

Child Obesity in Context: Ecology of Family and Community

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ABSTRACT

Int J Exerc Sci 4(2) : 86-92, 2011. Minority and low socioeconomic status groups have the highest rates of overweight and obesity. Children from these families face a greater risk for weight-related health problems such as diabetes, heart disease and cancer as compared to their non-minority and more affluent peers. Factors from the larger physical, social, and cultural environments, and within families, influence weight status among children. Many of these factors are yet to be identified and relationships among known factors are complex and not well understood. The National Institutes of Health and U.S. Department of Agriculture have proposed a research agenda for social and behavioral scientists to “examine how social contexts influence health and elucidate the mechanisms through which those mechanisms operate”, and to “develop ways to intervene on those factors for preventing obesity.” This editorial presents a social ecological view of child obesity and proposes several steps necessary to identify how community and family domain factors affect the weight-regulating behaviors of children. An empirically-based, theoretically-driven approach will lead to efficacious interventions which can be translated and widely disseminated into community-based programs, thus increasing the probability of success of population-based obesity prevention and control interventions.

KEY WORDS: Public health, social environment, intervention studies, health behavior, physical activity, nutrition science

INTRODUCTION

The world-wide epidemic of obesity is recognized as a critical population-level public health problem. In the United States, obesity is second only to smoking as a cause of death (4). Between 2003 and 2004, 66.3% of all adults were overweight or obese, and weight-related disparities persist between low socioeconomic status and minorities populations as compared to non-minority and more affluent adults (25). Increasing body mass index (BMI) among children and adolescents has been observed across all socioeconomic strata and all ethnic groups, and similar trends in group

disparities have been detected for youth. There is convincing evidence that child weight status tracks into adulthood (16,35). Consequently, increasing prevalence BMI trends in U.S. children and adolescents is a major health threat to our society. Of particular concern is the chronic disease burden expected to accompany this epidemic. Overweight and obese children have increased risk for developing chronic disease during adulthood. Approximately 60% of 5 to 10 year old overweight children manifest at least one physiological cardiovascular disease risk factor (8) and it has been estimated that more than one third of all U.S. children will develop type 2

diabetes at some point in their lives (21). Higher BMI is a factor that is strongly associated with many chronic health conditions including diabetes, hypertension, cardiovascular disease, metabolic syndrome, bone and kidney disease and increased risk for death due to stroke and some cancers.

Children and Adolescents: Dietary and Physical Activity Trends

The majority of children's diets are of low nutrient quality, and diet quality decreases with age. Specifically, consumption of fruits and vegetables decrease and milk intake is replaced by soft drinks. Population data shows that 16 percent of children and adolescents ages 2-19 do not meet any dietary recommendations and only 1 percent meets all recommendations (9,19). Children are eating more high-calorie snacks and more energy-dense meals away from home. Soft drink consumption by children and adolescents has also increased tremendously while distributors simultaneously increased portion sizes from 12.2 ounces to 19.9 ounces (24). In addition, sedentary behavior has increased among children. Watching television, using computers, and playing (sedentary) video games occupy a large proportion of children's leisure time. It is estimated that children in the U.S. are spending 25% of their waking hours watching television. Children who watch the most hours of television have the highest incidence of obesity (27). During television viewing, little energy is expended and consumption of high-calorie snacks often concurrently occurs. Poor and minority children spend more time watching TV than those with more resources (5). Lower levels of physical activity have also been associated with childhood obesity. In the Framingham

Children's Study, preschoolers with low physical activity levels gained more fat than those with higher physical activity levels (18). Other studies have shown that participation in physical activity can decrease body fat in preschoolers (15). When controlling for race/ethnicity, there is a general decreasing trend in physical activity levels as age increases (14,30). Surveillance data suggest that Latino and African-American children and adolescents are less likely to participate in moderate physical activity, vigorous physical activity and physical education than White adolescents (5,11). Poor eating habits and lack of physical activity observed among low socioeconomic status and minority children significantly contribute to the burgeoning problem of overweight among this population.

