings</td>
<td>7</td>
<td>0.8</td>
</tr>
<tr>
<td>Convenience foods and gas stations</td>
<td>6</td>
<td>0.7</td>
</tr>
<tr>
<td>Limited choices for healthy foods - restaurants</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>Incentives for consumption of fast foods (toys)</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>Car dominated society – rerouting of traffic</td>
<td>3</td>
<td>0.3</td>
</tr>
<tr>
<td>Drinking water access</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Ubiquity of outdoor advertising for high fat</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Buffet or unlimited servings restaurants</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Presence of motorized carts – shopping malls</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Total</td>
<td>1028</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Percentage is calculated by Frequency / 874. ¹ Antecedent significant in 20 to 30 articles. ² Antecedent significant in 15 to 19 articles. ³ Antecedent significant in 10 to 14 articles.
The highest reported antecedent "lack of places for youth to be active" in terms of frequency was additionally the theme with the most reported significance (viz., 23 articles). A similar antecedent "lack of access to parks, playgrounds, and/or recreational spaces, ranked 7th overall had the second highest number of articles citing antecedent significance (15 articles). Other antecedent themes with empirical support were: "perceived safety of community" (14 articles), and "geographic location" (14 articles). "Lack of sidewalks" as a theme was mentioned frequently in the literature, (ranked 3rd overall) however, significance was reported in only (4) articles.

**School Antecedents: Weighting and Theme Significance**

One hundred twenty-two journal articles or (14%) of (N=874) contained antecedents belonging to the conceptual category of school while seven hundred fifty two articles failed to mention an ecological antecedent from the school domain. School antecedents appearing most frequently in the sample included: "decline in physical education and health education requirements," "availability of high fat/calorie school cafeteria foods," and "lack of focus in physical education on fun and life-long fitness." The amount and accessibility was viewed as an important antecedent as was not permitting children to be active and recognition that unhealthy foods marketed to children on school grounds is a powerful barrier to healthy nutrition. (see Table 13).

The top two ranked antecedents in the school domain, "decline in physical education and health education requirements" and "high fat/calorie ala carte food options in school cafeterias" also had the highest number of articles citing antecedent significance (19 articles) and (12 articles) respectively. Results also indicate that the
third, fourth, and fifth frequently mentioned themes (i.e., “lack of focus on life-long fitness and fun,” “vending machine accessibility and quantity,” and “lack of recess time”) had (8), (9), and (9) articles citing significance. One antecedent, “school gym available after school hours” qualified as an outlier, ranked in frequency terms low (15th overall) yet had (6) studies reporting significance.

Table 13.

**Frequency and Percentage of School Antecedents**

<table>
<thead>
<tr>
<th>Ecological Antecedents – School (Themes)</th>
<th>Frequency</th>
<th>Percentage*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articles without mention of school factors</td>
<td>752</td>
<td>86.0</td>
</tr>
<tr>
<td>Articles with mention of school factors</td>
<td>132</td>
<td>14.0</td>
</tr>
<tr>
<td>Decline in P.E. and Health Ed. requirements</td>
<td>64⁴</td>
<td>7.3</td>
</tr>
<tr>
<td>High fat/calorie ala carte food options</td>
<td>38²</td>
<td>4.3</td>
</tr>
<tr>
<td>Lack of focus (P.E.) on life-long/fun fitness</td>
<td>33³</td>
<td>3.8</td>
</tr>
<tr>
<td>Vending machines (accessibility/quantity)</td>
<td>29³</td>
<td>3.3</td>
</tr>
<tr>
<td>Lack of recess time for activity</td>
<td>28³</td>
<td>3.2</td>
</tr>
<tr>
<td>Non-nutritious food marketing in school</td>
<td>12</td>
<td>1.4</td>
</tr>
<tr>
<td>Education of school administrators on obesity</td>
<td>9</td>
<td>1.0</td>
</tr>
<tr>
<td>Foods high in fat or sugar given as rewards</td>
<td>8</td>
<td>.9</td>
</tr>
<tr>
<td>Parental involvement in nutrition curriculum</td>
<td>8</td>
<td>.9</td>
</tr>
<tr>
<td>School safety restricting walking to school</td>
<td>8</td>
<td>.9</td>
</tr>
<tr>
<td>National school breakfast/lunch program</td>
<td>7</td>
<td>.8</td>
</tr>
<tr>
<td>Food workers educated on food preparation</td>
<td>7</td>
<td>.8</td>
</tr>
<tr>
<td>Availability and referral of school counseling</td>
<td>6</td>
<td>.7</td>
</tr>
<tr>
<td>Sale of high fat/calorie foods (e.g., bake sale)</td>
<td>6</td>
<td>.7</td>
</tr>
<tr>
<td>School gym available after school for exercise</td>
<td>6³</td>
<td>.7</td>
</tr>
<tr>
<td>Comprehensive School Health Education</td>
<td>4</td>
<td>.5</td>
</tr>
<tr>
<td>Allowing students to leave campus for lunch</td>
<td>3</td>
<td>.3</td>
</tr>
<tr>
<td>Referral system for obese youth (healthcare)</td>
<td>2</td>
<td>.2</td>
</tr>
<tr>
<td>Availability of school health services</td>
<td>2</td>
<td>.2</td>
</tr>
<tr>
<td>Access/availability of water fountains</td>
<td>1</td>
<td>.1</td>
</tr>
<tr>
<td>Posting signs to encourage stair use</td>
<td>1</td>
<td>.1</td>
</tr>
<tr>
<td>Total</td>
<td>1034</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Percentage is calculated by Frequency / 874.
1 Antecedent significant in 20 to 30 articles
2 Antecedent significant in 10 to 19 articles
3 Antecedent significant in 5 to 9 articles
**Family/Interpersonal Antecedents: Weight and Significance**

Two hundred ninety one journal articles or (33.3%) of \(N=874\) contained antecedents belonging to the conceptual category of family/interpersonal. Five hundred eighty three articles failed to mention an ecological antecedent from the family domain. Themes with the most frequent coverage included: “family socio-economic status” (protective or as risk-factor), “family eating patterns” (i.e., eating out frequently, eating fruits and vegetables, having an abundance of high fat/calorie foods available in the home etc.) and “peers having an influence on the eating and exercise behavior of children.” Studies reported that genetic component of obesity is a strongly associated antecedent, with additional emphasis on “parents’ modeling healthy eating behavior.” “Socio-economic status” (i.e., family domain and proximal factor) was the first antecedent in terms of frequency in the family domain \(n=95; 10.9\%\) and fourth in rank frequency in entire sample of antecedents \(n=94\). Family socio-economic status \(n=95; 10.9\%\) appeared in 61.1% empirical articles as compared to 38.9% with a theoretical focus.

“One or more parents being obese” ranked 4\textsuperscript{th} overall in terms of frequency and had the most articles citing significance (36 articles), resulting in childhood obesity association. Similarly, “low levels of family activity” (frequency rank 6\textsuperscript{th} overall), and “family socio-economic status” (frequency rank 1\textsuperscript{st} overall), garnered an association to childhood obesity with both themes reporting (32 articles) and (30 articles) reporting significance respectively. Other antecedent themes frequently mentioned with significance, included: “quantity of high fat/calorie foods in
household” (23 articles reporting significance), “parents modeling healthy eating behavior” (18 articles significant), “overemphasizing diet or restriction of food” (18 articles significant), “lack of peer norms encouraging healthy eating behavior” (17 articles significant), and “stimulus cues to eating pervasively” (15 articles). See Table 14.

Table 14.

Frequency and Percentage of Family/Interpersonal Antecedents

<table>
<thead>
<tr>
<th>Ecological Antecedents – Family (Themes)</th>
<th>Frequency</th>
<th>Percentage*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articles with no mention of family factors</td>
<td>583</td>
<td>66.7</td>
</tr>
<tr>
<td>Articles with mention of family factors</td>
<td>291</td>
<td>33.3</td>
</tr>
<tr>
<td>Family socio-economic status (+/-)</td>
<td>95</td>
<td>10.9</td>
</tr>
<tr>
<td>Family eating patterns (e.g., high fat/calorie)</td>
<td>75</td>
<td>8.6</td>
</tr>
<tr>
<td>Lack of peer norms encouraging healthy eating</td>
<td>74</td>
<td>8.5</td>
</tr>
<tr>
<td>One or more parents/guardians being obese</td>
<td>59</td>
<td>6.8</td>
</tr>
<tr>
<td>Parents modeling healthy eating behavior</td>
<td>57</td>
<td>6.5</td>
</tr>
<tr>
<td>Low levels of family physical activity</td>
<td>54</td>
<td>6.2</td>
</tr>
<tr>
<td>Quantity of high fat/calorie foods in house</td>
<td>49</td>
<td>5.6</td>
</tr>
<tr>
<td>Parents knowledge regarding portion sizes</td>
<td>29</td>
<td>3.3</td>
</tr>
<tr>
<td>Overemphasizing dieting or restriction</td>
<td>21</td>
<td>2.4</td>
</tr>
<tr>
<td>Stimulus or cues for eating pervasive</td>
<td>21</td>
<td>2.4</td>
</tr>
<tr>
<td>Family stress/psychosocial problems present</td>
<td>19</td>
<td>2.2</td>
</tr>
<tr>
<td>Changing of parental work habits/hours</td>
<td>19</td>
<td>2.2</td>
</tr>
<tr>
<td>Exercise equipment in home</td>
<td>13</td>
<td>1.5</td>
</tr>
<tr>
<td>Presence of garden (e.g., fruit and vegetables)</td>
<td>13</td>
<td>1.5</td>
</tr>
<tr>
<td>Self-efficacy and positive social environment</td>
<td>11</td>
<td>1.3</td>
</tr>
<tr>
<td>Rewarding/punishing children utilizing food</td>
<td>10</td>
<td>1.1</td>
</tr>
<tr>
<td>Number of annual visits to physician</td>
<td>10</td>
<td>1.1</td>
</tr>
<tr>
<td>Repeated verbal or physical abuse</td>
<td>9</td>
<td>1.0</td>
</tr>
<tr>
<td>Peers exclude/discriminate obese children</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Parents do not recognize obesity in children</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>1226</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Percentage is calculated by Frequency / 874.

1 Antecedent significant in 30 to 40 articles
2 Antecedent significant in 20 to 29 articles
3 Antecedent significant in 10 to 19 articles
**Individual/Intrapersonal Antecedents: Weighting and Theme Significance**

One hundred fourteen journal articles or (35.9%) of \(N=874\) contained antecedents belonging to the conceptual category of individual while five hundred sixty articles failed to mention an ecological antecedent from the individual domain. Individual antecedents appearing most frequently in the sample included: "sedentary lifestyle," including watching television, "genetic predisposition of obesity due to ethnicity," "poor body image or lowered self esteem including loneliness."

"Individual binge-eating," "elevated dieting or radical weight loss methods," and "preference for high fat/calorie foods" ranked four, five and six respectively (see Table 15).

Table 15.

* Frequency and Percentage of Individual/Intrapersonal Antecedents

<table>
<thead>
<tr>
<th>Ecological Antecedents – Individual (Themes)</th>
<th>Frequency</th>
<th>Percentage*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articles with no mention of individual factors</td>
<td>560</td>
<td>64.1</td>
</tr>
<tr>
<td>Articles with mention of individual factors</td>
<td>314</td>
<td>35.9</td>
</tr>
<tr>
<td>Low physical activity (e.g., television/video)</td>
<td>137(^1)</td>
<td>15.7</td>
</tr>
<tr>
<td>Genetic predisposition towards obesity</td>
<td>110(^1)</td>
<td>12.6</td>
</tr>
<tr>
<td>Poor body image, poor self-esteem/loneliness</td>
<td>64(^1)</td>
<td>7.3</td>
</tr>
<tr>
<td>Binge eating, loss of control of eating</td>
<td>46(^2)</td>
<td>5.3</td>
</tr>
<tr>
<td>Elevated dieting or radical weight loss methods</td>
<td>45(^3)</td>
<td>5.1</td>
</tr>
<tr>
<td>Preference for foods high in fat/calories</td>
<td>40(^2)</td>
<td>4.6</td>
</tr>
<tr>
<td>Lack of skills/efficacy for physical activity</td>
<td>34(^2)</td>
<td>3.9</td>
</tr>
<tr>
<td>Self ethnic identity that favors weight gain</td>
<td>20(^3)</td>
<td>2.3</td>
</tr>
<tr>
<td>Busy lifestyle favoring rushed eating</td>
<td>17</td>
<td>1.9</td>
</tr>
<tr>
<td>Coping styles favoring over-eating</td>
<td>17(^2)</td>
<td>1.9</td>
</tr>
<tr>
<td>Snacking patterns or eating out frequently</td>
<td>14(^3)</td>
<td>1.6</td>
</tr>
<tr>
<td>Preference for fruits and vegetables</td>
<td>4</td>
<td>.5</td>
</tr>
<tr>
<td>Breastfed as infant protective against obesity</td>
<td>1</td>
<td>.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1109</strong></td>
<td><strong>N/A</strong></td>
</tr>
</tbody>
</table>

*Percentage is calculated by Frequency / 874.

\(^1\) Antecedent significant in 30 to 40 articles

\(^2\) Antecedent significant in 10 to 19 articles

\(^3\) Antecedent significant in 5 to 9 articles
“Low physical activity” (e.g., television, computer, or video games) ranked 1st overall in terms of frequency and had the highest number of articles in the individual domain, citing a significant association in 39 articles. Similarly, “genetic predisposition” (frequency rank 2nd overall), and “poor body image or low self esteem” (frequency rank 3rd overall), had (32 articles) and (29 articles) citing significance respectively. Other antecedent themes frequently mentioned with significance, included: “binge eating, loss of control” (19 articles reporting significance), “preference for foods high in fat/calories” (10 articles significant), “lack of skills/efficacy for physical activity” (17 articles significant). Additionally, “coping styles favoring over-eating” although not reported as frequently as other individual antecedents (frequency rank 10th), did cite 13 articles reporting a significant association with childhood obesity.

When all five categories were examined, there was greater empirical support (e.g., significance of statistical findings) for antecedents more frequently mentioned in the literature. Krippendorff (1980) stated that the frequency with which a theme occurs in a stream of messages tends to be interpreted with a measure of importance, attention or emphasis. In other words, antecedent themes appearing at or near the top of the Tables 11 through 15, had greater numbers of significant relationships or associations to childhood obesity.

**Final Model: Results Across Five Domains**

When all antecedents (n=94) from all five domains were tallied, a comprehensive compilation of antecedent rank order was completed. Identified themes and quantified antecedents were summarized in Table 16. Findings suggest that no one single category or domain (i.e., national norms/policies, community,
school, family, individual) individually dominated the top frequencies. However three categories most frequent in the top 10 were (national norms/policies 4 of 10; individual 3 of 10; and family 3 of 10). When ranked antecedents were examined in top 15, six from the family domain and five from national norms/policies were presented. Conversely, only one antecedent in school domain and none in school domain resulted in top fifteen. Table 16 demonstrates a wide range of antecedents \((n=94)\) including five categories of antecedents, which are both proximal and distal from the child (i.e., distal influences would include antecedents from national policy/social norms, community, and school; proximal influences would include antecedents from family and individual categories). Distal leverage points have indirect influence; are broad, pervasive, and often stronger forces over behavior than are proximal points (Booth et al., 2001; Neumark-Sztainer, 2000). Seven of top 20 antecedents belonged to social norm/national policy [distal], eleven of 20 belonged to family and individual antecedents [proximal]. Genetically speaking, antecedent themes relating to genetics were frequently cited in the literature as associated with childhood obesity. Genetic themes included: 1) “genetic predisposition towards obesity” [individual], 2) “culturally genetics or ethnicities are more prone to obesity” [social norm/national policy] and 3) “one or more parents/guardians obese or overweight” [family]. Genetic predisposition towards obesity (individual) ranked 3rd overall in frequency and had 32 articles citing significance. Culturally genetics or ethnicities more prone to obesity (social norm/national policy) ranked 9th overall and attained 22 articles citing significance. Lastly, having one or more parents/guardians obese ranked 12th overall, and had 36 articles indicating a significance.
Table 16.

Results: Most frequent ecological antecedents presented in sample (N=874)

<table>
<thead>
<tr>
<th>Ecological Antecedents (all categories)</th>
<th>Frequency/percentage*</th>
<th>Theoretical/Empirical</th>
</tr>
</thead>
<tbody>
<tr>
<td>(N) Improve social norms regarding eating/exercise</td>
<td>148/(16.9)</td>
<td>51.4/48.6</td>
</tr>
<tr>
<td>(I) Low levels of physical activity (e.g., television viewing)</td>
<td>137/(15.7)</td>
<td>36.5/63.5</td>
</tr>
<tr>
<td>(I) Genetic predisposition towards obesity</td>
<td>110/(12.6)</td>
<td>47.3/52.7</td>
</tr>
<tr>
<td>(F) Family socio-economic status</td>
<td>95/(10.9)</td>
<td>38.9/61.1</td>
</tr>
<tr>
<td>(N) Labor saving devices (e.g., car)</td>
<td>80/(9.2)</td>
<td>58.8/41.2</td>
</tr>
<tr>
<td>(F) Family irregular meals; eating out frequently</td>
<td>75/(8.6)</td>
<td>56.0/44.0</td>
</tr>
<tr>
<td>(F) Lack of peer norms or social support encouraging healthy eating</td>
<td>74/(8.5)</td>
<td>40.5/59.5</td>
</tr>
<tr>
<td>(N) Excessive non-nutritious food availability in United States</td>
<td>74/(8.5)</td>
<td>63.5/46.5</td>
</tr>
<tr>
<td>(N) Culturally genetics or ethnicities are more prone to obesity</td>
<td>72/(8.1)</td>
<td>43.1/56.9</td>
</tr>
<tr>
<td>(I) Poor body/self image or lowered self-esteem</td>
<td>64/(7.3)</td>
<td>35.9/64.1</td>
</tr>
<tr>
<td>(S) Decline in physical education or health education requirements</td>
<td>64/(7.3)</td>
<td>60.9/39.1</td>
</tr>
<tr>
<td>(F) One or more parents/guardians obese or overweight</td>
<td>59/(6.8)</td>
<td>22.0/78.0</td>
</tr>
<tr>
<td>(F) Parent modeling or knowledge of healthy eating patterns (e.g., autonomy)</td>
<td>57/(6.5)</td>
<td>35.1/64.9</td>
</tr>
<tr>
<td>(N) Bias, discrimination, or stigma attached to obese children – pressure to be thin</td>
<td>54/(6.2)</td>
<td>63.0/37.0</td>
</tr>
<tr>
<td>(F) Low levels of family activity (e.g., television viewing time)</td>
<td>54/(6.2)</td>
<td>33.3/66.7</td>
</tr>
<tr>
<td>(C) Lack of inexpensive/accessible places for youth to be active</td>
<td>50/(5.7)</td>
<td>50.0/50.0</td>
</tr>
<tr>
<td>(F) Quantity of high fat/calorie food in home</td>
<td>49/(5.6)</td>
<td>63.3/36.7</td>
</tr>
<tr>
<td>(N) Food advertising or marketing for high fat/calorie foods targeting kids</td>
<td>47/(5.4)</td>
<td>57.4/42.6</td>
</tr>
<tr>
<td>(I) Binge eating or other disordered eating habits (e.g., loss of control)</td>
<td>46/(5.3)</td>
<td>34.8/65.2</td>
</tr>
<tr>
<td>(I) Elevated dieting or radical weight loss methods</td>
<td>45/(5.1)</td>
<td>24.4/75.6</td>
</tr>
<tr>
<td>(N) Urbanization or industrialization</td>
<td>40/(4.6)</td>
<td>40.0/60.0</td>
</tr>
</tbody>
</table>

