ENCYCLOPEDIA
on Early Childhood
Development

[Archived] Early Prevention of Obesity

John J. Reilly, PhD

University of Glasgow, United Kingdom

January 2006

Introduction

An epidemic of pediatric obesity has affected most of the world in recent years, and the prevalence of obesity continues to increase.[1] Preschool children and toddlers have not been immune from the epidemic. Obesity has adverse consequences, both in the short term (for the obese child), and in the longer term (for the adult who was obese as a child).[2]

Subject

Our recent systematic review[2] found many “co-morbidities” of pediatric obesity. However, co-morbidities are more common, and more serious, in older children and adolescents than in young children.[2] Nevertheless, obesity by age four to five years is a concern because it tends to persist. Persistence is strongest when obesity is especially severe, and where at least one parent is obese, but some obese young children will “grow into their weight” and become non-obese in the absence of intervention programs.

Severe obesity before age three is rare, and may indicate underlying disease and/or a genetic disorder such as Prader-Willi Syndrome. Children under the age of three with severe obesity

should therefore be identified and referred from primary to secondary care for further investigation.

Obesity results from reduced physical activity and/or increased energy (food) intake. Levels of physical activity may be very low in contemporary young children, much lower than the 60 minutes per day of moderate- to vigorous-intensity physical activity currently recommended[3] – as evidenced by recent studies using objective measures of physical activity and energy expenditure.[4-6] Limited access to or use of outdoor space for play may be particularly important in constraining the physical activity of preschoolers.[7] The amount of TV viewing in infancy and early childhood is much higher than was previously appreciated, and commonly much higher than the recommended maximum of two hours per day.[8] Low levels of physical activity are likely to have adverse effects on cardiovascular health, bone health,[9] possibly cognitive function[3] and social/emotional development.[10]

The evidence base on *diagnosis* of overweight and obesity has been systematically reviewed and critically appraised.[2,11] A relatively large, high-quality and consistent body of evidence has shown that a high BMI for age is an appropriate diagnostic criterion for overweight (e.g. BMI ≥85th percentile on U.S. CDC BMI reference charts) and obesity (BMI ≥95th percentile on U.S. CDC BMI reference charts). Diagnosis of overweight and obesity in this way successfully:

1. identifies the fattest children in the population (with a low rate of false positives, increasing confidence in diagnosis); and
2. identifies children at high risk of co-morbidities of obesity.

Most nations have child-health surveillance programs focused on early childhood, and these are potentially valuable for identifying young children who are at risk of obesity or are obese.[12]

Problems and Research Context

The lack of existing programs for overweight and obese young children is a major problem. Systematic reviews have also noted the dearth of evidence on interventions aimed at preventing and treating obesity in children younger than elementary-school age.[11,13,14] Treatment is more likely to be successful if the family is the focus of treatment (not just the obese child),[15] if the family is motivated to make the necessary lifestyle changes,[15] if treatment continues for longer than is traditional (more appointments, more extended in duration),[15] and if treatment focuses on

modifying sedentary behaviour (particularly TV viewing) as well as diet.[15]

Key Research Questions

Research has addressed: whether evidence is available on the most appropriate forms of treatment and prevention of obesity; randomized controlled trials of interventions aimed at prevention of obesity in children of nursery age; observational studies of early-life risk factors for later obesity; and observational studies that attempt to quantify “lifestyle” of young children objectively.

Recent Research Results

The best targets of interventions aimed at obesity prevention should meet certain criteria.[16] The intervention should do no harm; should target modifiable behaviour(s) that, if modified, might improve child health or development in ways other than obesity; and should target behaviour(s) that are important to the development and/or maintenance of obesity. At present, these criteria are met by relatively few behaviours:[16] promotion of breastfeeding (formula feeding increases risk of later obesity); reduction in TV viewing (which may increase energy expenditure and/or decrease energy intake); reduction in sugar-sweetened drink consumption (which encourages over-consumption of energy); and increases in physical activity.

At least four trials of obesity prevention interventions, usually in the nursery/kindergarten setting, have been published.[17-20] These interventions have largely focused on promotion of physical activity and/or reduction in TV viewing as a means of preventing obesity. The trials have had some success, but one concern common to all of them is the generalizability of the interventions tested. The preschool setting (for example, the nature of nursery education and the nursery physical environment) does appear to have a significant effect on the habitual physical activity of children.[21]

Some novel risk factors for later obesity that operate in infancy and early childhood have emerged. Of particular note is sleep duration: children who sleep for short periods overnight are at higher risk of later obesity, for reasons that are uncertain.[22] Rapid growth (weight gain) in infancy and early childhood also appears to be a risk factor for later obesity,[23] again for reasons that are unclear.

The lack of evidence and absence of good models of obesity treatment make it difficult to establish programs aimed at prevention and treatment. The general aims of treatment recommended for older children[11,15] are probably applicable to younger children: treatment should focus on a few sustainable lifestyle changes; treatment should aim for weight maintenance, not weight loss. Weight maintenance with height growth will permit young children to “grow into their weight” to some extent.

Conclusions

Young children have been affected by the pediatric obesity epidemic. Obesity has a variety of adverse consequences, even in early childhood. There is a dearth of high- quality generalizable evidence on the most appropriate interventions to prevent and treat obesity before elementary school age, but some promising interventions are in the literature at present. Contemporary young children lead very physically inactive lifestyles – this is likely to have an impact on obesity and later cardiovascular disease, and possibly have wider effects on behaviour, social and emotional development, and cognitive function.