Family Influences on Children's Dietary Intake and Physical Activity Behavior

The family shapes child behavior and it is the most influential aspect of the young child's immediate environment. Early human development takes place largely within the context of the family, which molds children's attitudes, beliefs, and values. Parents are important social referents for child physical activity and eating behaviors. Published studies indicate that parents influence their children's physical activity by: *participating with them* (34), *encouraging them to be active* (3), and *taking them to places where they can be active* (28). Most studies measuring social influences on physical activity find significant associations (30). Social support, from family and friends, and behavioral modeling are associated with physical activity among young and old men and women (29), and the obese (13). The family influences children's healthy eating

behaviors in at least five ways: *availability and accessibility of healthy foods* (6,12), *meal structure* (10,22), *adult food modeling* (23,33), *food socialization practices* (2,23) and *food-related parenting style* (1,23,26). Early childhood and the social environment in which the child is fed are widely assumed to be critical to the establishment of lifelong healthful eating habits.

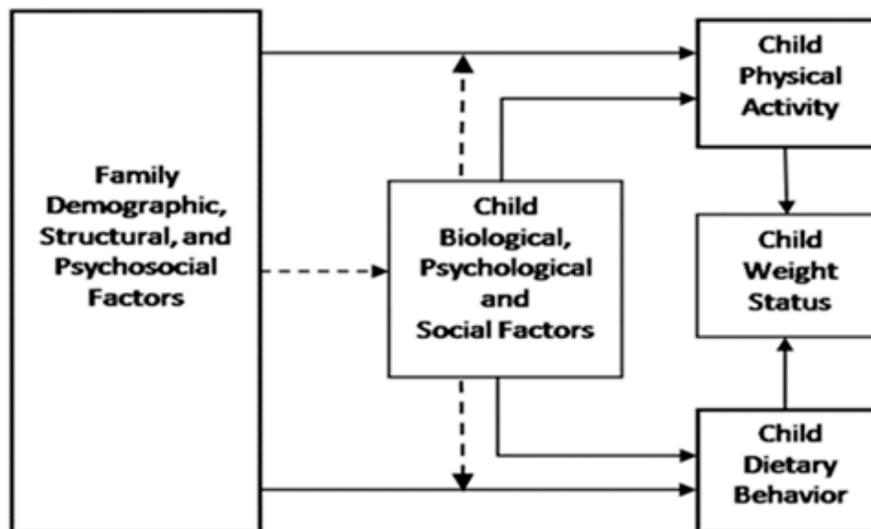
A Social Ecological Perspective

The term ecology refers to the study of relationships between organisms and their environments. Ecological models for health promotion recognize the existence of a dynamic inter-relationship between individuals and their environment. For example, changes in the human genome cannot fully explain the speed and magnitude by which obesity has increased worldwide, during the past two decades; the gene pool has not changed substantially over the last 35,000 years (7). The environment, however, especially in industrialized countries, has changed dramatically. Some argue that our present-day obesity epidemic is more likely the result of changes in environmental conditions that promote a combination of increased levels of food consumption and decreased levels of physical activity, rather than changes in biological factors (9). The human biological ability to efficiently store fat, once an advantage during periods of food scarcity, is now maladaptive in a society with abundant food supplies. Families live and function in neighborhoods and communities and must be studied “in context.” Given the shift toward an obesogenic environment, effective community-based programming efforts are sorely needed to reach high-risk families to prevent and control obesity.

Ecological approaches aid researchers and practitioners in identifying “leverage points” for targeting health promotion interventions (17,31-32). Several principles from the social ecological paradigm for community health promotion, as outlined by Stokols, serve as useful guides for developing context-sensitive community-based interventions and programs (32). For instance, environmental settings are complex and there are multiple dimensions of influence on person-environment interactions within settings. Effective programming considers that multiple environmental dimensions interact with family and child behaviors. An ecological perspective also emphasizes the interconnectedness of systems; individuals are nested within multiple levels of external influences that can affect health. Research is needed to delineate the causal linkages between environmental levels and child weight-regulating behaviors. To guide effective programs, ecological analyses also emphasize the integration of multiple levels of analysis and diverse methodologies in research and program evaluation, taking into account the hierarchical nature of the data.

Figure 1 is a hypothetical model illustrating the family as a major influence on physical activity and dietary behaviors – the proximal determinants of weight status of children. From a social ecological perspective, this model suggests that a child’s physical activity and dietary behaviors are directly influenced (denoted by the solid line arrows) by intrinsic

Figure 1. Hypothetical Model of Relationships Between Factors Affecting Child Weight Status



biological and psychological factors as well as by extrinsic family domain factors. Further, the influence of family domain factors on those behaviors may be mediated or moderated (denoted by the dashed line arrows) by a child's intrinsic biological or psychological factors. Although not shown in the hypothetical model, child sex and age are both documented as moderators of physical activity and dietary behaviors; parental weight status is also strongly correlated with child weight status.