(N)=National policy/social norms; (C)=Community; (S)=School; (F)=Family; (I)=Individual
### Table 16. Continued

<table>
<thead>
<tr>
<th>Ecological Antecedents (all categories)</th>
<th>Frequency/percentage*</th>
<th>Theoretical/Empirical</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I) Preferences for high fat/calorie foods including self-efficacy to prepare healthier foods</td>
<td>40/(4.6)</td>
<td>32.5/67.5</td>
</tr>
<tr>
<td>(C) Lack of safety perceived or real in community preventing activity</td>
<td>35/(4.0)</td>
<td>68.6/31.4</td>
</tr>
<tr>
<td>(I) Dislike or lack of skills for physical activity (e.g., self-efficacy)</td>
<td>34/(3.9)</td>
<td>52.9/47.1</td>
</tr>
<tr>
<td>(S) Lack of focus on life-long fun activity in physical education class</td>
<td>33/(3.8)</td>
<td>69.7/30.3</td>
</tr>
<tr>
<td>(N) Ubiquity of televisions, computers, remote controls, or video games</td>
<td>31/(3.5)</td>
<td>54.8/45.2</td>
</tr>
<tr>
<td>(N) Low priority as medical condition or disease</td>
<td>31/(3.5)</td>
<td>77.4/22.6</td>
</tr>
<tr>
<td>(S) Accessibility or availability of vending machines offering high fat/calorie foods in school</td>
<td>29/(3.3)</td>
<td>65.5/34.5</td>
</tr>
<tr>
<td>(F) Parent knowledge of portion sizes and food preparation</td>
<td>29/(3.3)</td>
<td>58.6/41.4</td>
</tr>
<tr>
<td>(S) Lack of opportunities for students to be active in school (e.g., lack of recess)</td>
<td>28/(3.2)</td>
<td>39.3/60.7</td>
</tr>
<tr>
<td>(C) Lack of sidewalks (presence or quality) for walking or biking</td>
<td>27/(3.1)</td>
<td>70.4/29.6</td>
</tr>
<tr>
<td>(C) Where one lives or resides geographically (e.g., winter makes it difficult to exercise outdoors)</td>
<td>26/(3.0)</td>
<td>23.1/76.9</td>
</tr>
<tr>
<td>(N) Pricing strategies that favor the consumption of high fat/calorie foods</td>
<td>26/(3.0)</td>
<td>76.9/24.1</td>
</tr>
<tr>
<td>(N) News media which are not clear or consistent with best practices</td>
<td>23/(2.6)</td>
<td>65.2/34.8</td>
</tr>
<tr>
<td>(C) Few opportunities for less fit children to be active in community</td>
<td>23/(2.6)</td>
<td>73.9/26.1</td>
</tr>
<tr>
<td>(C) Lack of bike paths to bike to school or work</td>
<td>22/(2.5)</td>
<td>77.3/22.7</td>
</tr>
<tr>
<td>(F) Family eating patterns that favor dieting or food restriction (-)</td>
<td>22/(2.5)</td>
<td>50.0/50.0</td>
</tr>
<tr>
<td>(F) Stimulus or cues for over-eating and/or parental modeling exercise</td>
<td>21/(2.4)</td>
<td>42.9/57.1</td>
</tr>
<tr>
<td>(N) Increased portion sizes as fast food restaurants</td>
<td>21/(2.4)</td>
<td>71.4/29.6</td>
</tr>
<tr>
<td>(I) Self ethnic or cultural identity favoring weight gain</td>
<td>20/(2.3)</td>
<td>55.0/45.0</td>
</tr>
<tr>
<td>(C) Availability of physicians in community for screening for obesity</td>
<td>20/(2.3)</td>
<td>60.0/40.0</td>
</tr>
<tr>
<td>(C) Lack of access to playgrounds</td>
<td>20/(2.3)</td>
<td>55.0/45.0</td>
</tr>
</tbody>
</table>

(N)=National policy/social norms; (C)=Community; (S)=School; (F)=Family; (I)=Individual

**Salient Antecedents: Disadvantaged Youth and Food Availability in U.S.**

When one examines the final model, two salient themes appear toward the top;

1) an apparent socio-economic disadvantage in one form or another is present and 2)
Table 16. Continued

<table>
<thead>
<tr>
<th>Ecological Antecedents (all categories)</th>
<th>Frequency/percentage*</th>
<th>Theoretical/Empirical</th>
</tr>
</thead>
<tbody>
<tr>
<td>(F) Changing parental work habits</td>
<td>19/(2.2)</td>
<td>68.4/31.6</td>
</tr>
<tr>
<td>(F) Family stress; psychosocial problems</td>
<td>19/(2.2)</td>
<td>52.6/47.4</td>
</tr>
<tr>
<td>(C) Numerous fast food restaurants</td>
<td>19/(2.2)</td>
<td>84.2/15.8</td>
</tr>
<tr>
<td>(I) Busy lifestyle leading to rushed eating and low physical activity</td>
<td>17/(1.9)</td>
<td>64.7/35.3</td>
</tr>
<tr>
<td>(I) Coping styles associated with anxiety and overeating</td>
<td>17/(1.9)</td>
<td>41.2/58.8</td>
</tr>
<tr>
<td>(I) Meal and/or snacking patterns associated with high fat/calorie foods</td>
<td>14/(1.6)</td>
<td>28.6/71.4</td>
</tr>
<tr>
<td>(F) Access to exercise equipment at home</td>
<td>13/(1.5)</td>
<td>69.2/30.8</td>
</tr>
<tr>
<td>(N) Crime (perceived or real) involving safety at public recreational facilities</td>
<td>13/(1.5)</td>
<td>76.9/23.1</td>
</tr>
<tr>
<td>(F) Presence of garden – home</td>
<td>13/(1.5)</td>
<td>46.2/53.8</td>
</tr>
<tr>
<td>(S) Non-nutritious food marketing in school (e.g., soda pop advertising)</td>
<td>12/(1.4)</td>
<td>66.7/33.3</td>
</tr>
<tr>
<td>(N) Insurance or managed care companies not covering weight control</td>
<td>12/(1.4)</td>
<td>58.3/41.7</td>
</tr>
<tr>
<td>(C) Connectivity and quality of streets/sidewalks for walking (e.g., people with disabilities)</td>
<td>11/(1.3)</td>
<td>63.6/46.4</td>
</tr>
<tr>
<td>(C) Availability of vending machines in community</td>
<td>11/(1.3)</td>
<td>72.7/27.3</td>
</tr>
<tr>
<td>(F) Self-efficacy (parent role) of providing positive eating environment</td>
<td>11/(1.3)</td>
<td>54.5/45.5</td>
</tr>
<tr>
<td>(N) Labeling of &quot;no fat&quot;/ &quot;low fat&quot; encouraging eating more food</td>
<td>10/(1.1)</td>
<td>80.0/20.0</td>
</tr>
<tr>
<td>(F) Rewarding children with food or lack of food as punishment</td>
<td>10/(1.1)</td>
<td>30.0/70.0</td>
</tr>
<tr>
<td>(N) Ethnic or cultural denial of being overweight or obese</td>
<td>10/(1.1)</td>
<td>70.0/30.0</td>
</tr>
<tr>
<td>(F) Number of annual visits to physician or clinic for weight control</td>
<td>10/(1.1)</td>
<td>30.0/70.0</td>
</tr>
<tr>
<td>(S) Education of school administrators on obesity or weight control topics</td>
<td>9/(1.0)</td>
<td>77.8/22.2</td>
</tr>
<tr>
<td>(F) Repeated verbal or sexual abuse</td>
<td>9/(1.0)</td>
<td>66.7/33.3</td>
</tr>
</tbody>
</table>

(N)=National policy/social norms; (C)=Community; (S)=School; (F)=Family; (I)=Individual

an abundance or easily accessible non-nutritious foods negatively impacting purchasing and/or consumption. It is clear that findings suggest that lack of resources (e.g., lack of places to play, low levels of family activity, family eating patterns and family socio-economic status are all critical antecedents. Children like all people, are strongly influenced by the physical and social environments that they belong to. Results identify a substantial number of salient themes involving some sort of disadvantage, disorganization, or lack of resources tied to the risk of obesity. For example, eleven
**Table 16. Continued**

<table>
<thead>
<tr>
<th>Ecological Antecedents (all categories)</th>
<th>Frequency/percentage*</th>
<th>Theoretical/Empirical</th>
</tr>
</thead>
<tbody>
<tr>
<td>(S) Foods high in fat/sugar as rewards</td>
<td>8/(0.9)</td>
<td>25.0/75.0</td>
</tr>
<tr>
<td>(S) Parental involvement in curriculum</td>
<td>8/(0.9)</td>
<td>37.5/62.5</td>
</tr>
<tr>
<td>(S) School safety restricting walking to school – urban decay around school</td>
<td>8/(0.9)</td>
<td>87.5/12.5</td>
</tr>
<tr>
<td>(C) Grocery stores and SES offerings</td>
<td>7/(0.8)</td>
<td>57.1/42.9</td>
</tr>
<tr>
<td>(S) National school breakfast/lunch</td>
<td>7/(0.8)</td>
<td>42.9/57.1</td>
</tr>
<tr>
<td>(S) Food workers and food preparation</td>
<td>7/(0.8)</td>
<td>57.1/42.9</td>
</tr>
<tr>
<td>(N) Nutrition labeling and menu boards</td>
<td>7/(0.8)</td>
<td>57.1/42.9</td>
</tr>
<tr>
<td>(N) Obese children uncomfortable exercising in public settings</td>
<td>6/(0.7)</td>
<td>33.4/66.6</td>
</tr>
<tr>
<td>(N) Food pyramid needs altering</td>
<td>6/(0.7)</td>
<td>83.3/16.7</td>
</tr>
<tr>
<td>(C) Convenience foods/gas stations</td>
<td>6/(0.7)</td>
<td>66.6/33.4</td>
</tr>
<tr>
<td>(S) Availability of school counseling</td>
<td>6/(0.7)</td>
<td>66.6/33.4</td>
</tr>
<tr>
<td>(S) Bake sale/ high calorie/fat content</td>
<td>6/(0.7)</td>
<td>66.6/33.4</td>
</tr>
<tr>
<td>(S) School gym available after school</td>
<td>6/(0.7)</td>
<td>83.3/16.7</td>
</tr>
<tr>
<td>(C) Healthy food choice/restaurants</td>
<td>5/(0.6)</td>
<td>20.0/80.0</td>
</tr>
<tr>
<td>(N) Decrease in tobacco use nationally</td>
<td>4/(0.5)</td>
<td>66.6/33.4</td>
</tr>
<tr>
<td>(C) Incentive to eat fast foods/restaurants</td>
<td>4/(0.5)</td>
<td>50.0/50.0</td>
</tr>
<tr>
<td>(S) Comprehensive health education</td>
<td>4/(0.5)</td>
<td>100.0/0.0</td>
</tr>
<tr>
<td>(I) Preference for fruits and vegetables</td>
<td>4/(0.5)</td>
<td>25.0/75.0</td>
</tr>
<tr>
<td>(C) Car dominated society/traffic problems in inner city – exercise barrier</td>
<td>3/(0.3)</td>
<td>66.6/33.4</td>
</tr>
<tr>
<td>(S) Allowing students to leave for lunch</td>
<td>3/(0.3)</td>
<td>33.4/66.6</td>
</tr>
<tr>
<td>(C) Drinking water access in public</td>
<td>2/(0.2)</td>
<td>100.0/0.0</td>
</tr>
<tr>
<td>(S) Referral system for obese youth for health care or clinical assessment</td>
<td>2/(0.2)</td>
<td>100.0/0.0</td>
</tr>
<tr>
<td>(S) Availability of health services in school</td>
<td>2/(0.2)</td>
<td>100.0/0.0</td>
</tr>
<tr>
<td>(F) Peers/family exclude/discriminate obese youth</td>
<td>2/(0.2)</td>
<td>100.0/0.0</td>
</tr>
<tr>
<td>(F) Parents do not recognize obesity in their children</td>
<td>2/(0.2)</td>
<td>50.0/50.0</td>
</tr>
<tr>
<td>(C) Ubiquity of outdoor advertising (e.g., billboards or other advertisements</td>
<td>1/(0.1)</td>
<td>100.0/0.0</td>
</tr>
<tr>
<td>(C) Buffet or unlimited food servings</td>
<td>1/(0.1)</td>
<td>100.0/0.0</td>
</tr>
<tr>
<td>(C) Presence of motorized carts/malls</td>
<td>1/(0.1)</td>
<td>100.0/0.0</td>
</tr>
<tr>
<td>(S) Drinking water access in school</td>
<td>1/(0.1)</td>
<td>100.0/0.0</td>
</tr>
<tr>
<td>(S) Posting signs to encourage stair use</td>
<td>1/(0.1)</td>
<td>100.0/0.0</td>
</tr>
<tr>
<td>(I) Breastfed as infant - protective against obesity</td>
<td>1/(0.1)</td>
<td>0.0/100.0</td>
</tr>
</tbody>
</table>

(N)=National policy/social norms; (C)=Community; (S)=School; (F)=Family; (I)=Individual

Of the top 20 fit this description; including: one or more parents being obese, lack of sidewalks in community, urbanization, lack of accessible or affordable open spaces for youth to be active, low family socio-economic status, quantity of high fat/calorie foods in home (i.e., less expensive foods in home), perceived or real crime in
neighborhood, belonging to an ethnic group that are more prone to obesity development, lack of peer norms or social support encouraging healthy eating, parent knowledge of eating behavior (e.g., giving the child autonomy over selection of food and/or creating a pleasurable atmosphere to eat), family eating fast foods too frequently or family not consuming a desirable amount of fruits and vegetables, and availability of poor nutritional quality foods in neighborhood market.

**Final Model**

All antecedents \( n=94 \) were examined for sub-themes as a final model was constructed (see Figure 9). Through grounded emergent variable identification of themes, the majority of antecedents impact eating behaviors \( n=57 \) versus \( n=29 \) impacting activity levels. Eleven \( n=11 \) antecedents impact other environmental influences not specific to physical activity and/or diet. In two cases, (i.e., social norms regarding eating and physical activity and comprehensive school health education) were viewed as antecedents that could impact either eating behavior and/or activity levels.

**Critical Antecedents**

Article focus (e.g., theoretical vs. empirical) varied across the five domains. Individual and family domains were more likely to be reported in empirical articles and social norm/national policy, community, and school antecedents were more likely to be covered in theoretical articles. In the final model, a sixth domain was developed (viz., genetics) because genetic antecedents were thought to have strong influence (i.e., frequency and coverage) on obesity development. Of the three antecedents
Figure 9. Final Model

3. Genetic predisposition towards obesity (12.6%) Theoretical (52.7%) Empirical
9. Culturally certain genetics or ethnicities more prone to obesity (8.3%) (43.1%) Theoretical (56.9%) Empirical
41. Self ethnic or cultural identity favoring weight gain (2.3%) (55%) Theoretical (45%) Empirical

Social Norms - (85%) Theoretical focus (15%) Empirical Focus

1. Social norms regarding eating and physical activity (16.9%)
5. Modern technology - labor saving devices for reduced activity (9.2%)
8. Excessive non-nutritious food availability in US. (8.5%)
9. Culturally, genetics may play a role due to ethnicity and food availability (8.2%)
14. Bites, discrimination or stigma against obese people in society (6.2%)
18. Food advertising or food marketing towards children (5.4%)
21. Urbanization and industrialization in developing countries (4.6%)
27. Obesity low priority as a medical condition/laziness or gluttony (3.5%)
33. Pricing strategies that favor consumption of high fat/energy dense foods (3.0%)
35. Literature confusing and/or not "best practice" for nutrition (2.5%)
39. Food portion sizes increased in restaurants (2.4%)
47. Perceived crime (culturally) - reduced activity (1.9%)
53. Insurance or managed care fails to cover obesity/weight loss (1.4%)
58. Cultural denial of being overweight or obese (1.1%)
59. Labeling foods "no-fat" or "low-fat" misleading (1.1%)
67. Nutrition labeling laws (i.e., menu boards) (0.8%)
71. Obese child feels uncomfortable exercising (0.7%)
78. National decrease in tobacco use (0.5%)

Other Influences

- Other influences or antecedents which do not necessarily impact eating behavior or physical activity

Bold and italicized font indicates 20 antecedents most commonly present in sample

DISTAL LEVERAGE POINTS
National Norms
Community
School
### Liftable Behaviors

#### Theoretical focus (76.9%) - Empirical focus (23%)
- Individual preference for fruits/vegetables
- Decline in physical education requirements
- Lack of focus on lifelong fitness in physical education
- Vending machine accessibility/quantity in school
- Non-nutritious food marketing in school
- Education of school administrators on obesity
- Foods high in fats/calories given as rewards in school
- Parental involvement in nutrition curriculum
- School safety restricting walking to school
- Foods high in fats/calories given as rewards
- National school breakfast and lunch; high fats/calories
- Lack of focus on life-long fitness in physical education
- Vending machine accessibility/quantity in school
- Non-nutritious food marketing in school
- Education of school administrators on obesity
- Foods high in fats/calories given as rewards in school
- Parental involvement in nutrition curriculum
- School safety restricting walking to school
- Foods high in fats/calories given as rewards
- National school breakfast and lunch; high fats/calories

#### Characteristics
- Physical activity
-垣 foods in home
- Eating portion sizes
- Restriction
- Socioeconomic status
- Work habits or hours not home
- Home
- At home
- Home social environment
- Children with food
- Time to physician
- Typical abuse
- Time obese children
- Parents do not recognize obesity

### School Antecedents
- Decline in physical education requirements
- Lack of focus on lifelong fitness in physical education
- Vending machine accessibility/quantity in school
- Non-nutritious food marketing in school
- Education of school administrators on obesity
- Foods high in fats/calories given as rewards in school
- Parental involvement in nutrition curriculum
- School safety restricting walking to school
- Foods high in fats/calories given as rewards
- National school breakfast and lunch; high fats/calories

### Community Antecedents
- Lack of inexpensive places for youth to be active
- Perceived safety in community - urban decay
- Lack of sidewalks - presence and/or quality
- Geographic location - winter and inactivity
- Obese youth and opportunity to be active in community
- Lack of bike paths to school, work or town
- Lack of access to playgrounds in school or work
- Availability of physicians in community
- Numerous fast food restaurants in community
- Connectivity and quality of streets for wheelchairs
- Vending machine - quantity and location
- Grocery stores in urban settings offer less nutritional foods
- Convenience food stops
- Healthy foods choices in restaurants
- Drinking water access - community
- Ubiquity of outdoor advertising
- Buffer or unlimited food servings
- Presence of neutralized carts in malls
- Passive rules to encourage fit (15.7%) - Theoretical (53.8%) - Empirical (46.2%)
belonging to the domain genetics, two appeared more frequently in empirical articles whereas one appeared more often in theoretical articles. As the final model demonstrates, critical antecedents to be addressed include: a) sedentary lifestyle, b) individual genetics and behavior, c) psychosocial factors, and d) community and school factors. Sub-themes considered critical include: a) disadvantaged youth and food availability, b) family characteristics, including socio-economic disadvantage, and lack of peer norms encouraging healthy eating, c) parents modeling healthy behavior, d) low levels of family activity, and e) quantity of high fat/calorie foods in home. Critical antecedents identified in chapter four will be highlighted in chapter five.

