Adolescent obesity: Making a difference to the epidemic

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Abstract: Adolescent obesity is a major public health problem in Australia, and in many other parts of the world. Recent data suggests that as many as one quarter of young people in Australia are either overweight or obese, and that the majority of obese young people have one or more risk factors for chronic disease. Efforts to reduce the health and economic burden of obesity must focus on both management of affected individuals and prevention of further cases. This paper reviews some of the research currently underway in Australia, and includes recent data on both the prevalence of obesity and associated complications from large surveys and smaller cohorts. State and Federal governments have developed policies aimed at obesity prevention, but these are yet to be fully evaluated. Two large-scale community-based interventions are underway, one of which has reported positive preliminary findings. A number of smaller research programs are examining macro and individual level causation of obesity and include unique research examining the way adolescents perceive their environment. Other research includes the development and evaluation of service delivery models specifically targeting adolescents. A greater emphasis on environmental determinants and management of adolescent obesity is needed in future programs.

Key words: adolescent, obesity, aetiology, prevention, treatment, Australia

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INTRODUCTION

Despite a reputation as an active, sport-loving nation, Australians, including adolescents, have not escaped the obesity epidemic sweeping the world. Currently, more than 25% of adolescent boys and almost 20% of adolescent girls are either overweight or obese (1), with the prevalence of overweight having doubled, and that of obesity trebled, over the past twenty years (2,3). This paper summarises the current situation in Australia, in terms of epidemiology, causes, morbidity, clinical management and recent policy and research developments that include provision of funds for large scale community-based interventions. A number of challenges are evident: firstly, to develop strategies for prevention to reverse the current trends in obesity; and secondly, to provide clinical management appropriate for obese adolescents.

MEASUREMENT OF OVERWEIGHT

Body mass index (BMI; weight/height$^2$) is a simple, cost-effective measure of body fatness for children, adolescents and adults (4). Among adults, a person with a BMI of
25.00-29.99 kg/m² is considered overweight, while those with a BMI >30.00 kg/m² are classified as obese, cut-points that relate to the point at which health risks rise steeply, at least in adult European populations (5). However, among adolescents there is insufficient evidence to provide an absolute definition of health-related overweight. BMI also varies dramatically with age and sex during development, rising in the first year, falling during preschool years, before then rising once more into adolescence. Therefore, the standard adult BMI cut-points cannot be used to define overweight or obesity in childhood or adolescence.

In 2000, the International Obesity Taskforce (IOTF) published a table of age- and sex-specific BMI cut-points for people aged <18 years which were based upon a compilation of nationally representative cross-sectional growth studies from a number of countries, and which relate to the adult cut-points of 25 kg/m² and 30 kg/m² (6). An Australian expert committee has recommended that for epidemiological studies in children and adolescents, the BMI cut-points identified by the IOTF (6) be used to categorize individuals as being overweight, obese or not overweight or obese (7).

EPIDEMIOLOGY
The most recent national prevalence data on overweight and obesity in the Australian adolescent population were collected in 1995, however more recent data collections have occurred in NSW, Queensland and Western Australia. Other States have collected data on younger age groups (8), and yet other data are available from smaller studies.

In NSW, Australia’s most populous State, the NSW Schools Physical Activity and Nutrition Survey (SPANS 2004) collected data on measured height, weight and waist circumference among over 5,000 students aged 5-16 years in early 2004 (9). Table 1 shows the prevalence of overweight and obesity among adolescent boys and girls in school years 6, 8 and 10 with mean ages of 11.3, 13.3 and 15.3 years respectively (10). The prevalence of both overweight and obesity was higher among boys than girls, with the exception of overweight prevalence in year 8 girls. Analysis of the trend in obesity prevalence from 1997-2004 among year 8 and 10 students found that the rate of increase is much higher in boys than girls: 0.94% per year compared with 0.27% per year (1).

While BMI increased among all socioeconomic status (SES) categories in the SPANS study, there is evidence of an inverse association between SES and BMI (10), although the difference between socioeconomic groups is not as great as that reported in the United States (11). Earlier research has also found an inverse association between SES and BMI, waist circumference and waist-hip ratio (12) and SES and BMI and weight control practices (13) in Australian adolescents.

It is not just BMI that is increasing; Garnett et al measured 342 boys and girls based in western Sydney at age 7-8 and again five years later, and found that waist circumference had increased at a greater rate than BMI (14). Waist circumference provides an indication of central adiposity (or abdominal fat), which is associated with adverse risk factors for cardiovascular disease and diabetes (15).