CONCLUSION

Prevention of the development of obesity is essential, and prevention should start with children. Children have the lowest prevalence of obesity and the personal habits associated with obesity prevention and control are largely established early in life. Many risk and protective factors from

the larger physical, social, and cultural environments and from within families can affect the weight status and weight-related habits of children. However, the relationships among these factors are complex and not well understood. To develop successful interventions for preventing and controlling obesity among children, we must first understand how families influence the weight-regulating behaviors of children. In order to develop effective interventions, research efforts must elucidate critical mechanisms at work within individual, families and the social and physical environments in which they live. We must strive to integrate basic, clinical, and applied research to identify and understand the complexity of multi-level relationships between factors from "neurons to neighborhoods" [20]. Answering this challenge will require concerted interdisciplinary and multidisciplinary scientific collaborations.

As part of this larger effort, social and behavioral scientists should consider several steps for developing effective family-based interventions to prevent and control child obesity. First, they should examine associations between family domain factors and child physical activity and eating behaviors and delineate the strength and direction of the relationships to identify factors with the greatest potential for change through community-based interventions. Second, measures of family domain factors associated with child physical activity and eating behaviors must be developed and validated so interventions can be systematically evaluated. Third, pilot interventions targeted to family factors associated with child physical activity and eating behaviors must be developed, implemented and evaluated for efficacy. Fourth, family-based interventions should be replicated as randomized trials to establish effectiveness then rolled out as community-based programs under the translational research paradigm. Direct or moderating effects of unique neighborhood and community settings in which interventions are implemented must then be examined. This is an ambitious agenda for research, but the magnitude of the problem certainly merits the effort. It is fortunate that federal agencies have identified the need for this research and are willing to fund the development of evidence-based strategies for reducing childhood obesity.

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REFERENCES

1. Baughcum AE, Burklow KA, Deeks CM, Powers SW, Whitaker RC. Maternal feeding practices and childhood obesity: a focus group study of low income mothers. *Arch Pediatr Adolesc Med* 152: 1010-1014, 1998.
2. Birch LL. The acquisition of food acceptance patterns in children. In Brookes RA, Editor. *Eating habits, food physiology and learned behavior*. Chichester: Wiley; 1987.
3. Bungum T, Vincent M. Determinants of physical activity among female adolescents. *Am J Prev Med* 13: 115-122, 1997.
4. Caterson, ID, Hubbard V, Bray GA, Grunstein R, Hansen BC, Hong Y, Labarthe D, Seidell JC, Smith SC. Obesity, a worldwide epidemic related to heart disease and stroke: group III: worldwide comorbidities of obesity. *Circulation* 110: 476-483, 2004.
5. Crawford PB, Story M, Wang MC, Ritchie LD, Sabry ZI. Ethnic issues in the epidemiology of childhood obesity. *Pediatr Clin North Am* 48: 855-878, 2001.
6. Cullen KW, Baranowski T, Rittenberry L, Olvera N. Social environmental influences on children's diet: results from focus groups with African-, Euro-, and Mexican American children and their parents. *Health Educ Res* 15: 581-590, 2000.
7. Eaton SB, Konner M, Shostak M. Stone agers in the fast lane: chronic degenerative diseases in evolutionary perspective. *Am J Med* 84: 739-749, 1988.
8. Freedman DS, Dietz WH, Srinivasan SR, Berenson GS. The relation of overweight to cardiovascular risk factors among children and adolescents: The Bogalusa Heart Study. *Pediatrics* 103: 1175-1182, 1999.
9. French SA, Story M, Jeffery RW. Environmental influences on eating and physical activity. *Annu Rev Public Health* 22: 309-335, 2001.