Summary

Results of the analyses specific to research question 1, 2, and 3 were presented in chapter four. Prior to answering research questions one through three, a review of past theoretical ecological models specifically addressing childhood obesity prevention was necessary. Ten theoretical models were combined to form an *a priori* codebook (qualitative content analysis). Following an expert panel review, an initial pilot test was conducted to examine if antecedent theme definitions for content analysis measures were appropriate to code for themes present in journal articles.

Both intra- and inter-coder reliability tests were then conducted on the codebook with (91.4%) and (89.4%) agreement, respectively. Finally, a grounded or emergent process of environmental antecedent identification (quantitative content analysis) utilizing an inductive process was conducted on a sample of 874 journal articles.
For research question one (i.e., what environmental antecedents were published in 25 journals across 5 disciplines from 1993 to 2002?) ninety-four environmental antecedents in five categories were identified (i.e., 20 from national policy/social norms; 20 from community; 21 from school; 20 from family; and 13 from individual). Three environmental antecedents not anticipated were added to the final model. Journal articles failing to mention environmental antecedents included: national policy/social norms \((n=529)\) or 60%; community \((n=734)\) or 84%; school antecedents \((n=752)\) or 86%; family antecedents \((n=583)\) or 66.7%; and individual antecedents \((n=560)\) or 64.1%. Additionally, a greater number of journal articles were empirically focused (62.4%) versus theoretically focused (37.6%).

Research question 2 (to what extent or frequency are environmental antecedents covered in selected journals between 1993 and 2002?) Journals of medicine had the greatest combined coverage of childhood obesity articles \((n=342)\) followed by disciplines nutrition \((n=243)\), health education \((n=200)\), sport sciences \((n=50)\), and psychology \((n=39)\). The most frequently presented antecedents belonged to “national policy,” “individual,” and “family” categories. School and community domains accounted for \((n=16\%)\) and \((n=14\%)\) respectively. Of the total sample \((N=874)\), 536 articles provided at least one antecedent. Of 536 articles (62.4%) were empirical and (37.6%) were theoretically focused.

Research question 3 asked what major trends and differences of frequencies of theorized antecedents were presented in theoretical and empirical articles. Twenty-four antecedents of \((N=94)\) appeared in journal articles with an empirical focus versus seventy antecedents appearing in journal articles with a theoretical focus. Journal
articles with an empirical focus contained and emphasized both family and individual
categories more frequently, while journals with a theoretical focus contained
antecedents belonging to social norms, community, and school categories.
Environmental antecedents concerning concepts of genetics, socioeconomic status,
psychological issues (i.e., self-esteem, self image, or body image) and disordered
eating behaviors appeared more frequently in empirical articles and garnered higher
proportions of articles citing significance.

In the final model, fifty-seven antecedents \( (n=57) \) directly impact diet, while
twenty-nine \( (n=29) \) impacted physical activity, and eleven \( (n=11) \) antecedents
impacted factors other than diet and activity levels. While categories social
norms/national policies, individual, and family had greater influence of critical
antecedents in the model, all three categories emphasized dietary intake over physical
inactivity. Antecedents in community and school categories, appearing less frequently
in the sample (i.e., frequency (16%) and (14%) respectively, had a greater share of
physical inactivity antecedents when compared to the other three categories (i.e.,
social norms/national policies, individual, and family).

Antecedents belonging to distal leverage points (i.e., national policies/social
norms, community, and school categories) were largely made up of articles with a
theoretical focus. Of antecedents designated in proximal leverage points (i.e.,
individual, family, and genetics), both individual and family categories were
empirically focused, while categorically genetics was split between both types of
articles. Overall data revealed that (38%) of articles sampled failed to address obesity
in terms of environment or ecological approach. Chapter Five will address conclusions, a discussion, and future recommendations.
CHAPTER FIVE
Summary, Conclusions, Discussion, and Recommendations

Introduction

The purpose of this study was to build a comprehensive, multi-disciplinary, ecological, childhood obesity prevention model by examining past theory and research in twenty-five journals covering five disciplines over the course of a decade, 1993-2002. This chapter will present a summary of the study, conclusions, a discussion of the findings, and makes recommendations for future research endeavors.

Summary

Practitioners and academians concerned with childhood obesity recognized that programs or studies that aim to reduce obesity seemingly weighed distal or innocuous factors (e.g., ubiquity of fast food restaurants in community) as having a disproportional influence on why the obesity epidemic is currently enduring. While there have been several excellent ecological models of childhood obesity examining a wide range of environmental antecedents that have contributed to our understanding of obesity prevention (Booth et al., 2000; Davison & Birch, 2001; Dietz & Gortmaker, 2001; Egger & Swinburn, 1997; Neumark-Sztainer, 2000), this study built upon those previous ecological models by reviewing greater number of studies (N=874), expanding the lists of environmental antecedents, creating a more complex and detailed picture of antecedents, and identifying crucial environmental antecedents identified by researchers from 1993 to 2002. The rationale of uncovering environmental antecedent themes can: a) justify staying power of environmental
antecedents contained in previous models, b) elucidate new antecedents not contained in previous models, c) examine agreement or disagreement across disciplines highlighting antecedent weight or acceptance, and d) serve as an important taxonomy to promote further investigation.

Findings suggest key beliefs about critical environmental antecedents are being placed on factors (external to the child) providing increased opportunity for overeating and sedentary lifestyle as opposed to individual antecedents alone. Overall, there was emphasis on social norms/national policy, individual, and family and less on school and community. Results suggest: a) overall there is a lack of research published on ecological models, frameworks, or initiatives that target the environment as part of the problem, 2) there is a lack of research addressing community and school antecedents collectively, and 3) although published articles on childhood obesity have steadily increased over the past decade, it is still uncertain if stakeholders will support the proposed ecological initiatives that have been identified as critical to slow down, halt, and reverse the epidemic.

A qualitative method of content analysis (defining, refining and identifying themes) was utilized to identify ecological antecedent themes of childhood obesity. Quantitative measures were used in conjunction with grounded or emergent variable identification to confirm existing theories in producing a new model. Antecedent themes were then combined to build theory using inductive analysis as outlined by Neuendorf (2002).

Prior to answering the research questions, a review of ecological models, environmental antecedents related to childhood obesity was necessary. Namely,
what ecological models or frameworks designed for the prevention of childhood obesity, if any, were published in the literature? Results of the data base search produced 496 journal articles. Articles (n = 496) were carefully reviewed for research relevance. Criteria for model inclusion included identifying or matching models utilizing an ecological construct developed by Neumark-Sztainer (2000) and matching the ecological perspective definition provided by Sallis and Owen (1997). Although multiple ecological theories existed for childhood obesity prevention, not all theories found were equal in their abilities to link problems, processes, and goals to provide interventions for practice. Six criteria (i.e., comprehensiveness, precision, and testability, parsimony, empirical validity, heuristic value, and applied value) for evaluating scientific theory developed by (Ryckman, 1994) were utilized. Ten models were retained for inclusion in the study.

Of articles reviewed in this study (N=874 articles), three of five domains (e.g., national, individual, and family) accounted for a greater share of antecedents (e.g., n=39.5%; n=35.9%; and n=33.3% respectively). The categories of community and school accounted for (n=16.0%) and (n=14.0%) respectively. When all articles were coded, three antecedents not anticipated, nor identified in previous ecological models were identified and added to the final model.

A greater proportion of articles (n=545; 62.4%) were empirically based versus (n=329; 37.6%) theoretically based. Social norms regarding physical activity and eating was the environmental antecedent appearing the most frequently (n=148; 16.9%) in the sample, followed by low levels of physical
activity (e.g., television viewing time) \((n=137; 15.7\%)\), and genetic predisposition towards obesity \((n=110; 12.6\%)\). When examining environmental antecedents with the greatest weight, categorically social norms/national policies and family were present most frequently, followed by individual, community and lastly, school. When viewed across all categories, (viz., national policy/social norms, community, school, family, and individual); 338 articles sampled or (38.8\%) of total sample failed to have at least one environmental antecedent mentioned in the article.

Conclusions

The following conclusions were drawn from the results of this study and apply to the sample. Caution should be adopted before generalizing results.

1. More empirical articles were published on childhood obesity than theoretical articles may represent funding opportunities more so than needed research. As previously discussed, it is more common for empirically focused journal articles to examine fewer number of environmental antecedents on average as compared to theoretical journal articles. This finding may both underscore the difficulty in measuring objective measures in qualitative research and limit exposure and/or presence of environmental variables published in the research. This becomes a major negative attribute when current government officials, academians, and researchers alike are recommending we identify all environmental contributor to this epidemic.

2. One way to gain perspective on environmental influences on obesity is
to examine which behaviors are written about more (e.g., eating or inactivity). *When examining journal articles on childhood obesity, a larger share of environmental antecedents from ecological theory were used to describe food intake or excess food availability over and above exercise or physical inactivity.* The greater percentage of food intake antecedents indicates that our culture currently places the greater emphasis on the food intake side of the energy balance equation, with limited importance given to exercise.

3. *There is a distinct need for research to present and discuss implementation for programs in ecological terms.* As previously discussed, researchers agree that an ecological approach is an accepted behavioral change model for childhood obesity (e.g., $n=529$ articles failed to mention national policies/social norm antecedents, $n=734$ articles failed to mention community antecedents, $n=752$ articles failed to mention school antecedents, $n=583$ articles failed to mention family antecedents, and $n=560$ failed to mention individual antecedents in an ecological framework. When compared to the fight against tobacco use, many different avenues were implemented to create a more difficult environment to use tobacco. The result? Tobacco use has fallen sharply since the 1960’s. If research fails to address obesity in terms of the environment, obesity rates will continue to rise unless multiple strategies implementing environmental change are enacted evenly across categories (viz., community, school, family etc).
4. *Childhood obesity needs to be addressed at school and community levels as part of a comprehensive plan of prevention. In other words, more empirical and theoretical research needs to be conducted in the schools and community.* Results of this study run contrary to what is recommended in the literature. The lack of balance among categories (e.g., social norms/ national policies, community, school, family, and individual) is a troublesome finding. The literature on obesity prevention has suggested that specific behaviors are associated with location. Schools and communities are important areas to address, since both schools and communities have the potential to make valuable contributions to both the prevention and treatment of obesity -especially schools. More than 95% of youth, ages 5-17 are enrolled in school, and no other institution has as much continuous and intensive contact with children during the first two decades of life. The combination of classroom health education, physical education programs, food service, health services, and family contact make schools a viable location for providing obesity interventions in a comprehensive manner.

5. *Published articles on childhood obesity have increased during the years examined (i.e., 1993 to 2002). There is no guarantee that we are making progress in the fight against childhood obesity.* However, logically one would have to attribute that more attention to this topic through publication should move the issue into a higher health priority.

6. *Solving the obesity crisis will require experts in multiple fields (e.g., dieticians, medical professionals, exercise physiologists, psychologists, and health educators) to communicate, complete, and share research.* Because the problem is
multi-determined due to breadth, experts from varied fields are necessary to reverse the obesity trend. There was a lack of journal articles on childhood obesity published in the disciplines of sports sciences and psychology. This may or may not have influenced the number of antecedents that dealt specifically with exercise or inactivity. Additionally, the presence of individual psychosocial factors may or may not have been affected.

7. Our environment is providing increasing opportunities to eat in an unhealthy fashion coupled with the environment acting as a barrier to exercise. Arguably, the United States has been built around the automobiles for travel and not by bike nor by foot. Polls show that gasoline consumption and hours spent watching television have risen as quickly as the rate of obesity and may attempt to partly explain our obesity crisis. Furthermore, safety concerns in communities also make it difficult to be active without a major monetary commitment. Lack of community resources (e.g., lack of inexpensive places to be active for low income youth etc., in tandem with the rising popularity of sedentary indoor activities - video games) may contribute to why many researchers feel there are more barriers to being active in today’s high technology society.

8. The greater the number of critical antecedents targeted across domains at critical leverage points would assist in identifying children at risk. The dramatic increases in childhood obesity prevalence that has occurred in the last few decades across almost all population and age groups make prevention of obesity a public health imperative. However casting a wider net at the problem has both advantages
and disadvantages. More time, money, and resources are required to cast a broad net. Why not address the more critical or important antecedents with greater resources?

9. **Family identity and behavior are strong predictors of obesity.** Children who become overweight during childhood are more likely to carry that excess weight into adulthood. Obesity in parents is a major risk factor for development of obesity in their children. Treating obesity is a very difficult process with mixed success. Children depend on family members to provide a healthy environment for eating and exercising. If risk factors are present then the distinct possibility of obesity exists. Parents of children need to be directly involved in obesity prevention. Efforts to make healthy changes in the home and reinforce and support healthy eating and exercise both in school and home are warranted.

10. **Public health strategies to prevent childhood obesity should work towards producing an environment that supports healthy eating and activity throughout the entire community.** The implementation of such an approach requires general acceptance that prevention of obesity is not just the responsibility of individuals, their families or health professionals, but will require a commitment from all sectors of society and environmental changes in our society. Researchers agree that the intensity or strength of distal leverage points tend to have greater influence on society than do proximal leverage points. Unfortunately, distal leverage points are often the most difficult to change because the stakeholders (e.g., the food industry, food marketing, food advertising, beef industry etc.) have something to lose. Perhaps the U.S. follows Western Europe’s lead, as a successful example of prohibiting food marketing on television directed specifically towards children.
Discussion

While the journals and journal articles selected in the sample of this study through citation factor indexing represents one method of identifying peer reviewed and scholarly contributions to ecological theory, obviously not all journals nor articles concerned with childhood obesity could be reviewed. However, studies selected in the sample included an exhaustive number of antecedents (n=94) across five ecological domains. This study was designed to provide an overall picture of which environment antecedents of childhood obesity are considered crucial to address in the form of a new model; it was not designed to be a thorough analysis (e.g., individual factor analysis) on any particular environmental factor. Thus, an environmental antecedent was added to the model if one or more studies found that factor to be related to childhood obesity, even if other studies failed to find the same factor to be significantly related to obesity. By constructing an ecological model of all published environmental factors regardless of significance, the researcher indeed introduced a bias. Kirby (2002) notes that once this type of bias is introduced into research, it may or may not compound bias that an author may have in the tendency to report only significant factors related to the study and not report those factors that were found to be not significant. Hence, you may or may not have a comprehensive list of environmental antecedents thought to contribute to the problem of childhood obesity. For instance, when environmental antecedents are listed in a table, figure, or introduction section of an article, the factor may have been significant for only certain groups of children, or significant during a certain point in time, or may have been affected by the measurement technique, or may have been significant by chance.
alone. On the other hand, while it is also true that many of the environmental antecedents were identified as antecedents in multiple studies, (i.e., replicating their importance across multiple groups of children and time periods) the author noted and controlled for these antecedents by not including them in the final frequency tally. Noting repetitive study overlap (e.g., meta-analysis of previous studies) was a critical but arduous task.

*Article focus*

In the total sample (*N*=874) a greater number of articles were empirically focused (*n*=545) versus theoretical articles (*n*=329). Overall, empirical articles had antecedent frequencies lower than did theoretical articles. Empirically focused articles examined a smaller number of environmental antecedents (i.e., 2.25 per article vs. 3.84 per theoretical article). Perhaps this finding underscores the difficulty in conducting objective measures of environmental antecedents in quantitative research, as mentioned by Sallis and Owen, 1997. Conversely, theoretical articles by definition are less concerned with measurement and more concerned with descriptive research containing comments or personal opinions on universal rather than particular aspects of a problem. Recall that researchers are recommending we identify and measure *all known environmental antecedents*, underscoring the continued importance of empirical and theoretical research concerned with obesity.

*Final Model: Critical Antecedents*

Five hundred thirty six articles provided at least one antecedent. Examples of environmental antecedents stressed in the final model, which clearly impact eating
and exercising behavior were: genetic predisposition, having one or more parents who are obese, hours of television viewing, social economic status, decline in physical education participation, poor body image, dislike for activity. Critical antecedents listed have generous support in the literature (Dietz & Gortmaker, 2001; Ernsberger & Koletsky, 1999; Smith, 1999), however, other strong influences which are arguably less observable or more silent (e.g., self-efficacy of the child to perform exercise, lack of real or perceived safety in neighborhood, pricing strategies that favor consumption of high fat/energy dense foods, discrimination of obese child by culture that over-values thinness, lack of sidewalks or bike paths in a car dominated society, and lack of inexpensive, open areas for urban youth to be active) additionally were implicated as critical components to address.

Formation of a new ecological model, with \( n = 94 \) environmental antecedents within five categories, indicates the sheer number of factors uncovered and involved in childhood obesity development. The problem is multi-factorial and cuts across all perceived categorical boundaries (both proximally and distally). Booth et al., states, “it is important to appreciate the interaction among multiple environmental factors and that complex behavior changes are dependent on different influences at different levels” (2001, p. S21). Depending on how precisely one defines the various ecological factors that have a direct or indirect impact on a child’s weight, more than 90 antecedents were identified among numerous research studies over a decade. The research articles reviewed not only describe obese and non-obese children, but also the influence of important people and institutions within their environment (e.g.,
parents, friends, siblings, schools, churches, and communities). This dynamic inter-
relationship (i.e., between child and environment) represents a complicated,
reciprocal relationship that paints a richly detailed, but complex heuristic of a child’s
environment.

_Theme: Sedentary Lifestyle and Television or Technology_

The most frequently observed antecedent overall was a social attitude that
American children are becoming more “inactive” and a need exists to improve diets
and exercise patterns across the board. Social norms regarding eating and activity
patterns appeared in 148 journal articles representing 16.9% of the sample. The
second most observed theme is somewhat similar because it directly targets the
child with much of the same theme “low levels of activity and high levels of
inactivity” (e.g., television viewing, computer and/or video games). This finding may
suggest that the research community attributes causation of obesity to an entrenched
belief that American children are more “inactive” than ever before. Targeting
inactivity or sedentary lifestyle over and above food intake has a share of support in
attributes “…physical activity as being no less difficult to change than eating habits,
but were [physical activity] likely to have more impact once successful change was
achieved.”