CAUSES OF OVERWEIGHT
Put simply, excess body fat accumulation primarily occurs when energy intake is greater than energy expenditure, but this
must be examined within the context of changing food, family and physical activity environments. While genetic and biological factors make a major contribution to an individual’s susceptibility to the development of obesity, unless the “correct” environmental conditions exist, an individual’s genetic predisposition for obesity may not be fully expressed. The dramatic increase in obesity prevalence in recent decades highlights the central role of environmental change on the development of obesity. Some of these recent trends, as they affect adolescents, are highlighted below.

Table 1. Prevalence of overweight and obesity in boys and girls from the 2004 NSW Schools Physical Activity and Nutrition Survey (10)

<table>
<thead>
<tr>
<th>BMI Category*</th>
<th>Boys</th>
<th>Girls</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 6 (n=483)</td>
<td>Year 8 (n=408)</td>
<td>Year 10 (n=555)</td>
</tr>
<tr>
<td>Not Overweight</td>
<td>68.4</td>
<td>73.7</td>
<td>73.5</td>
</tr>
<tr>
<td>Overweight</td>
<td>22.2</td>
<td>18.2</td>
<td>19.6</td>
</tr>
<tr>
<td>Obese</td>
<td>9.4</td>
<td>8.2</td>
<td>7.0</td>
</tr>
</tbody>
</table>

* BMI defined according to International Obesity Taskforce criteria (6)

**FOOD HABITS**
Comparison of data from two National Nutrition Surveys conducted in 1985 and 1995 found that energy intake had increased by 12-15% in the adolescent age-group over the ten year period (16), and that more than 50% of total energy intake came from carbohydrate. Sugars (including fruit sugars) were the major source of carbohydrate (17).

Several studies suggested that soft drink consumption may contribute to excess energy intake and obesity in young people (18,19). Soft drink and “fast food” are examples of energy dense food and beverages that are heavily marketed to adolescents (18,20,21). Recent data from SPANS 2004 indicate that over one-half of boys and one third of girls drink more than one cup of soft drink each day and 7-12% of boys drink more than one litre each day (10). Not surprisingly, increasing consumption is associated with excess weight gain (18;22).

Soft drinks are very popular with adolescents who are at a life-stage where they experience increased autonomy, both in terms of availability of meals outside the home and discretionary income (23,24). Taste preferences, parental (especially maternal) modelling, convenience, food availability (in the home, in school canteens and elsewhere) and relative cost may all play a role in influencing purchasing and consumption patterns (25-27).

**PHYSICAL ACTIVITY**
The way that adolescents or their parents perceive their environment may impact on their activity levels and weight status. In a study of adolescents aged 13 years in western Sydney, adolescents were more likely to walk or cycle if their parents perceived the area as being safe and as having good places for physical activity, or if the young people had friends living nearby or found the neighbourhood easy to get around (28). Timperio and her colleagues found that 10-12 year olds in metropolitan Melbourne who perceived
their environment as “safe” were more likely to walk and cycle in their area (29). Further, the children of parents who were concerned about road safety were significantly more likely to be overweight or obese (30). Thus, such factors as neighbourhood cohesion, safety and quality may be important predictors of adolescents’ level of active transport and resilience to the development of obesity. In Australia, both walking and cycling to school have declined dramatically between 1985 and 2001 (31), and fewer than 20% of high school students reported walking and fewer than 3% of students regularly cycled to school in SPANS 2004 (10). Okely and colleagues, however, compared self-reported physical activity among adolescents from 1985-2004 and found that the prevalence of participation in moderate to vigorous physical activity significantly increased in both boys and girls aged 13-16 years (10). The authors acknowledge the potential weakness of self-report data (32).

SEDENTARY BEHAVIORS

Increases in sedentary behaviours, and in particular small screen recreation, are implicated in the increasing prevalence of obesity among adolescents. Hardy et al (33) found that Australian adolescents spend between 34 and 45 hours each week involved in such sedentary pastimes as small screen recreation, homework and other educational pursuits, travel and cultural and social activities. Another study (14) from western Sydney found that those children who watch more than two hours of television per day at age eight years were significantly more likely to be overweight or obese by early adolescence.

CONSEQUENCES

Overweight and obese adolescents in Australia are afflicted with co-morbidities common to adolescents throughout the world. Recent data from the SPANS study indicate a very high prevalence of risk factors for cardiovascular disease, non-alcoholic fatty liver disease (NAFLD) and type 2 diabetes among the overweight and obese students (10) (see Table 2). Obese boys and girls were significantly more likely to have multiple risk factors (34).