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10. Gillman MW, Rifas-Shiman SL, Frazier AL, Rockett HR, Camargo CA, Field AE, Berkey CS, Colditz GA. Family dinner and diet quality among older children and adolescents. *Arch Fam Med* 9: 235-240, 2000.
11. Gordon-Larsen P, McMurray PG, Popkin BM. Adolescent physical activity and inactivity vary by ethnicity: The National Longitudinal Study of Adolescent Health. *J Pediatr* 135: 301-306, 1999.
12. Hearn MD, Baranowski T, Baranowski J, Doyle C, Smith M, Lin LS, Resicow K. Environmental influences on dietary behavior among children: availability and accessibility of fruits and vegetables enable consumption. *J Health Educ* 29: 26-32, 1998.
13. Hovell MF, Barrington E, Hofstetter CR, Sallis JF, Black D, Rauh M. Correlates of physical activity in overweight and not overweight persons: an assessment. *JADA* 90:1260, 1990.
14. Institute of Medicine. Preventing childhood obesity: health in the balance. Washington, D.C.: The National Academies Press; 2005.
15. Klesges RC, Klesges LM, Eck LH, Ray J. A longitudinal analysis of accelerated weight gain in preschool children. *Pediatrics* 95: 126-130, 1995.
16. Law CM, Shiell AW, Newsome CA, Syddall HE, Shinebourne EA, Fayers PM. Fetal, infant, and childhood growth and adult blood pressure: a longitudinal study from birth to 22 years of age. *Circulation* 105: 1088-1092, 2002.
17. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health Educ Q* 15: 351-377, 1988.
18. Moore LL, Nguyen U, Rothman KJ, Cupples L, Ellison R. Preschool physical activity level and change in body fatness in young children: The Framingham Children's Study. *Am J Epidemiol* 142: 982-988, 1995.
19. Munoz K, Krebs-Smith S, Ballard-Barbash R, Cleveland L. Food intakes of U.S. children and adolescents compared with recommendations. *Pediatrics* 100: 323-329, 1997.
20. National Research Council and Institute of Medicine. From neurons to neighborhoods: the science of early childhood development. Committee on Integrating the Science of Early Childhood Development. Shonkoff JP, Phillips DA, editors. Board on Children, Youth, and Families, Commission on Behavioral and Social Sciences and Education. Washington, D.C.: National Academy Press, 2000.
21. Nayaran KM, Boyle JP, Thompson TJ, Sorensen SW, Williamson DF. Lifetime risk for diabetes mellitus in the United States. *JAMA* 290: 1184-1890, 2003.
22. Neumark-Sztainer D, Hannan PJ, Story M, Croll J, Perry C. Family meal patterns: associations with sociodemographic characteristics and improved dietary intake among adolescents. *JADA* 103: 317-322, 2003.
23. Nicklas TA, Baranowski T, Baranowski J, Cullen K, Rittenberry L, Olvera N. Family and child-care provider influences on preschool children's fruit, juice, and vegetable consumption. *Nutr Rev* 59: 224-235, 2001.
24. Nielsen SJ, Popkin BM. Patterns and trends in food portion sizes, 1977-1998. *JAMA* 289: 450-453, 2003.
25. Ogden CL, Carrol MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA* 295: 1549-1555, 2006.
26. Olvera-Ezzell N, Power TG, Cousins JH. Maternal socialization of children's eating habits: strategies used by obese Mexican-American mothers. *Child Dev* 61: 395-400, 1990.
27. Robinson TN. Television viewing and childhood obesity. *Pediatr Clin North Am* 48:1017-1025, 2001.

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28. Sallis JF, Alcaraz JE, McKenzie TL, Howell MF. Predictors of change in children's physical activity over 20 months: variations by gender and level of adiposity. *Am J Prev Med* 16: 222-229, 1999.
29. Sallis JF, Hovell MF, Hofstetter CR, Faucher P, Elder JP, Blanchard J, Caspersen CJ, Powell KE, Christenson GM. A multivariate study of determinants of vigorous exercise in a community sample. *Prev Med*, 18: 20-34, 1989.
30. Sallis JF, Owen N. Determinants of physical activity. In: Sallis JF, Owen N, editors. *Physical activity and behavioral medicine*. Thousand Oaks, CA: Sage; 1999.
31. Stokols, D. Establishing and maintaining healthy environments: toward a social ecology of health promotion. *Am Psychol*, 47: 6-22, 1992.
32. Stokols D. Translating social ecological theory into guidelines for community health promotion. *Am J Health Promot* 104: 282-293, 1996.
33. Tibbs T, Haire-Joshu D, Schechtman KB, Brownson RC, Nanney MS, Houston C, Auslander W. The relationship between parental modeling, eating patterns, and dietary intake among African-American parents. *JADA* 101: 535-541, 2001.
34. Trost SG, Kerr D, Ward DS, Pate R. Physical activity and determinants of physical activity in obese and non-obese children. *Int J Obes Relat Metab Disord* 25: 822-829, 2001.
35. Wright CM, Parker L, Lamont D, Craft AW. Implications of childhood obesity for adult health: findings from Thousand Families Cohort Study. *BMJ* 323:1280-1284, 2001.