Not surprising was the fact that the amount of television, computer use, or
video game use was ranked very high as an antecedent, supporting studies by:
Gortmaker et al., 1996, Coon & Tucker, 2002; and Robinson, 1999. Dietz and
Gortmaker (1985) were pioneers stating that television viewing is directly and
causally related to childhood obesity prevalence. Additionally, television viewing has widely been accepted as a double-edged sword (i.e., television viewing is a sedentary event coupled with the possibility of eating high calorie snack foods given children respond to direct food marketing). According to Mercer et al. (2003), televised food advertisements for nutritionally poor foods have a major influence on the dietary intakes of children. For example, a recent study found that food products account of more than 60% of the products advertised on Saturday morning television programs for children (Gamble & Cotugna, 1999). Surprisingly, marketing high fat/calorie foods to children did not appear as frequently ($n=47$; 5.4%) nor stressed in the final model. Mass marketing foods to children via television, is an issue worth exploring since television commercials that encourage the consumption of poor quality but attractive foods have been shown to contribute to obesity in children (Dietz & Gortmaker, 1985; Nestle, 2002). In many parts of Western Europe, high fat/calorie food marketing towards children is banned and Western Europeans have identified television advertising as a strong environmental antecedent to resultant behavior (Nestle, 2002; Schlosser, 2001). Advertising to children has long been a concern for three reasons: 1) children watch television for extended periods, 2) commercials are numerous and endlessly repeated, and 3) children lack the critical reasoning skills to distinguish commercials from program content (Nestle, 2002).

Theme: Individual Category

Views among professionals across disciplines tend to differ with regard to the main contributing factors according to Neumark-Sztainer (1999) ranging from those in which the major focus is on genetic factors (i.e., least amount of individual control)
to those which focus on individual choices and behaviors (i.e., increased individual control and victim-blaming). Results of this study indicate that there tend to be subtle beliefs across disciplines about key etiological factors with more emphasis being placed on the interaction between genetic predisposition towards childhood obesity and environmental factors providing increased opportunities for eating and barriers to exercise. Other possible psychological or individual factors, which can place children at higher risk for obesity were additionally linked (e.g., bias, discrimination towards obese child, poor body image or self-esteem, and binge eating disorder). This finding represents that the majority of health professionals are NOT blaming children for their obesity but taking the approach that eating and exercising behaviors may not be viewed as individual choices, but rather the function of one's surrounding environment. Hence, the predominant viewpoint among health professionals (i.e., as indicated by environmental antecedents ranked one, two, three, four and five across the sample) is that although multiple factors contribute to the onset and progression of obesity, there is a consensus that children in the United States with a predisposition towards obesity (i.e., one or more parents with obesity or predisposed) who live in an environment where caloric-dense food is easily accessible (i.e., at home, school, or community), have a greater propensity for obesity.

Results indicate that many but not all efforts to reduce childhood obesity still focus on childrens’ beliefs, attitudes, skills, and behavior regarding weight control, nutrition, and exercise. Ecologically speaking, individual environmental antecedents in the final model had 5 antecedents among the top 20, second only to national
policies and social norms at \((n=345; 39.5\%)\), intrapersonal antecedents had a frequency of \((n=314; 35.9\%)\) overall. This focus is troublesome given that of 874 articles sampled, antecedents categorized as intrapersonal or individual ranked: 2, 3, 9, 16, 18, 19 overall.

Programs that target individual environmental antecedents alone (e.g., education alone is not sufficient to change weight-related behaviors, [Booth et al., Sallis & Owen, 1997]) have not come close to eliminating the obesity epidemic nor have they demonstrated long-term impact (Booth et al., 2001; Nestle & Jacobson, 2000). This finding supports the notion that perhaps too much emphasis is placed on the child (attitude, skills, and knowledge) for behavior change (Allensworth, 1993; Levesque et al., 2000; Sallis & Owen, 1997). A handful of researchers agree that preventing the childhood obesity epidemic will require programs which promote changes in individual behavior (i.e., eating and activity patterns) as well as eliminating environmental barriers to healthy food choices and active lifestyles (Neumark-Sztainer, 1996; Nestle & Jacobson, 2000; Sallis & Owen, 1997). Other interpretations can be made concerning the presence and emphasis of individual antecedents perhaps owing in part to an authors’ own bias or level of understanding of behavior change and/or impact of change. In fact, individual environmental antecedents may have the greatest impact as a child ages and, therefore, have been included historically in educational programs that have succeeded. However, authors caution that primary attention to an individual alone without environmental intervention is a potential source of unintended program failure and/or victim-blaming (Levesque, et al., 2000; Minkler, 1994; Neumark-Sztainer, 1999).
Theme: Psychosocial Factors

As the final model demonstrates, researchers do emphasize psychosocial antecedents (e.g., bias and discrimination (14th; 6.2%) and lowered body image or self-esteem (10th; 7.3%) as associated factors in the development of childhood obesity. Results do not completely support previous research that reported weak or inconsistent associations between psychosocial antecedents and obesity development in children (French et al., 1995; Friedman & Brownell, 1995; Strauss, 2000). However binge eating and other eating disorders with children, especially girls, has support in the literature (Neumark-Sztainer, 2000; Story, 1999).

Theme: Balancing School and Community Domains

With an equally heavy emphasis on national/norms, individual, and family (e.g., 39.5%, 35.9%, and 33.3% respectively) potentially important categories of antecedents (e.g., school and community) may have not been well studied or reported. This finding causes concern. A balanced ecological approach targeting multiple levels of influence has been recommended in the literature (Neumark-Sztainer, 1999). For example, Booth et al. (2001) further suggest that “consistent with ecological models of behavior, population-wide improvements in eating and physical activity are most likely to result from interventions that change as many levels of the framework as possible, including intrapersonal, social, cultural, environmental, and policy levels” (p. S35). Despite support for an ideal hypothetical ecological domain balance in the literature (Neumark-Sztainer, 1999), findings suggest there is a paucity of both school and community antecedents in the literature. An overall lack of both school and community antecedents is a most troublesome dilemma, given that schools have been
cited as the most logical place to stress health and physical education given the
contact time with children (Durlak, 1995; Gill, 1997; Story, 1999). Because schools
touch all families and schools are, for the most part, where children are, logically for
schools to hold promise of addressing and reversing obesity, mention of school
antecedents in the literature is paramount.

Despite the perceived importance of school vending machines, lack of focus
on fitness in class, and unhealthy food marketing in school, a paucity of research is
noted. A provocative finding is that in 64 separate journal articles (viz., first school
antecedent in terms of presence), a decline in physical education requirements could
be an important noteworthy target for future interventions. Concerns over state
physical education requirements coupled with a need to address physical education
quality (i.e., lack of focus on life-long fun activity in physical education class) are
two probable and critical tenets to address in the school. When one examines the
distribution of antecedents and the representation of ecological domains across the
sample, a balanced commitment to all levels (i.e., national, community, school,
family, individual) is warranted (Booth et al., 2001; Kumanyika et al., 2002;
Neumark-Sztainer, 2000). What is disconcerting is that community and school
domains did not receive nearly as much attention as did social norms, family and
individual (i.e., community domain frequency = 140 (16.0%) and school domain
frequency = 122 (14.0%).

It has been stated that the community and school collectively have a unique
opportunity to positively change and influence children's lives (USDHHS, 1990).
Despite lower frequencies of school and community antecedents in the final model,
the CDC lists two of six critical health-risk behaviors (i.e., unhealthy dietary
behaviors and physical inactivity) that are crucial to address, which contribute to the
leading causes of morbidity and mortality among youth (CDC, 1990). An underlying
assumption of the ecological theory is that a comprehensive approach is more
effective than a one-level (e.g., individual) approach (Neumark-Sztainer, 2000; Sallis
& Owen, 1997). One might expect to find a balanced representation of all five
categories (e.g., social norm/national policies, community factors, school factors,
family/peer factors, and individual factors) and antecedents represented. However
results from this study showed an uneven distribution of critical environmental
domains. One explanation for this result is that traditionally to date, most health
education programs implemented in the community, corporate or clinical and schools
have focused on change within individuals rather than the environment, and therefore
such programs have failed to address environmental modifications (Booth et al.,
2001; Sallis & Owen, 1997). Another possible explanation of the unbalanced
representation between antecedents presented is the perceived level of public support
for change. Given the large number of proposed influences which support unhealthful
patterns of eating and physical activity, some antecedents may be easier or more
accepted to implement, measured, and/or valued, and therefore, are researched or
written about more frequently (Booth et al., 2002; Sallis & Owen, 1997). An example
from Booth et al., includes the notion that even though to address community issues
and national issues (both distal in nature and furthest from the individual) would
create the largest impact, both domains traditionally have the greatest resistance
amongst stakeholders. Alternatively, perhaps researchers are less familiar with
ecological factors (e.g., community and/or school antecedents [Sallis & Owen]) and/or increased time and money are concerns.

Sub-Themes of Environmental Antecedents: Data Analysis

Disadvantaged Youth and Food Availability in U.S.

When one examines the final model, two salient themes appear toward the top; 1) an apparent socio-economic disadvantage in one form or another is present and 2) an abundance or easily accessible non-nutritious foods negatively impact purchasing and/or consumption. Addressing the first sub-theme (economic disadvantage), children, like all people, are strongly influenced by the physical and social environments to which they belong. Results of this study identify a substantial number of salient antecedents that involve some form of disadvantage, disorganization, or lack of resources tied to the risk for obesity. For example, twelve of the top 20 antecedents fit this description, including: one or more parents being obese, lack of sidewalks in community, urbanization, lack of accessible or affordable open spaces for youth to be active, low family socio-economic status, quantity of high fat/calorie foods in house (i.e., less expensive foods in home), perceived or real crime in neighborhood, belonging to an ethnic group more prone to obesity development, lack of peer norms or social support encouraging healthy eating, parent knowledge of eating behavior (e.g., giving the child autonomy over selection of food and/or creating a pleasurable atmosphere to eat), family eating fast foods too frequently or family not consuming a desirable amount of fruits and vegetables, and availability of poor nutritional quality foods in neighborhood market. Environmental antecedents involving disadvantaged children clustered near the top of the model support the
notion that disadvantaged children having a disproportionate amount of negative environmental influences are at greater risk for obesity. Conversely, children who belong in a higher socio-economic group may inherently have protective factors that systematically and synergistically work to ameliorate risks of obesity.

Addressing the second sub-theme, food availability in the U.S. has reached all time highs (Chou, Grossman, & Saffer, 2001). State-based data from the U.S. Behavioral Risk Factor Surveillance System on the prevalence of obesity demonstrated that the rapid increase in childhood obesity between 1984 and 1999 might be best explained by the increase of the number of fast food outlets (Chou et al., 2001). Excessive non-nutritious food availability impacts four of the top eight antecedent themes in the model (e.g., social norms regarding eating, family eating out frequently, lack of peer norms regarding eating, excessive availability of fast foods).

**Family Antecedents of Childhood Obesity**

Previous research supports the concept that significant people in the lives of children impact eating and exercise habits strongly (Gable & Lutz, 2000). Seven out of the top twenty antecedents were in the family domain (e.g., family socio-economic status, \( n=95; \) 10%); irregular meals lacking fruits and vegetables at home \( n=75; \) 8.6%; lack of peer or parent social support encouraging healthy eating \( n=74; \) 8.5%; parents modeling or knowledge of healthy eating patterns (e.g., autonomy) \( n=57; \) 6.5%; sedentary family time (e.g., television) \( n=54; \) 6.2%; and, quantity of high calorie/fat foods in household \( n=49; \) 5.6% supporting a view that families or peers are influential on a child’s behavior. This finding comes as little surprise given that children are still dependent on parents until they reach high school. Health educators
need greater focus on involving parents in a comprehensive nutrition curriculum
designed for family examination of eating behaviors, food preparation, and food
selection.

*Families, Working Moms, and Convenience of Food*

Two antecedents (busy lifestyle favoring rushed eating – individual
\(n=17; 1.9\%\)) and changing of parental work habits or hours worked outside the home
– family \(n=19; 2.2\\%\), were not considered strong environmental antecedents for
childhood obesity, even though there is relatively strong support in the literature to
suggest otherwise (Bluestone & Rose, 1997; Chou et al., 2001). Other associated
themes, related to families and meals. [viz., families eating out frequently \(6^{th}\; 8.6\%\),
excessive non-nutritious food availability in home \(8^{th}\; 8.5\%\), and quantity of high
fat/calorie foods in home \(17^{th}\; 5.6\%\)] would reflect a rushed or busy lifestyle or
stress the changing of the workforce with increased numbers of working single
mothers. Chou et al., (2001) identified one important economic change was increase
of the value of time, particularly of women, which is reflected by the growth in their
labor force participation rates and in their hours of work. Since the late 1970’s, Chou
and colleagues postulate that the reduction in home time, due in part to the slow
growth in income among certain ethnic groups, has been associated with an increase
in the demand for convenience food. Researchers point out that when the value of
work exceeds the cost of restaurant food, working mothers will opt for, and purchase
convenience food rather than prepare the food at home (Crocket & Sims, 1995;
Johnson et al., 2001; Mercer et al., 2003; Rosenstock, 1990). Championing the
convenience food obesity connection, Chou et al., state:
The increases in hours worked and labor force participation rates, reduction in wage rates, and declines or modest increases in real income experienced by certain groups have stimulated the demand for inexpensive convenience and fast food which has increased caloric intakes (p. 8).

As previously mentioned, convenience foods typically contain 45% to 55% of total calories from fat (MacKenzie, 2000). At the same time, the reduction in time available for active leisure in families has reduced calories expended as supported by the presence and frequency of the antecedent “low levels of family activity” – family ($n=54$; 6.2%). However, to link increases in obesity (child and adult) from 1970 to present and the increase of working mothers is at best, spurious. However support for this linkage is fairly consistent, as labor force participation of married women jumped from 41 percent in 1970 to 62 percent in 1998 (Chou et al.). During this time frame, as women in the workforce (married and single) increased, so did prevalence of obesity in children and adults.

*Tobacco and Obesity: Why The Problem is Different*

The reduction of tobacco consumption in the United States (from 1965 to 2003) has been declared one of America’s greatest public health achievements of the 20th century (CDC, 1999a; 1999b). Decreased use of tobacco products can be attributed to a public health approach (i.e., ecological model) that reduced tobacco consumption by altering the physical environment (i.e., clean air, workplaces/restaurants, taxation, pricing, and/or banning advertising) (Mercer, Green, Rosenthal, Husten, Khan, and Dietz, 2003). Utilizing the reduction of tobacco as an
example, studies examining the systematic trends examining prevalence of smoking, attempts to quit, and successful cessation concluded that no single component contained in the programs could account for tobacco use reduction (Eriksen, 2000; USDHHS, 2000b). With the possible exception of pricing, the input of each component of comprehensive tobacco control targeting all domains were enhanced by the existence and synergy of all other domains operating as a whole (Hopkins & Fielding, 2001; USDHHS, 2000b).

Similar environmental forces that shape tobacco use also impact eating and exercising (Mercer et al., 2003). There are, however, some distinct differences. Unlike tobacco, food and physical activity are necessary for life. While social influences and advertising pressures may influence a child to consume too much, environmental constraints and circumstances may lead a child to minimize energy expenditure by limiting physical activity. Prevention of childhood obesity rests on the ability to provide children with the supporting environmental networks (i.e., home, school, community, and social norms and national policy) as part of a comprehensive school health program. (Institute of Medicine, 1997). Regular exercise is an important part of a comprehensive school health program, as are a variety of nutritional strategies that focus on: a) choosing a variety of foods from the food guide pyramid, b) planning a healthful diet, c) adhering to dietary guidelines, d) being able to read food labels, e) making food selections to reduce the risk of disease, f) making healthful selections when dining out, f) considering food safety, maintaining desirable weight, g) avoiding harmful eating patterns, and h) recognizing eating disorders (Meeks, Heit, & Page, 1996).
In efforts to reduce childhood obesity, identifying important environmental antecedents of childhood exercise and eating habits are important for two reasons: First knowing the critical environmental antecedents can lead to the development of more effective programs. That is, if interventions target antecedents that (a) have the greatest causal impact on eating and exercise behaviors and (b) can actually be changed by interventions, then logically they can have greater impact on sustained healthy behavior. Second, critical environmental antecedents identified in a new model can be utilized to identify youth who are at greater risk of becoming obese, and in turn, these youth can be more intensely targeted by programs that stress crucial antecedents. Nestle and Jacobson state “traditional ways of preventing and treating overweight and obesity have invariably focused on changing the behavior of individuals, an approach that has proven woefully inadequate, as indicated by the rising rates of both conditions” (2000, p. 12).

Ecological Balance

Thematic environmental antecedents have been identified in this study from past research as critical to address, or relevant, in the development of childhood obesity. Current research in the area of childhood obesity recommends a new paradigm be implemented to halt the epidemic. This “public health approach” and/or “ecological approach” attacks obesity development on various leverage points (i.e., distal and proximal) to the child on five different levels.

Overall, 338 articles sampled or (38.7%) failed to address childhood obesity in terms of an ecological approach. This result is disturbing given a fair number of
researchers and academicians are recommending an ecological paradigm be implemented nationally to halt the obesity epidemic (Booth et al., 2001; Hill & Peters, 1998; Ritenbaugh et al., 1999; Poston & Foreyt, 1999). Sallis and Owen (1997) state, "perhaps the most basic challenge is that many ecological variables are less subject to experimental control and manipulation than intrapersonal variables" (p. 420). Despite the methodological and logistical dilemma of studying ecological models of health behavior, it is essential to expand the current data base of antecedents involved in both changing eating behavior and activity levels (Booth et al., 2001; Sallis & Owen, 1997). Therefore, the majority of childhood obesity research conducted over the past decade, included: a) having cheap and easily accessible food in combination with growing numbers of inactive children, b) empirical focus or clinical in nature, c) antecedents involving the individual, the family, and genetics, and d) antecedents impacting dietary intake were presented more commonly than antecedents mentioning physical activity.

**Common Findings: Prior Research**

In 2001, researchers with an exercise and nutrition background attended a national summit on promoting healthy eating and active living (Booth et al., 2001). One objective from the summit was to build a framework of an ecologic model of behavior, including physical activity and eating influences. Ten environmental influences of behavior and ten environmental influences of nutrition were discussed, prioritized, and ranked according to level of changeability, behavior setting, impact, and influence. Findings of the summit are compared with antecedent rankings of this
study. There are some marked similarities and differences. Environmental antecedents considered crucial to address are: 1) access to public recreation areas in the community, 2) physical education class requirements, 3) having the ability to walk or have sidewalks in community, 4) having fun and life-long fitness taught in school, 5) having perceived or real crime in community, 6) availability and/or quantity of high fat/calorie foods in home, 7) irregular family meals, and 8) providing a la carte foods in school. Agreement between this study and the prior summit may provide support for including 1-8 environmental antecedents into a prevention plan of action.

However, some differences were noted, most visibly in the school domain. In the 2001 study, training of physical education teachers was considered a critical component to address, whereas results from this study suggested teacher training was not as critical to address. Other critical antecedents to address according to the prior study included: school vending machines (access and quantity), food server education and preparation, and school gym use after school. These recommendations by the summit run counter to the findings of this study (i.e., vending machines in school, food server preparation and training, and school gym availability) ranked relatively low (29th, 67th, and 71st) in comparison. Another antecedent identified as critical to address (Booth et al., 2001) was quality of the USDA school lunch. Quality of USDA breakfast and lunch ranked 67th appearing in 0.8% of the articles sampled. Overall, the possible explanation as to the low number of articles addressing factors within school may be due to the journal sample selection.
Recommendations

Based on the findings of this study, the following recommendations are made for future research.