Implications

Developments in health and education services are required that provide more effective surveillance of overweight and obesity in early childhood, better identification of overweight and obese children, and greater and more effective support for families to prevent/treat obesity. The contemporary physical and cultural environment appears to restrict the physical activity of young children, limit their opportunities to play and promote sedentary behaviour. Macro-environmental changes that promote physical activity and play are likely to be required urgently if the pediatric obesity epidemic is to be addressed effectively. Increased physical activity in early childhood would also have many other benefits.

References

1. Ebbelling CB, Pawlak DB, Ludwig DS. Childhood obesity: public-health crisis, common sense cure. *Lancet* 2002;360(9331):473-482.
2. Reilly JJ, Methven E, McDowell ZC, Hacking B, Alexander D, Stewart L, Kelnar CJH. Health consequences of obesity. *Archives of Disease in Childhood* 2003;88(9):748-752.
3. Strong WB, Malina RM, Blimkie CJR, Daniels SR, Dishman RK, Gutin B, Hergenroeder AC, Must A, Nixon PA, Pivarnik JM, Rowland T, Trost S, Trudeau FO. Evidence based physical activity for school-age youth. *Journal of Pediatrics* 2005;146(6):732-737.

4. Reilly JJ, Jackson DM, Montgomery C, Kelly LA, Slater C, Grant S, Paton JY. Total energy expenditure and physical activity in young Scottish children: mixed longitudinal study. *Lancet* 2004;363(9404):211-212.
5. McKee DP, Boreham CAG, Murphy MH, Nevill AM. Validation of the Digiwalker ™ pedometer for measuring physical activity in young children. *Pediatric Exercise Science* 2005;17(4):345-352.
6. Finn KJ, Specker B. Comparison of Actiwatch ® activity monitor and children's activity rating scale in children. *Medicine and Science in Sports and Exercise* 2000;32(10):1794-1797.
7. Burdette HL, Whitaker RC, Daniels SR. Parental report of outdoor playtime as a measure of physical activity in preschool-aged children. *Archives of Pediatrics and Adolescent Medicine* 2004;158(4):353-357.
8. Certain LK, Kahn RS. Prevalence, correlates, and trajectory of television viewing among infants and toddlers. *Pediatrics* 2002;109(4):634-642.
9. Janz KF, Burns TL, Levy SM, Torner JC, Willing MC, Beck TJ, Gilmore JM, Marshall TA. Everyday activity predicts bone geometry in children: The Iowa Bone Development Study. *Medicine and Science in Sports and Exercise* 2004;36(7):1124-1131.
10. Burdette HL, Whitaker RC. Resurrecting free play in young children: looking beyond fitness and fatness to attention, affiliation, and affect. *Archives of Pediatrics and Adolescent Medicine* 2005;159(1):46-50.
11. Reilly JJ, Wilson ML, Summerbell CD, Wilson DC. Obesity: diagnosis, prevention, and treatment: evidence-based answers to common questions. *Archives of Disease in Childhood* 2002;86(6):392-395.
12. Armstrong J, Reilly JJ, Child Health Information Team. The prevalence of obesity and undernutrition in Scottish children: Growth monitoring within the child health surveillance programme. *Scottish Medical Journal* 2003;48(2):32-37.
13. Summerbell CD, Waters E, Edmunds LD, Kelly S, Brown T, Campbell KJ. Interventions for preventing obesity in children. *Cochrane Database of Systematic Reviews* 2005;4:CD001871.
14. Summerbell CD, Ashton V, Campbell KJ, Edmunds L, Kelly S, Waters E. Interventions for treating obesity in children. *Cochrane Database of Systematic Reviews* 2003;3:CD001872.
15. Barlow SE, Dietz WH. Obesity evaluation and treatment: Expert committee recommendations. *Pediatrics* 1998;102(3):e29.
16. Whitaker RC. Obesity prevention in pediatric primary care: Four behaviors to target. *Archives of Pediatrics and Adolescent Medicine* 2003;157(8):725-727.
17. Reilly JJ, Kelly LA, Montgomery C, Fisher A, Williamson A, McColl JH, Paton JY, Grant S. Cluster randomised trial for obesity prevention in young children. *British Medical Journal*. In Press.
18. Dennison BA, Russo TJ, Burdick PA, Jenkins PL. An intervention to reduce television viewing by preschool children. *Archives of Pediatrics and Adolescent Medicine* 2004;158(2):170-176.
19. Mo-Suwan L, Pongprapai S, Junjana C, Puetpaiboon A. Effects of a controlled trial of a school-based exercise program on the obesity indexes of preschool children. *American Journal of Clinical Nutrition* 1998;68(5):1006-1011.
20. Fitzgibbon ML, Stolley M, Schiffer L, Van Horn L, Kaufer-Christoffel K, Dyer A. Two-year follow-up results of hip-hop to health Jr.: A randomized controlled trial for overweight prevention in preschool minority children. *Journal of Pediatrics* 2005;146(5):618-625.
21. Pate RR, Pfeiffer KA, Trost SG, Ziegler P, Dowda M. Physical activity among children attending preschools. *Pediatrics* 2004;114(5):1258-1263.
22. Reilly JJ, Armstrong J, Dorosty AR, Emmett PM, Ness A, Rogers I, Steer C, Sherriff A, ALSPAC Study Team. Early life risk factors for obesity in childhood: cohort study. *British Medical Journal* 2005;330(7504):1357-1359.
23. Baird J, Fisher D, Lucas P, Kleijnen J, Roberts H, Law C. Being big or growing fast: systematic review of size and growth in infancy and later obesity. *British Medical Journal* 2005;331(7522):929-931.