Table 2. Prevalence of chronic disease risk factors in Year 10 boys and girls from the 2004 NSW Schools Physical Activity and Nutrition Survey (10)

<table>
<thead>
<tr>
<th></th>
<th>Boys (%)</th>
<th></th>
<th>Girls (%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not overweight</td>
<td>Overweight</td>
<td>Obese</td>
<td>Not overweight</td>
</tr>
<tr>
<td>Elevated Insulin</td>
<td>8.6</td>
<td>31.2</td>
<td>68.4</td>
<td>12.1</td>
</tr>
<tr>
<td>Low HDL Cholesterol</td>
<td>5.2</td>
<td>24.6</td>
<td>26.3</td>
<td>2.4</td>
</tr>
<tr>
<td>High LDL Cholesterol</td>
<td>1.9</td>
<td>13.1</td>
<td>5.3</td>
<td>5.4</td>
</tr>
<tr>
<td>High Alanine Aminotransferase</td>
<td>2.9</td>
<td>19.7</td>
<td>42.1</td>
<td>3.0</td>
</tr>
</tbody>
</table>

POLICY

The Australian Federal Government has developed a healthy weight strategy (Healthy Weight 2008) focused upon young people and families that describes prevention strategies in multiple settings.
including food supply, marketing, primary care and schools. The program was launched in 2004, has been only partially implemented and has not been formally evaluated; the impact on adolescents cannot be estimated. State governments, with responsibility for government schools, have implemented healthy school canteen policies that include bans on soft drinks within the school environment. An evaluation of the NSW School Canteen strategy indicated that more than 98% of school canteen managers had adopted all or some of the program in the first year of implementation (35). Other environmental strategies that may potentially enhance the adolescent’s food and physical activity environment, including bans on food marketing, pricing structures that favour healthy food and availability of safe active transport options, have not been addressed in the Australian context.

COMMUNITY-BASED INTERVENTIONS
Two large scale community-based obesity prevention trials are underway: one in the Barwon-South Western region of Victoria (36) and the other in the Hunter-New England region of New South Wales (37). Both trials have received substantial funding from their respective State governments and represent an opportunity to develop multiple strategies for obesity prevention in a wide range of settings, and include school media and policy dimensions. Early results from the Barwon intervention indicate a high level of parental awareness and recall of the intervention messages (38).

CLINICAL MANAGEMENT
Programs and policies aimed at preventing the development of obesity in young people are important, but so too is the provision of effective clinical services for the assessment and management of affected individuals. In 2003, the Australian National Health and Medical Research Council published its clinical practice guidelines for the management of overweight and obesity in children and adolescents (39). Unfortunately, this evidence-based set of recommendations which was aimed at general practitioners was not accompanied by an education or dissemination program so that awareness and use of the guidelines remains limited (40).

The conventional components of weight management include dietary modification, increased physical activity, decreased sedentary activity, behaviour modification and family involvement (39,41). However evidence for most of these is based on studies dealing with pre-adolescent children and their parents, the majority of such studies occurring either in schools or tertiary clinical settings and few specifically focussing on adolescents (42). Indeed, there is only extremely limited evidence to guide effective weight management interventions in the adolescent age group, especially at an intensity that would be sustainable in health care settings such as in Australia. In Australia, several randomized clinical trials (RCT) in adolescent obesity have commenced, or are recently completed. They differ in their focus on patients or clients with different levels of severity of obesity and in the intensity and type of intervention offered. For example, the Loozit® trial, underway in Sydney (43), is a group-based weight management program for overweight or obese adolescents developed for delivery in a variety of primary care or community settings by a
range of health professionals with outcomes to be measured at two years. In Melbourne, a 12 session cognitive behavioural therapy intervention achieved significant differences in body fat between the intervention and control groups that were maintained over 6 months of follow-up (44). The first RCT of bariatric surgery in severely obese older adolescents is currently underway in Melbourne – this is a trial of what is essentially a quaternary level of intervention (45). Results of these and other studies, when available, will help inform the development of clinical service delivery in the area of adolescent obesity management.

**FUTURE DIRECTIONS**

Although innovative research is being undertaken throughout Australia, prevention and treatment of adolescent obesity needs further commitment to prevent an overwhelming burden on the public health system in the future. In particular, the development of health service delivery models that acknowledge the unique needs of adolescents, and provide appropriate care for affected young people, be they mildly or severely obese. Efforts toward prevention must focus on better understanding the determinants and causes of obesity in adolescents in an effort to develop evidence-based prevention strategies. This would include not just individual level causes such as food and activity behaviours but environmental determinants such as urban planning, transport infrastructure, food sale policies and the effects of advertising on young people. Finally, ongoing monitoring of the prevalence of obesity as well as determinants is vital in order that the immediate effect of the epidemic and its impact on young adults be quantified.

**REFERENCES**