1. *Research efforts should identify, refine, and define all ecological antecedents that impact childrens' eating and exercising behaviors.* Efforts to continue to refine ecological concepts would both illuminate possible pathways and/or linkages for prevention and would include further critical examination of existing and future models or initiatives of ecological models. Greater refinement for prevention programming could save valuable time and money.

2. *Efforts should be continued to educate health education students at all levels (i.e., bachelor, master’s, or doctoral) on health behavior change theories with emphasis on matching health issues with appropriate health behavior change theories.*

3. *Further examination of state laws requiring physical education should be made to encourage states to re-examine and strengthen existing physical education requirements.* There tends to be agreement that physical education is just as, if not as, important as traditional academic subjects taught in elementary schools today.

4. *A greater emphasis should be placed on examining community and school efforts to reduce childhood obesity.* Results of this study suggest a lack of research was reported concerning both categories in the decade examined (1993 through 2002).

5. *Health educators and health professionals concerned with childhood obesity should familiarize themselves with and research ecological approaches to*
preventing this health issue. Results of this study suggest there was a lack of research that described environmental antecedents as a possible causal contributor to the epidemic.

6. All disciplines should work collaboratively to research and publish scholarly works concerning childhood obesity. Results of this study suggest a need for the disciplines of sports sciences and psychology to increase article publications on childhood obesity. Different disciplines hold differing reasons for the cause of obesity. Making exercise and healthy eating a priority involve two distinctly different behaviors requiring multi-disciplinary therapy and/or education.

Future Research

1. Major funding sources should fund and encourage both theoretical and empirical research conducted on childhood obesity before the obesity epidemic worsens.

2. Further analysis should be conducted on childhood obesity ecological model and antecedent theme development. Researchers should continue to identify, refine, and define, antecedent themes in each ecological category. Attention should be given to exercise, inactivity or sedentary lifestyle antecedents.

3. Further research on the development of adolescent and adult ecological models for childhood obesity is encouraged.

4. This study should be replicated with the use of an alternative method of selecting journals. Greater diversity in journals is recommended with the inclusion of journals belonging to the nursing and sociology profession. A survey to be completed
by the different disciplines is recommended, with input as to professional readership
to garner journals most often read by each profession.

5. *A follow-up study examining critical antecedent trend changes would benefit research by signaling to practitioners and academians alike as to which critical antecedents are in need of targeting from an ecological standpoint.*

6. *A follow-up study should be conducted to examine if a balance of initiatives from all categories (i.e., national policies/social norms, community, school, family, and individual) are being researched or addressed evenly in the literature. Additionally, future research should be conducted to validate the ecological model produced by this study.*
REFERENCES
REFERENCES


Cheatle, A., Psaty, B. M., Diehr, P., Koepsell, T., Wagner, E., Wickezer, T., &
community based health promotion. *International Quarterly of Community
Health Education*, 13, 329-363.

popular press: The case of Donald Burr and People Express. *Administrative

obesity: Results from the Behavioral Risk Factor Surveillance System.

Christoffel, K. K., & Ariza, A. (1998). The epidemiology of overweight in children:

with osteoarthritis of the hand and knee in women: A twin study. *Journal of
Rheumatology*, 23, 1221-1226.


*Critical Reviews in Food Science and Nutrition*, 33, 423-430.

Science in Sports, and Exercise*, 31(Suppl.), S663-S667.


*America's eating habits: Changes and Consequences.* (pp. 173-180).
Washington D.C: United States Department of Agriculture.


Faucette, N., Iannotti, R. J., Killen, J. D., Klesges, R. C., Petray, C. K.,
and interventions in youth. Medicine and Science in Sports and Exercise,
24(Suppl. 6), S248-S257.

Halweil (Eds.), Vital signs: The environmental trends that are shaping our
future (pp. 70-71). New York: Norton.

Surgeon General's Call to Action - Overweight and Obesity Threaten U.S.


Schlicker, S. A., Borra, S. T., & Regan, C. (1994). The weight and fitness status of


prevention and treatment of obesity. Medical Clinics of North America,
84(2), 491-512.

Review, 48, 373-379.


Retrieved August 20, 2001, from


APPENDICES
APPENDIX A

*Journal Article Focus: Applied/Theoretical vs. Data-based/Empirical*
### Definitions for Applied and Empirical Journal Article Focus

<table>
<thead>
<tr>
<th><strong>Applied/Theoretical Focus</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viewpoint</strong></td>
<td>Angle, opinion, belief, notion, point of view or standpoint. A theory or point of view held by the author.</td>
</tr>
<tr>
<td><strong>Commentary</strong></td>
<td>To explain or interpret something by comment, expression or opinion, observation, remark, note, reflection, criticism, opinion or interpretation.</td>
</tr>
<tr>
<td><strong>Editorial</strong></td>
<td>Author gives opinion, expression of opinion in journal.</td>
</tr>
<tr>
<td><strong>General Article</strong></td>
<td>Generic or prevalent. Concerned with dealing with universal than particular aspects.</td>
</tr>
<tr>
<td><strong>Recommendation</strong></td>
<td>To endorse as worthy or competent. Worthy of acceptance or trial.</td>
</tr>
<tr>
<td><strong>Guideline</strong></td>
<td>An article which leads, directs, or gives direction of information to the reader.</td>
</tr>
<tr>
<td><strong>Teaching Technique</strong></td>
<td>Teaching style, teaching skill, teaching execution, or method of teaching presented.</td>
</tr>
<tr>
<td><strong>Teaching Application</strong></td>
<td>Fitting, suitable, appropriate, relevant, pertinent to present as childhood obesity prevention topic.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Data-based/Empirical Focus</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intervention Techniques</strong></td>
<td>The treatment or treatments which were discussed. What happened in the particular study?</td>
</tr>
<tr>
<td><strong>Survey Research</strong></td>
<td>Any attempt to view research in terms of viewing, examining, measuring, inspecting a particular childhood obesity prevention study.</td>
</tr>
<tr>
<td><strong>Knowledge, Attitude, and Behavior Research</strong></td>
<td>The measurement of; awareness, cognition. The measurement of perception, a stand, a mental position, or the measurement of the act of, action or conduct.</td>
</tr>
</tbody>
</table>
APPENDIX B

*Journal Citation Impact Factor Rankings*
### Top Journals ranked by impact factor within category

<table>
<thead>
<tr>
<th>Discipline and Journals</th>
<th>Rank</th>
<th>Impact Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutrition and Dietetics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+Progress in Lipid Research</td>
<td>1</td>
<td>7.400</td>
</tr>
<tr>
<td>++Annual Review of Nutrition</td>
<td>2</td>
<td>5.523</td>
</tr>
<tr>
<td>*American Journal of Clinical Nutrition</td>
<td>3</td>
<td>3.958</td>
</tr>
<tr>
<td>*Obesity Research</td>
<td>4</td>
<td>3.410</td>
</tr>
<tr>
<td>*Critical Reviews in Food Science and Nutrition</td>
<td>5</td>
<td>3.396</td>
</tr>
<tr>
<td>*International Journal of Obesity</td>
<td>6</td>
<td>3.199</td>
</tr>
<tr>
<td>*Nutrition Reviews</td>
<td>7</td>
<td>2.525</td>
</tr>
<tr>
<td><strong>Medicine: General, Internal, and Pediatrics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*The New England Journal of Medicine</td>
<td>1</td>
<td>28.857</td>
</tr>
<tr>
<td>*Journal of the American Medical Association</td>
<td>2</td>
<td>11.453</td>
</tr>
<tr>
<td>*The Lancet</td>
<td>3</td>
<td>10.197</td>
</tr>
<tr>
<td>*The Journal of Pediatrics</td>
<td>3</td>
<td>3.220</td>
</tr>
<tr>
<td>+Pediatric Research</td>
<td>4</td>
<td>2.671</td>
</tr>
<tr>
<td>++Pediatric Allergy and Immunology</td>
<td>5</td>
<td>2.247</td>
</tr>
<tr>
<td>*Archives of Pediatric and Adolescent Medicine</td>
<td>9</td>
<td>1.549</td>
</tr>
<tr>
<td><strong>Psychology and Clinical Psychology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Psychological Bulletin</td>
<td>1</td>
<td>7.790</td>
</tr>
<tr>
<td>++Annual Review of Psychology</td>
<td>2</td>
<td>7.545</td>
</tr>
<tr>
<td>*Psychological Review</td>
<td>3</td>
<td>6.803</td>
</tr>
<tr>
<td>*Journal of Clinical Psychology</td>
<td>4</td>
<td>4.172</td>
</tr>
<tr>
<td>*Journal of Consulting and Clinical Psychology</td>
<td>5</td>
<td>3.919</td>
</tr>
<tr>
<td>*Psychological Medicine</td>
<td>6</td>
<td>3.389</td>
</tr>
<tr>
<td><strong>Public. Environmental, and Occupational Health</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>++Annual Review of Public Health</td>
<td>1</td>
<td>4.356</td>
</tr>
<tr>
<td>*American Journal of Epidemiology</td>
<td>2</td>
<td>3.978</td>
</tr>
<tr>
<td>+Cancer Cause Control</td>
<td>5</td>
<td>3.044</td>
</tr>
<tr>
<td>*American Journal of Public Health</td>
<td>7</td>
<td>3.015</td>
</tr>
<tr>
<td>*Health Education Quarterly/Health Education &amp; Behavior</td>
<td>10</td>
<td>1.637</td>
</tr>
<tr>
<td>*Journal of School Health</td>
<td>32</td>
<td>0.567</td>
</tr>
<tr>
<td>*American Journal of Health Behavior</td>
<td>39</td>
<td>0.430</td>
</tr>
<tr>
<td><strong>Sport Sciences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>++Exercise Immunology Reviews</td>
<td>1</td>
<td>2.900</td>
</tr>
<tr>
<td>*American Journal of Sports Medicine</td>
<td>2</td>
<td>2.327</td>
</tr>
<tr>
<td>*Medicine and Science in Sports and Exercise</td>
<td>3</td>
<td>2.110</td>
</tr>
<tr>
<td>*Journal of Applied Physiology</td>
<td>4</td>
<td>2.081</td>
</tr>
<tr>
<td>*Journal of Sport and Exercise Physiology</td>
<td>5</td>
<td>1.489</td>
</tr>
<tr>
<td>*Journal of Physical Education, Recreation, &amp; Dance</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

Impact factor = the average number of times recent articles in a specific journal were cited in the previous two years preceding 1999.
* = Denotes journals selected based on citation index factor ranking and committee review.
+ = Journals not reviewed due to concern over original publications and committee review.
++ = Journals not reviewed due to concern over pertinence of childhood obesity.
N.A. = Not ranked in 1999 Journal Citation Reports, Science Edition.
APPENDIX C

How to Read and Plot Growth Charts

Calculated Body Mass Index Values for Selected Heights
And Weights for Ages 2 to 20 Years

CDC Growth Charts for Girls: Body Mass Index-for-Age Percentiles
Girls: Stature-for-Age and Weight-for-Age Percentiles

CDC Growth Charts for Boys: Body Mass Index-for Age Percentiles
Boys: Stature-for-Age and Weight-for-Age Percentiles
Appendix C

How to Read and Plot Growth Charts

Body Mass Index, or BMI (wt/ht²), provides a guideline based on weight and height to determine underweight and overweight. As children grow, their body fatness changes over the years. The interpretation of BMI depends on the child's age. Additionally, girls and boys differ in their body fatness as they mature. Therefore, BMI-for-age is plotted on gender-specific growth charts.

Each of the CDC BMI-for-age gender specific charts contains a series of curved lines indicating specific percentiles. Healthcare professionals use the following established percentile cutoff points to identify underweight and overweight in children:

- **Underweight**: BMI-for-age < 5th percentile
- **At risk of overweight**: BMI-for-age 85th percentile to < 95th percentile
- **Overweight**: BMI-for-age ≥ 95th percentile

http://www.cdc.gov/nccdpb/dnpa/growthcharts/bmi_tools.htm
APPENDIX C

CDC Table for Calculated Body Mass Index Values for Selected Heights and Weights for Ages 2 to 20 Years

Body Mass Index (BMI) is determined as follows:

English Formula:

\[
\frac{\text{Weight in pounds}}{\text{Height in inches}} + \frac{\text{Height in inches}}{703} = \text{BMI}
\]

Metric Formula:

\[
\frac{\text{Weight in kilograms}}{\text{Height in meters}} + \text{Height in meters} = \text{BMI}
\]

The above BMI formulas have already been calculated and are presented in the table that follows. To use the BMI table, first locate the child's height and weight in the height and weight ranges listed in the upper right corner of each page. Weight measurements are listed in increasing sequential order. Once the exact page has been located in the table, the point where height and weight intersect represents the BMI value. This value is then plotted on the BMI-for growth chart to determine whether the child is within a normal growth pattern, overweight, at risk of becoming overweight, or underweight. Whenever a child's specific height or weight measurement is not listed, round to the closest number in the table.

Source: Department of Health and Human Services, Centers for Disease Control and Prevention, June 2000,
2 to 20 years: Girls
Stature-for-age and Weight-for-age percentiles

<table>
<thead>
<tr>
<th>NAME</th>
<th>RECORD #</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Mother's Stat</th>
<th>Father's Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Age</td>
</tr>
<tr>
<td>------</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In</th>
<th>cm</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10:11</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td>155</td>
<td>150</td>
<td>145</td>
<td>140</td>
<td>135</td>
<td>130</td>
<td>125</td>
<td>120</td>
<td>115</td>
</tr>
<tr>
<td>155</td>
<td>150</td>
<td>145</td>
<td>140</td>
<td>135</td>
<td>130</td>
<td>125</td>
<td>120</td>
<td>115</td>
<td>110</td>
</tr>
<tr>
<td>150</td>
<td>145</td>
<td>140</td>
<td>135</td>
<td>130</td>
<td>125</td>
<td>120</td>
<td>115</td>
<td>110</td>
<td>105</td>
</tr>
<tr>
<td>145</td>
<td>140</td>
<td>135</td>
<td>130</td>
<td>125</td>
<td>120</td>
<td>115</td>
<td>110</td>
<td>105</td>
<td>100</td>
</tr>
<tr>
<td>140</td>
<td>135</td>
<td>130</td>
<td>125</td>
<td>120</td>
<td>115</td>
<td>110</td>
<td>105</td>
<td>100</td>
<td>95</td>
</tr>
<tr>
<td>135</td>
<td>130</td>
<td>125</td>
<td>120</td>
<td>115</td>
<td>110</td>
<td>105</td>
<td>100</td>
<td>95</td>
<td>90</td>
</tr>
<tr>
<td>130</td>
<td>125</td>
<td>120</td>
<td>115</td>
<td>110</td>
<td>105</td>
<td>100</td>
<td>95</td>
<td>90</td>
<td>85</td>
</tr>
<tr>
<td>125</td>
<td>120</td>
<td>115</td>
<td>110</td>
<td>105</td>
<td>100</td>
<td>95</td>
<td>90</td>
<td>85</td>
<td>80</td>
</tr>
<tr>
<td>120</td>
<td>115</td>
<td>110</td>
<td>105</td>
<td>100</td>
<td>95</td>
<td>90</td>
<td>85</td>
<td>80</td>
<td>75</td>
</tr>
<tr>
<td>115</td>
<td>110</td>
<td>105</td>
<td>100</td>
<td>95</td>
<td>90</td>
<td>85</td>
<td>80</td>
<td>75</td>
<td>70</td>
</tr>
<tr>
<td>110</td>
<td>105</td>
<td>100</td>
<td>95</td>
<td>90</td>
<td>85</td>
<td>80</td>
<td>75</td>
<td>70</td>
<td>65</td>
</tr>
<tr>
<td>105</td>
<td>100</td>
<td>95</td>
<td>90</td>
<td>85</td>
<td>80</td>
<td>75</td>
<td>70</td>
<td>65</td>
<td>60</td>
</tr>
</tbody>
</table>

SOURCE: Developed by the National Center for Health Statistics in collaboration with
the National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts

SAPER•HEALTHIER•PEOPLE*
2 to 20 years: Boys
Body mass index-for-age percentiles

To Calculate BMI: Weight (kg) × Stature (cm) + Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) + Stature (in) ÷ 703
APPENDIX D

Healthy People 2010: Health Status Objectives
Appendix D

Health Status Objectives Related to Childhood Obesity: *Healthy People 2010*

**YEAR 2010 Physical Activity/Exercise Objectives**

- Reduce coronary heart disease deaths
- Reduce overweight prevalence
- Preserve independent functioning in older adults
- Increase moderate physical activity
- Increase vigorous physical activity
- Reduce sedentary lifestyle
- Increase activities that enhance muscular strength, endurance, and flexibility
- Increase sound weight loss practices
- Increase participation in school physical education
- Increase activity level in school physical education
- Increase worksite fitness programs
- Increase availability and accessibility of community fitness facilities
- Increase physical activity counseling by primary care providers

**YEAR 2010 Nutrition Objectives**

- Reduce coronary heart disease deaths
- Reverse the rise in cancer deaths
- Reduce overweight prevalence
- Reduce growth retardation
- Reduce dietary fat intake
- Increase complex carbohydrate and fiber-containing foods
- Increase sound weight loss practices
- Increase calcium intake
- Decrease salt and sodium intake
- Reduce iron deficiency
- Increase breastfeeding
- Decrease baby bottle tooth decay
- Increase use of food labels
- Achieve useful nutrition labeling
- Increase availability of low-fat foods
- Increase low-fat, low-calorie food choices
- Increase school and child care menus consistent with the Dietary Guidelines
- Increase home-delivered meals
- Increase nutrition education in schools
- Increase nutrition education and weight management programs at worksites
- Increase nutrition assessment, counseling, and referrals
- Reduce stroke deaths
- Reduce colorectal cancer deaths
- Reduce diabetes incidence/prevalence
Appendix D

**HEALTH STATUS OBJECTIVES RELATED TO CHILDHOOD OBESITY: Healthy People 2010**

19. Nutrition and Overweight

19-3. Reduce the proportion of children and adolescents who are overweight or obese.

**Target and baseline:**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Reduction in Overweight or Obese</th>
<th>1988–94</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children and Adolescents*</td>
<td>Baseline</td>
<td>Target</td>
<td></td>
</tr>
<tr>
<td>19-3a.</td>
<td>Children aged 6 to 11 years</td>
<td>11%</td>
<td>5%</td>
</tr>
<tr>
<td>19-3b.</td>
<td>Adolescents aged 12 to 19 years</td>
<td>11%</td>
<td>5%</td>
</tr>
<tr>
<td>19-3c.</td>
<td>Children and adolescents aged 6 to 19 years</td>
<td>11%</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Target setting method:** Better than the best.

19-5. Increase the proportion of persons aged 2 years and older who consume at least two daily servings of fruit.

**Target:** 75 percent.

**Baseline:** 28 percent of persons aged 2 years and older consumed at least two daily servings of fruit in 1994–96 (age adjusted to the year 2000 standard population).

**Target setting method:** Better than the best.

19-6. Increase the proportion of persons aged 2 years and older who consume at least three daily servings of vegetables, with at least one-third being dark green or orange vegetables.

**Baseline:** 3 percent of persons aged 2 years and older consumed at least three daily servings of vegetables, with at least one-third of these servings being dark green or orange vegetables in 1994–96 (age adjusted to the year 2000 standard population).
19-7. Increase the proportion of persons aged 2 years and older who consume at least six daily servings of grain products, with at least three being whole grains.

Target: 50 percent.

Baseline: 7 percent of persons aged 2 years and older consumed at least six daily servings of grain products, with at least three being whole grains in 1994–96 (age adjusted to the year 2000 standard population).

19-8. Increase the proportion of persons aged 2 years and older who consume less than 10 percent of calories from saturated fat.

Target: 75 percent.

Baseline: 36 percent of persons aged 2 years and older consumed less than 10 percent of daily calories from saturated fat in 1994–96 (age adjusted to the year 2000 standard population).

19-9. Increase the proportion of persons aged 2 years and older who consume no more than 30 percent of calories from total fat.

Target: 75 percent.

Baseline: 33 percent of persons aged 2 years and older consumed no more than 30 percent of daily calories from total fat in 1994–96 (age adjusted to the year 2000 standard population).

19-10. Increase the proportion of persons aged 2 years and older who consume 2,400 mg or less of sodium daily.

Target: 65 percent.
Baseline: 21 percent of persons aged 2 years and older consumed 2,400 mg or less of sodium daily (from foods, dietary supplements, tap water, and salt use at the table) in 1988–94 (age adjusted to the year 2000 standard population).

Target setting method: Better than the best.

19-15. (Developmental) Increase the proportion of children and adolescents aged 6 to 19 years whose intake of meals and snacks at school contributes to good overall dietary quality.

22. Physical Activity and Fitness

22-8. Increase the proportion of the Nation's public and private schools that require daily physical education for all students.

Target and baseline:

<table>
<thead>
<tr>
<th>Objective</th>
<th>Increase in Schools Requiring Daily Physical Activity for All Students</th>
<th>Baseline</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>22-8a.</td>
<td>Middle and junior high schools</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td>22-8b.</td>
<td>Senior high schools</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

Target setting method: 47 percent improvement for middle and junior high schools; 150 percent improvement for senior high schools.

22-12. (Developmental) Increase the proportion of the Nation’s public and private schools that provide access to their physical activity spaces and facilities for all persons outside of normal school hours (that is, before and after the school day, on weekends, and during summer and other vacations).

22-14. Increase the proportion of trips made by walking.

Target and baseline:
<table>
<thead>
<tr>
<th>Objective</th>
<th>Increase in Trips</th>
<th>Length of Trip</th>
<th>1995</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Made by Walking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22-14a. Adults aged 18 years and older</td>
<td>Trips of 1 mile or less</td>
<td>17</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>22-14b. Children and adolescents aged 5 to 15 years</td>
<td>Trips to school of 1 mile or less</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Target setting method:** 47 percent improvement for 22-14a and 68 percent improvement for 22-14b. (Better than the best will be used when data are available.)

**22-15. Increase the proportion of trips made by bicycling.**

**Target and baseline:**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Increase in Trips</th>
<th>Activity</th>
<th>1995</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Made by Bicycling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22-15a. Adults aged 18 years and older</td>
<td>Trips of 5 miles or less</td>
<td>0.6</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>22-15b. Children and adolescents aged 5 to 15 years</td>
<td>Trips to school of 2 miles or less</td>
<td>2.4</td>
<td>5.0</td>
<td></td>
</tr>
</tbody>
</table>

**Target setting method:** 233 percent improvement for 22-15a and 108 percent improvement for 22-15b. (Better than the best will be used when data are available.)

APPENDIX E

*Environmental Factors Providing a Constant Pressure Toward Positive Energy Balance and Increase in Body Fat Mass*
Environmental factors providing a constant pressure toward positive energy balance and increase in body fat mass

APPENDIX F

Determinants and Correlates of Excess Body Weight or Fat
### Determinants and Correlates of Excess Body Weight or Fat

<table>
<thead>
<tr>
<th>Determinant for Positive Energy Balance</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>More prevalent in adults and middle-aged individuals.</td>
</tr>
<tr>
<td>Gender</td>
<td>Females have more fat.</td>
</tr>
<tr>
<td>Positive Energy Balance</td>
<td>An absolute requirement over a relatively long period.</td>
</tr>
<tr>
<td>Amount of Energy Intake</td>
<td>Overfeeding leads to gain in weight and fat mass.</td>
</tr>
<tr>
<td>Composition of Intake</td>
<td>High-fat intake may be a contributing factor.</td>
</tr>
<tr>
<td>Physical Activity Level</td>
<td>Low or decreasing level of activity.</td>
</tr>
<tr>
<td>Resting Metabolic Rate</td>
<td>A low value with respect to body mass and fat free mass is correlated with weight gain.</td>
</tr>
<tr>
<td>Thermic Effect of Food</td>
<td>Low for energy intake in some obesity cases.</td>
</tr>
<tr>
<td>Lipid Oxidation</td>
<td>A high respiratory quotient is correlated with body fat and weight gain.</td>
</tr>
<tr>
<td>Ratio of Fat to Lean Tissue</td>
<td>A high-fat mass-to-fat free mass ratio is correlated with excess weight or weight gain.</td>
</tr>
<tr>
<td>Adipose-Tissue Lipoprotein Lipase Activity</td>
<td>High in obese individuals and remains high (perhaps even increases) with weight gain.</td>
</tr>
<tr>
<td>Variety of Social and Behavioral Factors</td>
<td>Obesity in associated with socioeconomic status, familial Conditions, network of friends, pattern of leisure activities, television time, smoking habits, alcohol intake, etc.</td>
</tr>
<tr>
<td>Undetermined Genetic Characteristics</td>
<td>These affect energy balance particularly via the energy expenditure components, the deposition of the energy surplus as fat or as lean tissue, and the relative proportion of lipids and carbohydrates oxidized.</td>
</tr>
</tbody>
</table>

APPENDIX G

The Reciprocal Determination of Behavior, Person, and Environment
Appendix G

The Reciprocal Determination of Behavior, Person, and Environment

Personal Factors

Knowledge
Skills
Self-Efficacy
Outcome Expectations
Personal Goals

Environmental Factors

Social
Institutional
Physical

Frequency
Consistency
Other Relevant Aspects

APPENDIX H

*An Ecological Perspective: Risk Factors Associated with Childhood Obesity.*
Risk Factors Associated with Childhood Obesity: An Ecological Perspective

Social Norms/National Policies
- Excessive availability of food within the United States Society
- Pricing strategies that do not favor consumption of lower-fat/energy foods
- Modern technology leading to decreased physical activity
- Food advertising targeted at children/adolescents
- Societal norms regarding eating and physical activity
- Social norms regarding acceptable body shapes/sizes leading to unhealthy diet
- Social norms regarding acceptable body shapes/sizes leading to discomfort while being physically active

Community Factors
- Lack of safety within neighborhood (for walking, playing outside)
- Few opportunities for less physically fit or overweight youth to participate in sports
- Numerous local fast food restaurants
- Lack of sidewalks for walking
- Lack of inexpensive and accessible places for low income youth to be active

School Factors
- School policies allowing students to leave campus for lunch
- High fat/high caloric a la carte food options within school cafeterias
- Decline in physical education requirements in the schools
- Lack of opportunities for less physically fit and overweight students to be active within the schools
- Lack of a focus on life-long and fun physical activity within physical education classes at school
- Health care policies regarding the treatment of obesity among youth within clinical settings

Individual (Interpersonal Factors)
- Family eating patterns such as irregular meals, frequent eating out, low consumption of fruits and vegetables, and high consumption of foods high in fats and calories
- Low levels of family physical activity and tendency towards sedentary leisure-time behaviors (including television watching)
- Parental attitudes/knowledge regarding the development of childhood eating patterns that discourage autonomy and emphasize control
- Lack of peer norms that encourage healthful eating and physical activity
- Family and peer norms that overemphasize dieting as a weight-control strategy and de-emphasize healthful eating and physical activity.

Individual (Intrapersonal Factors)
- Genetic predisposition towards obesity
- Poor body/self image leading to decreased physical activity and diet-binge cycles
- Dislike and/or lack of skills for physical activity
- Low levels of physical activity and high levels of sedentary activity (e.g., television viewing)
- Preferences for foods high in fats/calories
- Busy lifestyle leading to rushed eating and low physical activity
- Binge eating and other disordered eating behaviors
- Meals and snacking patterns in which foods high in fats/calories are consumed (e.g., eating-out)

Adapted from: D. Neumark-Sztainer (2000, September). Risk Factors for Childhood and Adolescent Obesity. Healthy Generations, 1(2). A newsletter from Maternal and Child Health. Division of Epidemiology, School of Public Health at the University of Minnesota
APPENDIX I

A Flowchart for the Typical Process of Content Analysis Research
Appendix I

A Flowchart for the Typical Process of Content Analysis Research

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Theory or rationale: What content will be examined and why? Are there certain theories or perspectives that indicate that the particular message content is important to study? If you're using an integrative model, linking the content analysis with the text to show the relationship with the source is an important characteristic. What are your research questions or hypothesis to be tested?</td>
</tr>
<tr>
<td>2.</td>
<td>Conceptualization: What variables or antecedents will be used in the study, and how will you define them? It is recommended that the researcher examines some examples of the content to be examined to be reasonably certain that all the variables to be measured can be coded for.</td>
</tr>
<tr>
<td>3.</td>
<td>Operationalizations or Measures: Measures should match conceptualizations, otherwise known as internal validity. Are the variables measured well (i.e., at a high level of measurement, with categories that are mutually exclusive)? An a priori coding scheme describing all measures must be created. Both face validity and content validity can also be assessed at this point.</td>
</tr>
<tr>
<td>4.</td>
<td>Coding Schemes: Researchers need to create an a) codebook (with all variable measures fully explained, and b) a coding form</td>
</tr>
<tr>
<td>5.</td>
<td>Sampling: How will you randomly sample a subset of the content? The Sample application could be accomplished by designating a: time period, journal article, number of pages, issue, or channel.</td>
</tr>
<tr>
<td>6.</td>
<td>Training and Pilot Reliability: During a training session in which coders work together, find out whether they can agree on the coding of variables. Then, in an independent coding test, not the reliability on each variable. At each stage, revise the codebook or coding form as needed.</td>
</tr>
<tr>
<td>7.</td>
<td>Coding: Use at least two coders, to establish reliability. Coding should be done independently, with at least 80% for the reliability test.</td>
</tr>
<tr>
<td>8.</td>
<td>Final reliability: Calculate the reliability figure (percent agreement) for each variable.</td>
</tr>
<tr>
<td>9.</td>
<td>Tabulation and reporting: Figures and statistics may be reported one variable at a Time (univariate), or variables may be cross-tabulated in different ways (bivariate and multivariate techniques). Over-time trends are also a common reporting method. In the long run, relationships between content analysis variables may establish criterion and construct validity.</td>
</tr>
</tbody>
</table>

APPENDIX K

Ten Ecological Models or Frameworks Used to Develop Codebook
Model 1.

Model 2.

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>SCHOOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Age and gender</td>
<td>• Parents -*KAB</td>
</tr>
<tr>
<td>• Ethnicity</td>
<td>• Child -*KAB</td>
</tr>
<tr>
<td>• SES</td>
<td>• Community</td>
</tr>
<tr>
<td>• Social norms</td>
<td>• Safety (real or perceived)</td>
</tr>
<tr>
<td>• Parents -*KAB</td>
<td>• Counseling</td>
</tr>
<tr>
<td>• Child -*KAB</td>
<td>• School system</td>
</tr>
<tr>
<td>• Family composition</td>
<td>• Facilities</td>
</tr>
<tr>
<td></td>
<td>• Personnel</td>
</tr>
<tr>
<td></td>
<td>• Curriculum</td>
</tr>
</tbody>
</table>

*KAB = Knowledge, attitudes, and beliefs
Model 3.

* = child risk factors refer to child behaviors associated with the development of overweight.

** = characteristics of child interact with child risk factors and contextual factors to influence the development of overweight.
Model 4.

**Environmental Influences on Food Intake and Physical Activity**

<table>
<thead>
<tr>
<th>Type of Environment</th>
<th>Physical Environment</th>
<th>Economic Environment</th>
<th>Sociocultural Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Food</td>
<td>Activity</td>
<td>Food</td>
</tr>
<tr>
<td>Macro</td>
<td>Food Laws and regulation</td>
<td>Labor saving devices</td>
<td>Taxes and Subsides</td>
</tr>
<tr>
<td></td>
<td>Food technology</td>
<td>Cycleways/walkways</td>
<td>Cost of food technology</td>
</tr>
<tr>
<td></td>
<td>Low fat foods</td>
<td>Fitness industry policy</td>
<td>Marketing costs</td>
</tr>
<tr>
<td></td>
<td>Food industry policies</td>
<td>Transport system</td>
<td>Food prices</td>
</tr>
<tr>
<td>Micro</td>
<td>Food in House</td>
<td>Local Rec. Facilities</td>
<td>Family income</td>
</tr>
<tr>
<td></td>
<td>Food choices at school and at work</td>
<td>Second cars</td>
<td>Other household expenses</td>
</tr>
<tr>
<td></td>
<td>Food in local shops</td>
<td>Household rules for watching TV and video</td>
<td>Subsidized canteens</td>
</tr>
<tr>
<td></td>
<td>Proximity of fast food outlets</td>
<td>Safe streets</td>
<td>Home grown foods</td>
</tr>
</tbody>
</table>

Model 5.

INTERNATIONAL FACTORS

GLOBALIZATION OF MARKETS

DEVELOPMENT

NATIONAL/STATE

EDUCATION POLICY

TRANSPORT POLICY

URBANIZATION

HEALTH POLICY

FOOD POLICY

Agriculture/Gardens/Local Markets

COMMUNITIES

PUBLIC TRANSPORT

PUBLIC SAFETY

SANITATION

HEALTH CARE SYSTEM

Manufactured/Imported food

LEISURE ACTIVITY/FACILITIES

SCHOOL ACTIVITY

Worksites

WORKSITE EXERCISE

WORKSITE FOOD

LIBERATION

School Food

INDIVIDUAL

HOMECARE

ENERGY EXPENDITURE

OBESITY

PREVALENCE

Food Intake: Nutrient Density

Labor

Infections

School

Agriculture/Gardens/Local Markets
Model 6.

Model 7.

**Familial Approach to the Treatment of Childhood Obesity: Conceptual Model**

**Parental Cognitive and Behavioral Change**

- Increased Nutrition/Health Change
  - Enhancing parental knowledge about nutrition
  - Purchasing healthy foods by reading food labels
  - Providing companionship at meal times
  - Preparing healthy balanced foods and meals
  - Selecting lower fat, higher fiber foods
  - Eating slowly
  - Selecting appropriate serving sizes
  - Increasing self-efficacy in appropriate parental food intake habits
  - Exercising regularly

- Increased Parenting Skills
  - Reframing the problem
  - Reframing parental role and child responsibility
  - Exercising parental leadership
  - Exercising parental general skills
  - Promoting parent-child effective communication
  - Promoting problem-solving skills
  - Increasing self-efficacy in parental role of providing a positive family environment for healthy eating

**Environmental Change**

- Create Environment in the Family/Home for Healthy Habits
  - Practicing regular meal times and scheduling
  - Between-meal snacks
  - Allocating individual portions
  - Providing alternative leisure-time activities
  - Creating opportunity for physical activities
  - Reducing stimulus for overeating

**Modeling**

**Change in child weight status**

Model 8. An Ecological Perspective: Risk Factors Associated with Childhood Obesity

Social Norms/National Policies
- Excessive availability of food within the United States Society
- Pricing strategies that do not favor consumption of lower-fat/energy foods
- Modern technology leading to decreased physical activity
- Food advertising targeted at children/adolescents
- Societal norms regarding eating and physical activity
- Social norms regarding acceptable body shapes/sizes leading to unhealthy diet
- Social norms regarding acceptable body shapes/sizes leading to discomfort while being physically active

Community Factors
- Lack of safety within neighborhood (for walking, playing outside)
- Few opportunities for less physically fit or overweight youth to participate in sports
- Numerous local fast food restaurants
- Lack of sidewalks for walking
- Lack of inexpensive and accessible places for low income youth to be active

School Factors
- School policies allowing students to leave campus for lunch
- High fat/high caloric a la carte food options within school cafeterias
- Decline in physical education requirements in the schools
- Lack of opportunities for less physically fit and overweight students to be active within the schools
- Lack of a focus on life-long and fun physical activity within physical education classes at school
- Health care policies regarding the treatment of obesity among youth within clinical settings

Individual (Interpersonal Factors)
- Family eating patterns such as irregular meals, frequent eating out, low consumption of fruits and vegetables, and high consumption of foods high in fats and calories
- Low levels of family physical activity and tendency towards sedentary leisure-time behaviors (including television watching)
- Parental attitudes/knowledge regarding the development of childhood eating patterns that discourage autonomy and emphasize control
- Lack of peer norms that encourage healthful eating and physical activity
- Family and peer norms that overemphasize dieting as a weight-control strategy and de-emphasize healthful eating and physical activity.

Individual (Intrapersonal Factors)
- Genetic predisposition towards obesity
- Poor body/self image leading to decreased physical activity and diet-binge cycles
- Distlike and/or lack of skills for physical activity
- Low levels of physical activity and high levels of sedentary activity (e.g., television viewing)
- Preferences for foods high in fats/calories
- Busy lifestyle leading to rushed eating and low physical activity
- Binge eating and other disordered eating behaviors
- Meals and snacking patterns in which foods high in fats/calories are consumed (e.g., eating-out)

Adapted from: D. Neumark-Sztainer (2000, September). Risk Factors for Childhood and Adolescent Obesity. Healthy Generations. 1(2), pg. 4. A newsletter from Maternal and Child Health, Division of Epidemiology, School of Public Health at the University of Minnesota
Model 9.

Model 10. Framework for determinants of physical activity and eating behavior

Proximal

Pleasure  Genetics  Hierarchy of needs  Self identities  Physiology

Habits  Ethnic identities  Beliefs  Values  Life experience

Social trends  Seasonality  Convenience  Accessibility  Cost/Time

Home  Food Stores  Restaurants  Parks  Neighborhood

Distal

Political advocacy  Food industry  Transport system  Entertainment industry  Labor-saving device industry

LIFESTYLE
APPENDIX K

Journal Article Selection Scheme on Sample (n=25)
Journal article selection scheme on sample (n=25): Covering the periods 1993 through 2002

Two Procedures Utilized for Identifying Journal Articles in Sample:

1) Manual Search for journal articles covering childhood obesity

Manually go through each journal in the sample (n=25) during the periods chosen and select articles with both “childhood” and “obesity” in key word section.

Due to possible human error occurring during the identification and selection phase, a second procedure will be conducted.

2) Database Search for journal articles covering childhood obesity

The following databases (e.g., ERIC, psychINFO, EBSCO, CINAHL, HealthSTAR, ProQuest, & MEDLINE) were utilized to identify journal articles in the sampled journals (n=25). A keyword search utilizing the terms “Childhood” AND “Obesity” will be conducted. Articles will then be delimited to the journals in the sample and published during the sample frame of: 1993 through 2002 (including endpoint years). Note: Data-base search expanded to include articles with keyword “obesity” alone due to low number of articles in psychology discipline.

"Childhood" and "Obesity" Articles Garnered At Morris Library (n=164)  
Expanded to: "Obesity" articles alone (n=874)  

Childhood Obesity Prevention Articles (n=874) Reviewed and Coded  
Utilizing Operational Definition Matrices  

Categories Identified and Units of Analyses Counted, Frequencies Tabulated,  
Statistical Comparisons Computed  

Results
APPENDIX L

Data Collection Sheets: A and B
## Code Sheet A

<table>
<thead>
<tr>
<th>Major Category or Domain</th>
<th>Environmental Antecedents Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Norms/National Practices</td>
<td>N1, N2, N3, N4, N5, N6, N7, N8, N9, N10</td>
</tr>
<tr>
<td>Community Factors</td>
<td>C1, C2, C3, C4, C5, C6, C7, C8, C9, C10</td>
</tr>
<tr>
<td>School Factors</td>
<td>S1, S2, S3, S4, S5, S6, S7, S8, S9, S10</td>
</tr>
</tbody>
</table>

Other, Explain:
Other,
Explain:__

<table>
<thead>
<tr>
<th>Family/Peer or Interpersonal Factors F1</th>
</tr>
</thead>
<tbody>
<tr>
<td>F2</td>
</tr>
<tr>
<td>F3</td>
</tr>
<tr>
<td>F4</td>
</tr>
<tr>
<td>F5</td>
</tr>
<tr>
<td>F6</td>
</tr>
<tr>
<td>F7</td>
</tr>
<tr>
<td>F8</td>
</tr>
<tr>
<td>F9</td>
</tr>
<tr>
<td>F10</td>
</tr>
</tbody>
</table>

Other,
Explain:__

<table>
<thead>
<tr>
<th>Individual or Interpersonal Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1</td>
</tr>
<tr>
<td>I2</td>
</tr>
<tr>
<td>I3</td>
</tr>
<tr>
<td>I4</td>
</tr>
<tr>
<td>I5</td>
</tr>
<tr>
<td>I6</td>
</tr>
<tr>
<td>I7</td>
</tr>
<tr>
<td>I8</td>
</tr>
<tr>
<td>I9</td>
</tr>
<tr>
<td>I10</td>
</tr>
<tr>
<td>I11</td>
</tr>
<tr>
<td>I12</td>
</tr>
<tr>
<td>I13</td>
</tr>
<tr>
<td>I14</td>
</tr>
<tr>
<td>I15</td>
</tr>
</tbody>
</table>

Other,
Explain:__
APPENDIX L

Codesheet B

Individual data Summary

Author:

Title:

Name of Journal

Year

Volume

Pages

Journal article focus T or E

Research Design

Statistics

Ecological antecedents related to obesity in children (Abbreviations)

If an article was a meta-analysis study with referenced antecedents in previous research indicate here: Author Year Study Title

If article contains antecedent attributed to research prior to 1993 indicate here:

Journal article number ________
APPENDIX M

*Baseline Codebook and Operational Definitions for Content Analysis*
Hypothetical Ecological Model to Prevent Childhood Obesity: Operational Definitions Codebook

Category or Domain followed by Themes (Units of Analysis)

Social Norms/National Policies (N)

1. Excessive, plentiful, non-nutritious food availability in U.S. (i.e., easy access to high fat/energy dense foods)
2. Pricing strategies that favor consumption of high fat/energy dense foods and discourage healthier selections based on price (e.g., lack of taxation on junk foods)
3. Modern technology (e.g., labor-saving devices – cars or work-related labor saving devices creating sedentary jobs) leading to decreased physical activity; (i.e., U.S. designed for cars)
4. Food advertising or competitive marketing (e.g., cartoons, movie figures, billboards) for high fat foods targeted towards children; (i.e., repeated commercials)
5. Societal norms regarding eating and physical activity (e.g., "grazing" or "walkability" of surroundings) including cultural "inactivity". Recognized need to improve diet/activity
6. Social norms regarding acceptable body shapes/sizes leading to discomfort while being physically active (e.g., overweight individuals feel uncomfortable exercising in public)
7. Varying perceptions and acceptance of obesity due to ethnicity or lack of acceptance of physical activity –exercise; (e.g., cultural denial of being overweight or obese)
8. Nutrition labeling laws requiring fast food to provide calorie information on menus or menu boards; or nutrition logos on menu boards or grocery store shelves
9. Low priority as medical condition or disease (i.e., obesity not recognized as disease or condition by physicians; or obesity neglected as condition and attributed to "laziness or gluttony"
10. Ubiquity of televisions, computers, remote controls, video games as energy saving devices (e.g., the pervasiveness in our culture of labor saving and activity prohibiting devices)
11. Lack of sidewalks (presence and quality) for walking (e.g., from home to school) or lack of "pedestrian malls." Establish walking lanes or bike paths to encourage activity
12. Lack of inexpensive and accessible places for low-income youth to be active (e.g., lack of access to not-for-profit exercise facilities)
13. Lack of safety (i.e., perceived or real) within neighborhood by community (for walking, playing outside) (i.e., increased motor vehicle traffic prohibiting active lifestyles); Urban decay
14. Incentives for consumption of high fat or fast foods (e.g., toys)
15. Where one resides or lives geographically (e.g., rural or urban) and/or seasonal factors that inhabit activity in certain parts of the country
16. Availability of physicians in community and/or physicians counseling or screening for obesity in children (i.e., are overweight or obese children "counseled to lose weight?")
17. Grocery stores in areas of higher income offer more healthful foods than do lower income urban neighborhoods
18. Drinking water access
19. Availability of vending machines in community (e.g., high fat foods, sodas, soft drinks, juice drinks); Availability impacts consumption and over-consumption
20. Other Community factors. Explain: ____________________________

Appendix M
Operational Definitions Codebook (continued)

Individual or Intrapersonal Factors (I)

1. Genetic predisposition towards obesity (i.e., certain individuals with ethnic heritage may be more prone to obesity)
2. Poor body/self image (e.g., embarrassment, lowered self esteem, disgust, or guilt) leading to decreased physical activity and diet-binge cycles; Reduced confidence, Loneliness, isolation etc.
3. Dislike and/or lack of skills for physical activity (i.e., self-efficacy, confidence to be active or confidence to exercise)
4. Low levels of physical activity and high levels of sedentary activity (e.g., television viewing and/or video games)
5. Preferences for foods high in fats/calories or lack of skills (e.g., self-efficacy) or ability to prepare healthier food selections
6. Busy lifestyle leading to rushed eating and low physical activity; (i.e., skipping meals, eating convenience foods, and or excessive snacking due to rushed schedule)
7. Binge eating and other disordered eating behaviors (i.e., depression, impulse eating, or anxiety causing one to eat too quickly) including episodic overeating “loss of control”
8. Meals and snacking patterns in which foods high in fats/calories are consumed (e.g., eating-out or night eating)
9. Self-ethnic or cultural identity favoring weight gain (e.g., individual not concerned about weight status); Size acceptance (e.g., mother’s of low SES); or less desire to be thin
10. Elevated dieting and radical weight loss methods may increase one’s propensity for obesity (i.e., “stunting” or poor nutrition early in life can increase the risk of obesity later)
11. Other individual (Intrapersonal factors). Explain:

Family/Peer or Interpersonal Factors (F)

1. Family eating patterns such as irregular meals, frequent eating out, low consumption of fruits and vegetables, and high consumption of foods high in fats and calories (e.g., food choice and food patterns) including eating in front of television and “night eating”
2. Low levels of family physical activity and tendency towards sedentary leisure-time behaviors (including increased television watching). Need to provide alternative leisure-time activities
3. Parental attitudes/knowledge regarding the development of childhood eating patterns that discourage autonomy and emphasize control (including parental modeling)
4. Parental attitudes/knowledge regarding the allocating individual food portion sizes and food preparation techniques
5. Lack of peer norms that encourage healthful eating and physical activity (including social support).
6. Family and peer norms that overemphasize dieting as a weight-control strategy and de-emphasize healthful eating and physical activity; (e.g., food restriction)
7. One or both parent(s)/guardian(s) being obese; parents weight status (i.e., overweight)
8. Rewarding children with food or lack of food as punishment
9. Family stress; psychosocial problems etc.
10. Quantity and availability of high fat food/high energy food in household (e.g., soda, fruit juice drinks, potato chips, hot dogs, ice cream etc.)
11. Family socioeconomic status, including parents level of education (i.e., parents not recognizing obesity in their own children); Or Less diverse diets in home (e.g., fruits and veggies)
12. Reduce the stimulus for overeating or increase the cues for exercise or prompts to be active (i.e., parent modeling of activity)
13. Self-efficacy in parental role of providing a positive family environment for eating (e.g., companionship or conversation while the family eats together)
14. Access to exercise equipment in home; health club membership, participation in sports or accessibility of health clubs in proximity of home
15. Presence of garden; (i.e., availability of fruits and vegetables in home)
16. Changing parental work habits (e.g., one or more parents in work force); Time pressures have increased, causing children to become more responsible for preparation of meals
17. Repeated verbal, physical, or sexual abuse
18. Number of annual visits to physician of health care facility
19. Family/Peer (Interpersonal factors). Explain:

School Factors (S)

1. School policies allowing students to leave campus for lunch
2. School safety restricting physical commute to school (perceived or real); Lack of safety (i.e., urban decay and crime) preventing free play after school; including walking or biking to school
3. High fat/high caloric ala carte food options within school cafeterias as apposed to offering healthier selections (e.g., fast food chains in schools as option)
4. Decline in physical education and health education requirements (including nutrition education) in the schools (e.g., availability and frequency)
5. Lack of opportunities for students to be active within the schools (e.g., facilities, personnel, curriculum, sports, or lack of recess time)
6. Lack of a focus on life-long and fun physical activity within physical education classes at school. (e.g., structure, personnel, or curriculum concerns)
7. Health care policies regarding the treatment of obesity among youth (e.g., within school to be referred to clinical settings)
8. Availability of school counseling and psychology programs
9. Availability of school health services
10. Availability of vending machines offering junk food or soda (e.g., pouring rights of soft-drink companies, including pricing strategies that promote soda instead of milk)
11. Sale of high fats foods (e.g., student food stores or bake sales) based on profit making for school clubs or athletics
12. Non-nutritious food or soda marketing or advertising in school (e.g., educational television) or on school grounds
13. Drinking water access
14. National School Lunch Program (NSLP) and National School Breakfast Program (NSBP) may provide more calories and fat to youth who participate in both programs
15. Other school factors. Explain:

Individual or Intrapersonal Factors (I)

1. Genetic predisposition towards obesity (i.e., certain individuals with ethnic heritage may be more prone to obesity)
2. Poor body/self image (e.g., embarrassment, lowered self esteem, disgust, or guilt) leading to decreased physical activity and diet-binge cycles; Reduced confidence, Loneliness, isolation etc.
3. Dislike and/or lack of skills for physical activity (i.e., self-efficacy, confidence to be active or confidence to exercise)
4. Low levels of physical activity and high levels of sedentary activity (e.g., television viewing and/or video games)
5. Preferences for foods high in fats/calories or lack of skills (e.g., self-efficacy) or ability to prepare healthier food selections
6. Busy lifestyle leading to rushed eating and low physical activity; (i.e., skipping meals, eating convenience foods, and or excessive snacking due to rushed schedule)
7. Binge eating and other disordered eating behaviors (i.e., depression, impulse eating, or anxiety causing one to eat too quickly) including episodic overeating “loss of control”
8. Meals and snacking patterns in which foods high in fats/calories are consumed (e.g., eating-out or night eating)
9. Certain coping styles have been associated with persistence of anxiety (e.g., overeating); Conversely, problem solving is a positive form of coping
10. Self-ethnic or cultural identity favoring weight gain (e.g., individual not concerned about weight status); Size acceptance (e.g., mother’s of low SES); or less desire to be thin
11. Elevated dieting and radical weight loss methods may increase one’s propensity for obesity (i.e., “stunting” or poor nutrition early in life can increase the risk of obesity later)
12. Other individual (Intrapersonal factors). Explain:
Other Category or Domain (O)

1. Other category or domain. Explain: 

Ecological model: Environmental antecedents of childhood obesity: (Key)

**SOCIAL NORMS/NATIONAL POLICIES** = Local, state, federal policies and laws that regulate or support healthy actions and practices for disease and obesity prevention, early detection, control and management.

Obesity related factors from both (T) and (E) articles added to model: N1, N2, N3, N4, N5, N6, N7, N8, and N9

**COMMUNITY FACTORS** = Social networks and norms, or standards, which exist as formal or informal among individuals, groups, and organizations.

Obesity related factors from both (T) and (E) articles added to model: C1, C2, C3, C4, C5, and C6

**SCHOOL FACTORS** = Rules, regulations, policies, and informal school standards, which exist as formal or informal among individuals, groups, and organizations.

Obesity related factors from both (T) and (E) articles added to model: S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, and S11

**FAMILY/PEER OR INTERPERSONAL FACTORS** = Interpersonal processes, and primary groups including family, friends, peers, that provides social identity, support, and role definition

Obesity related factors from both (T) and (E) articles added to model: F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F11, F12, and F13

**INDIVIDUAL OR INTRAPERSONAL FACTORS** = Individual characteristics that influence behavior, such as knowledge, attitudes, beliefs, and personal traits.

Obesity related factors from both (T) and (E) articles added to model: I1, I2, I3, I4, I5, I6, I7, I8, and I9

**OTHER CATEGORY OR DOMAIN (O)** = Unexpected category or domain that appears in the sample of literature and does not fit in established category or domain.

Added to model as: O1, O2, or O3 etc.
Building an Ecological Model from the Ground Up: Environmental antecedents of childhood obesity

**SOCIAL NORMS/NATIONAL POLICIES**
Obesity related factors from both (T) AND (E): N1, N2, N3, N4, N5, N6, N7, N8, and N9

**COMMUNITY FACTORS**
Obesity related factors from both (T) and (E) articles added to model: C1, C2, C3, C4, C5, and C6

**SCHOOL FACTORS**
Obesity related factors from both (T) and (E) articles added to model: S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, and S11

**FAMILY/PEER OR INTERPERSONAL FACTORS**
Obesity related factors from both (T) and (E) articles added to model: F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F11, F12, and F13

**OTHER CATEGORY OR DOMAIN**

**OTHER ENVIRONMENTAL ANTECEDENTS**

**ENVIRONMENTAL BEHAVIORAL**

**INDIVIDUAL OR INTRAPERSONAL FACTORS**
Obesity related factors from both (T) and (E) articles added to model: I1, I2, I3, I4, I5, I6, I7, I8, and I9

**OTHER CATEGORY OR DOMAIN**

**OTHER BEHAVIORAL ANTECEDENTS**
APPENDIX O

Revised Codebook for Content Analysis
### Hypothetical Ecological Model to Prevent Childhood Obesity: Operational Definitions Codebook

#### Social Norms/National Policies (N)

1. (-) Excessive, plentiful, non-nutritious food availability in U.S. (i.e., easy access to high fat/energy dense foods)
2. (-) Pricing strategies that favor consumption of high fat/energy dense foods and discourage healthier selections based on price (e.g., lack of taxation on junk foods)
3. (-) Modern technology (e.g., labor-saving devices – cars or work-related labor saving devices creating sedentary jobs) leading to decreased physical activity; (i.e., U.S. designed for cars)
4. (-) Food advertising or competitive marketing (e.g., cartoons, movie figures, billboards) for high fat foods targeted towards children; (i.e., repeated commercials)
5. (-) Societal norms regarding eating and physical activity (e.g., “grazing” or “walkability” of surroundings) including cultural “inactivity”. Recognized need to improve diet/activity
6. (-) Social norms regarding acceptable body shapes/sizes leading to unhealthy diet; including bias, discrimination, stigma or oppression by a culture that over-values thinness
7. (-) Social norms regarding acceptable body shapes/sizes leading to discomfort while being physically active (e.g., overweight individuals feel uncomfortable exercising in public)
8. (-) Varying perceptions and acceptance of obesity due to ethnicity or lack of acceptance of physical activity –exercise; (e.g., cultural denial of being overweight or obese)
9. (-) Nutrition labeling laws requiring fast food to provide calorie information on menus or menu boards; or nutrition logos on menu boards or grocery store shelves
10. (-) Increased serving sizes of fast foods or restaurant foods and sodas available for purchase in a public setting
11. (-) Ubiquity of televisions, computers, remote controls, video games as energy saving devices (e.g., the pervasiveness in our culture of labor saving and activity prohibiting devices)
12. (-) Crime (perceived or real) safety in community or at public recreational facilities (e.g., government funding of “safe streets” for increased police patrol is one example)
13. (-) Recognition or recommendation that weight guidelines (USDA) and/or including food guide pyramid needs to be altered to match scientific knowledge concerning weight control
14. (-) Cultural, genetics may play a role as certain ethnic groups in the United States (i.e., or other Westernized nations) may face increased weight challenges based on U.S. food availability
15. (-) Managed care or insurance companies commonly do not cover weight maintenance as part of preventive services
16. (+/-) Current labeling of “low fat” or “no fat” foods (i.e., which are high calorie foods) encourage eating larger portion sizes; over-consumption negates “low-fat” claims
17. (+/-) News media/entertainment messages (e.g., nutrition or exercise) which are not clear or consistent with science or are contradictory with “best practice”
18. (+/-) National decrease in tobacco use inadvertently has led to cultural weight gain as a result of having less smokers.
19. (-) Urbanization and industrialization in developing countries; Westernized cultures are beginning to eat like the West and experience a culture that requires less activity or exercise
20. (-) Low priority as medical condition or disease (i.e., obesity not recognized as disease or condition by physicians; or obesity neglected as condition and attributed to “laziness or gluttony”)

#### Community Factors (C)

1. (-) Lack of safety (i.e., perceived or real) within neighborhood by community (for walking, playing outside) (i.e., increased motor vehicle traffic prohibiting active lifestyles); Urban decay
2. (-) Few opportunities for less physically fit or overweight youth to participate in sports; (e.g., lack of bike paths sidewalks, car dominated society)
3. (-) Numerous local fast food restaurants
4. (-) Lack of sidewalks (presence and quality) for walking (e.g., from home to school) or lack of “pedestrian malls.” Establish walking lanes or bike paths to encourage activity
5. (-) Lack of inexpensive and accessible places for low-income youth to be active (e.g., lack of access to not-for-profit exercise facilities)
6. (-) Lack of access to parks, playgrounds, state trails, nature/wildlife areas. (e.g., community insurance liability prevents access during “after hours”)
7. (-) Lack of bike paths to bike to school or work. (e.g., construction of roads used for automobile use where playing fields once existed is a product of “urbanization”)
8. (-) Connectivity and quality of streets for walking and biking (e.g., especially for people with disabilities)
9. (-) Availability of vending machines in community (e.g., high fat foods, sodas, soft drinks, juice drinks); Availability impacts consumption and over-consumption
10. (-) Drinking water access
11. (-) Automobile convenience food outlets availability (e.g., gas station, convenience store, drive-thru)
12. (-) Ubiquity of outdoor advertising for the marketing of high-fat, energy dense foods (e.g., billboards, signs on public transport, inside sports venues, on race cars etc.)
13. (+) Video arcade accessibility and quantity
14. (+) Parking lot placement at shopping mall
15. (-) Limited choices for healthy foods at restaurants or fast food chains (i.e., and/or the presence of unlimited buffet or “all you can eat” restaurants) promotes eating more
16. (-) Incentives for consumption of high fat or fast foods (e.g., toys)
17. (-) Where one resides or lives geographically (e.g., rural or urban) and/or seasonal factors that inhibit activity in certain parts of the country
18. (+/-) Availability of physicians in community and/or physicians counseling or screening for obesity in children (i.e., are overweight or obese children “counseled to lose weight?”)
19. (+/-) Grocery stores in areas of higher income offer more healthful foods than do lower income urban neighborhoods

#### School Factors (S)

1. (-) School policies allowing students to leave campus for lunch
2. (-) School safety restricting physical commute to school (perceived or real); Lack of safety (i.e., urban decay and crime) preventing free play after school; including walking or biking to school
3. (+/-) High fat/high caloric a la carte food options within school cafeterias as opposed to offering healthier selections (e.g., fast food chains in schools as option)
4. (-) Decline in physical education and health education requirements (including nutrition education) in the schools (e.g., availability and frequency)
5. (-) Lack of opportunities for students to be active within the schools (e.g., facilities, personnel, curriculum, sports, or lack of recess time)
6. (-) Lack of a focus on life-long and fun physical activity within physical education classes at school. (e.g., structure, personnel, or curriculum concerns)
7. (-) Health care policies regarding the treatment of obesity among youth (e.g., within school to be referred to clinical settings)
8. (+/-) Availability of school counseling and psychology programs
9. (+/-) Availability of school health services
Operational Definitions Codebook (continued)
Category or Domain followed by Themes (Units of Analysis)

School Factors (S)
10. (+/-) Availability of vending machines offering junk food or soda (e.g., pouring rights of soft-drink companies, including pricing strategies that promote soda instead of milk)
11. (+/-) Sale of high fat foods (e.g., student food stores or bake sales) based on profit making for school clubs or athletics
12. (-) Non-nutritious food or soda marketing or advertising in school (e.g., educational television) or on school grounds
13. (+) Drinking water access
14. (-) National School Lunch Program (NSLP) and National School Breakfast Program (NSBP) may provide more calories and fat to youth who participate in both programs
15. Other school factors. Explain: ____________________________

Family/Peer or Interpersonal (F)

I. (-) Family eating patterns such as irregular meals, frequent eating out, low consumption of fruits and vegetables, and high consumption of foods high in fats and calories (e.g., food choice and food patterns) including eating in front of television and “night eating”
2. (-) Low levels of family physical activity and tendency towards sedentary leisure-time behaviors (including increased television watching). Need to provide alternative leisure-time activities
3. (-) Parental attitudes/knowledge regarding the development of childhood eating patterns that discourage autonomy and emphasize control (including parental modeling)
4. (-) Parental attitudes/knowledge regarding the allocating individual food portion sizes and food preparation techniques
5. (-) Lack of peer norms that encourage healthful eating and physical activity (including social support).
6. (-) Family and peer norms that overemphasize dieting as a weight-control strategy and de-emphasize healthful eating and physical activity; (e.g., food restriction)
7. (-) One or both parent(s)/guardian(s) being obese; parents weight status (i.e., overweight)
8. (-) Rewarding children with food or lack of food as punishment
9. (-) Family stress; psychosocial problems etc.
10. (-) Quantity and availability of high fat food/high energy food in household (e.g., soda, fruit juice drinks, potato chips, hot dogs, ice cream etc.)
11. (-) Family socioeconomic status, including parents level of education (i.e., parents not recognizing obesity in their own children); or Less diverse diets in home (e.g., fruits and veggies)
12. (-) Reduce the stimulus for overeating or increase the cues for exercise or prompts to be active (i.e., parent modeling of activity)
13. (-) Self-efficacy in parental role for providing a positive family environment for eating (e.g., companionship or conversation while the family eats together)
14. (-) Access to exercise equipment in home; health club membership, participation in sports or accessibility of health clubs in proximity of home
15. (+/-) Presence of garden; (i.e., availability of fruits and vegetables in home)
16. (-) Family/Peer (Interpersonal factors). Explain: ____________________________

Individual or Intrapersonal Factors (I)

1. (-) Genetic predisposition towards obesity (i.e., certain individuals with ethnic heritage may be more prone to obesity)
2. (-) Poor body/self image (e.g., embarrassment, lowered self esteem, disgust, or guilt) leading to decreased physical activity and diet-binge cycles; Reduced confidence, Loneliness, isolation etc
3. (-) Dislike and/or lack of skills for physical activity (i.e., self-efficacy, confidence to be active or confidence to exercise)
4. (-) Low levels of physical activity and high levels of sedentary activity (e.g., television viewing and/or video games)
5. (-) Preferences for foods high in fats/calories or lack of skills (e.g., self-efficacy) or ability to prepare healthier food selections
6. (-) Busy lifestyle leading to rushed eating and low physical activity; (i.e., skipping meals, eating convenience foods, and or excessive snacking due to rushed schedule)
7. (-) Binge eating and other disordered eating behaviors (i.e., depression, impulse eating, or anxiety causing one to eat too quickly) including episodic overeating “loss of control”
8. (-) Meals and snacking patterns in which foods high in fats/calories are consumed (e.g., eating-out or night eating)
9. (-) Certain coping styles have been associated with persistence of anxiety (e.g., overeating); Conversely, problem solving is a positive form of coping
10. (-) Self ethnic or cultural identity favoring weight gain (e.g., individual not concerned about weight status); Size acceptance (e.g., mother’s of low SES); or less desire to be thin
11. (-) Elevated dieting and radical weight loss methods may increase one’s propensity for obesity (i.e., “stunting” or poor nutrition early in life can increase the risk of obesity later)
12. Other individual (Intrapersonal factors). Explain: ____________________________

Other Category or Domain (O)

1. Other category or domain. Explain: ____________________________
Ecological model: Environmental antecedents of childhood obesity: Operational definitions of Five Categories

SOCIAL NORMS/NATIONAL POLICIES = Local, state, federal policies and laws that regulate or support healthy actions and practices for disease and obesity prevention, early detection, control and management. Includes social norms and national policies that can act to promote exercise and/or encourage healthy eating or act as a potential barrier to eating and exercising regularly.

COMMUNITY FACTORS = Social networks and norms, or standards, which exist as formal or informal among individuals, groups, and organizations. Includes environmental antecedents in community that can act to promote exercise and/or encourage healthy eating or act as a potential barrier to eating and exercising regularly.

SCHOOL FACTORS = Rules, regulations, policies, and informal school standards, which exist as formal or informal Among individuals, groups, and organizations. Includes environmental antecedents in school that can act to promote exercise and/or encourage healthy eating or act as a potential barrier to eating and exercising regularly.

FAMILY/PEER OR INTERPERSONAL FACTORS = Interpersonal processes, and primary groups including family, friends, peers, that provides social identity, support, and role definition. Includes family or peer antecedents that can act to promote exercise and/or encourage healthy eating or act as a potential barrier to eating and exercising regularly.

INDIVIDUAL OR INTRAPERSONAL FACTORS = Individual characteristics that influence behavior, such as knowledge, attitudes, beliefs, and personal traits. Includes individual environmental antecedents that can act to promote exercise and/or encourage healthy eating or act as a potential barrier to eating and exercising regularly.

OTHER CATEGORY OR DOMAIN (O) = Unexpected category or domain that appears in the sample of literature and does not fit in established category or domain.
APPENDIX O

Intra- and Intercoder Reliability Tests
### Intra-Rater Reliability: Coder A

<table>
<thead>
<tr>
<th>Article number</th>
<th>N test/re-test</th>
<th>C test/re-test</th>
<th>S test/re-test</th>
<th>F test/test</th>
<th>I test/re-test</th>
<th>O test/re-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>87</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>*2/0</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>91</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>95</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>99</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>7/7</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>103</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>107</td>
<td>0/0</td>
<td>0/0</td>
<td>0/1*</td>
<td>0/0</td>
<td>2/2</td>
<td>0/1**</td>
</tr>
<tr>
<td>111</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>115</td>
<td>0/0</td>
<td>0/2*</td>
<td>7/7</td>
<td>7/7</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>119</td>
<td>3/3</td>
<td>0/0</td>
<td>1/1</td>
<td>*1/9</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>123</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>127</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>131</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>135</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>139</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>143</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>147</td>
<td>3/3</td>
<td>0/1*</td>
<td>0/0</td>
<td>3/3</td>
<td>4/4</td>
<td>0/0</td>
</tr>
<tr>
<td>151</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>370</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>374</td>
<td>3/3</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>378</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>382</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>386</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>390</td>
<td>4/7*</td>
<td>0/0</td>
<td>4/4</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>394</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>398</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>402</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>406</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>410</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>414</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>418</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>422</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>426</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>*3/0</td>
<td>0/0</td>
</tr>
<tr>
<td>430</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>434</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>587</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>591</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>595</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>599</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>4/4</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>603</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>*1/0</td>
<td>0/0</td>
</tr>
<tr>
<td>607</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>611</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>615</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>619</td>
<td>4/3*</td>
<td>3/3</td>
<td>1/3*</td>
<td>3/3</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>623</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>627</td>
<td>10/10</td>
<td>6/6</td>
<td>0/0</td>
<td>10/10</td>
<td>4/4</td>
<td>0/0</td>
</tr>
<tr>
<td>631</td>
<td>1/1</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td>0/2*</td>
<td>0/0</td>
</tr>
<tr>
<td>635</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>639</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>643</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>3/3</td>
<td>0/0</td>
</tr>
<tr>
<td>647</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>651</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>655</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>660</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>664</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>668</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>662</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
</tr>
</tbody>
</table>
### Intra-Rater Reliability: Coder A

<table>
<thead>
<tr>
<th>Article number</th>
<th>N</th>
<th>C</th>
<th>S</th>
<th>F</th>
<th>I</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>666</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>670</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>674</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>*2/1</td>
<td>0/0</td>
</tr>
<tr>
<td>678</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td>*1/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>682</td>
<td>1/2</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>686</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>690</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>694</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>870</td>
<td>0/0</td>
<td>4/4</td>
<td>1/1</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>874</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>878</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>*2/1</td>
<td>0/0</td>
</tr>
<tr>
<td>882</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>886</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>4/4</td>
<td>0/0</td>
</tr>
<tr>
<td>826</td>
<td>2/2</td>
<td>2/2</td>
<td>2/2</td>
<td>4/4</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>830</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>3/3</td>
<td>5/5</td>
<td>0/0</td>
</tr>
<tr>
<td>834</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>838</td>
<td>*7/6</td>
<td>4/4</td>
<td>5/5</td>
<td>4/4</td>
<td>5/5</td>
<td>0/0</td>
</tr>
<tr>
<td>842</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>846</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>850</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>854</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>858</td>
<td>5/5</td>
<td>4/4</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>862</td>
<td>5/5</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>866</td>
<td>3/3</td>
<td>3/3</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>870</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>874</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
</tbody>
</table>

Totals: 80/85, 29/34, 21/24, 90/84, 91/88, 0/1

N = National Norms and Social Policies; C = Community; S = School; F = Family and Peers; I = Individual; O = Other

Article focus = 23 Theoretical articles (test) 23 Theoretical (re-test) / 64 Empirical articles (test) 64 Empirical articles (re-test)

Articles 87 through 151 = Nutrition (n = 17)

Articles 370 through 434 = Medicine (n = 17)

Articles 587 through 655 = Psychology (n = 18)

Articles 630 through 694 = Health (n = 18)

Articles 870 through 874 = Sport Sciences (n = 18)

* = additional antecedent found

** = additional antecedent found “breastfeeding is a protective factor for obesity” antecedent added to family domain
### Inter-Rater Reliability: Coder A and Coder B

<table>
<thead>
<tr>
<th>Article number</th>
<th>Coder A/Coder B</th>
<th>Coder A/Coder B</th>
<th>Coder A/Coder B</th>
<th>Coder A/Coder B</th>
<th>Coder A/Coder B</th>
<th>Coder A/Coder B</th>
<th>Coder A/Coder B</th>
</tr>
</thead>
<tbody>
<tr>
<td>87</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>91</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>95</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>99</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>7/7</td>
<td>2/2</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>107</td>
<td>1/1</td>
<td>0/0</td>
<td>0/1*</td>
<td>0/0</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>111</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/3*</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>2/2</td>
<td>2/2</td>
<td>7/7</td>
<td>7/7</td>
<td>2/2</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>119</td>
<td>3/3</td>
<td>0/0</td>
<td>1/1</td>
<td>9/9</td>
<td>1/1</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>123</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>127</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>131</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>135</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>139</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/1*</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>143</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>147</td>
<td>3/3</td>
<td>1/1</td>
<td>0/0</td>
<td>3/3</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>151</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/1*</td>
<td>1/1</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>370</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>374</td>
<td>3/3</td>
<td>0/0</td>
<td>0/0</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>378</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
<td>1/1</td>
<td>0/1*</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>382</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>386</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>390</td>
<td>7/7</td>
<td>0/0</td>
<td>4/4</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>394</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/1*</td>
<td>1/1</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>398</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>402</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>406</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>410</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/1*</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>414</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/1*</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>418</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/1*</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>422</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/1*</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>426</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
<td>0/2*</td>
<td>3/3</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>430</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>434</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>587</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>591</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>595</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>599</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>4/4</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>603</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>607</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/1</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>611</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>615</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>619</td>
<td>4/3</td>
<td>3/3</td>
<td>1/3*</td>
<td>3/4*</td>
<td>2/2</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>623</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>627</td>
<td>10/10</td>
<td>6/6</td>
<td>3/3</td>
<td>10/10</td>
<td>4/4</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>631</td>
<td>1/1</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td>0/2*</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>635</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>639</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>643</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>647</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>651</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>655</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>659</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>662</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
</tbody>
</table>
### Inter-Rater Reliability: Coder A and Coder B (continued)

<table>
<thead>
<tr>
<th>Article number</th>
<th>N</th>
<th>C</th>
<th>S</th>
<th>F</th>
<th>I</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>666</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>670</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>674</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>678</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>682</td>
<td>1/2</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>686</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/1*</td>
<td>0/0</td>
</tr>
<tr>
<td>690</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>694</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>870</td>
<td>0/2*</td>
<td>4/4</td>
<td>1/1</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>874</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/1*</td>
<td>0/2*</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>878</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>882</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>886</td>
<td>0/1*</td>
<td>0/1*</td>
<td>0/0</td>
<td>0/0</td>
<td>4/4</td>
<td>0/0</td>
</tr>
<tr>
<td>826</td>
<td>2/2</td>
<td>2/2</td>
<td>2/2</td>
<td>4/4</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>830</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>3/3</td>
<td>5/5</td>
<td>0/0</td>
</tr>
<tr>
<td>834</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>838</td>
<td>*7/6</td>
<td>4/4</td>
<td>5/5</td>
<td>4/4</td>
<td>5/5</td>
<td>0/0</td>
</tr>
<tr>
<td>842</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>846</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>850</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>854</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>858</td>
<td>5/5</td>
<td>4/4</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>862</td>
<td>5/5</td>
<td>2/2</td>
<td>0/1*</td>
<td>2/2</td>
<td>1/1</td>
<td>0/0</td>
</tr>
<tr>
<td>866</td>
<td>3/3</td>
<td>3/3</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
</tr>
<tr>
<td>870</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>874</td>
<td>1/1</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
</tbody>
</table>

Totals          | 85/96| 34/36| 24/29| 85/94| 88/97| 0/0

N = National Norms and Social Policies; C = Community; S = School; F = Family and Peers; I = Individual; O = Other
Article Focus = Coder A (23) Theoretical / (64) Empirical -- Coder B (18) Theoretical / (69) Empirical -- Intercoder reliability = (94.3%) Articles 87 through 151 = Medicine (n = 17) Articles 370 through 434 = Medicine (n = 17) Articles 587 through 655 = Psychology (n = 18) Articles 630 through 694 = Health (n = 17) Articles 870 through 874 = Sport Sciences (n = 18) * = Additional antecedent found
APPENDIX P

Permission to Reprint Models
Hi David,
I have no problem with you including my model in the appendix of your dissertation, given that my co-author and I and the journal are cited.

I would most definitely like a copy of your work when you are done. When do you plan to finish?

Sincerely,
Kirsten Davison
permission granted, but i also think that you need to contact the journal. would be interested to see your final product. best wishes and good luck

William H. Dietz, M.D., Ph.D.
Director, Division of Nutrition and Physical Activity
Centers for Disease Control and Prevention
4770 Buford Hy NE, MS-K-24
Atlanta, GA 30341-3717

Tel: 770-488-6042
Fax: 770-488-6000

Fed Ex:
Rhodes Building
Koger Center
3005 Chamblee Tucker Rd
Atlanta, GA 30341-4133
Dear David

You have my permission to reprint the school-based obesity prevention model published in International Journal of Obesity, 23(Suppl), p. S47. Best wishes on your dissertation.

Mary Story PhD RD
Professor, Division of Epidemiology, and Associate Dean of Student Affairs
School of Public Health
University of Minnesota
1300 South 2nd Street, Suite 300
Mpls, Mn 55454
Hi David,
You may certainly use the intervention I developed.
Attached the revised version.
I would love to have a copy of your research
best regards
Moria Golan, PhD
Dear David Hey:


We are happy to grant you permission to use this material in your doctoral dissertation. Please use the following acknowledgment:


This permission to reprint is for a one-time usage only and any subsequent use of this material requires submission of a new permission request. Fees for this noncommercial usage have been waived for you.

If I can be of further assistance, please do not hesitate to contact me.

Best wishes for success with your thesis.

Sincerely,
Laura Folkner
Permissions Department
Annual Reviews
4139 El Camino Way
Palo Alto, CA  94306
Dear David,

You have my permission to reprint this article as outlined.

Kind Regards,

Garry Egger MPH PhD
David,

I received your request to reprint the model in my 2000 Behavioral Medicine article. Reprinting the model is fine with me; however, my understanding of copy write is that permission must be obtained from the publisher – in this case, Behavioral Medicine. Although I have intellectual "rights" to the ideas, Behavioral Medicine has "proprietary" rights to the published material.

I hope this helps more than confuses.

Cordially,

Joe

Joseph G. Grzywacz, Ph.D.
Department of Family and Community Medicine
Wake Forest University School of Medicine
Medical Center Boulevard
Winston-Salem, NC 27157-1084

(T) 336-716-2237
(F) 336-716-3206
VITA
VITA

Graduate School
Southern Illinois University

David W. Hey
Date of Birth: March 11, 1964

4985 W. 7th St. #14 Reno, NV 89503

University of Wisconsin – La Crosse
Bachelor of Science, Community Health Education, May 1987

University of Wisconsin – La Crosse
Master of Science, School Health Education, May 1993

Special Honors and Awards:
Eta Sigma Gamma, Alpha Alpha Chapter – Most Distinguished Service Award – (2000 and 2001)

Dissertation Title:
Development of a multi-disciplinary ecological model for childhood obesity

Publications:


Major Professor: Roberta J. Ogletree, HSD, CHES