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Towards Healthy Growth and Development: Issues of overweight, obesity and under-nutrition among children in Queensland

INSIDE

Monitoring early childhood growth and development should be the 'gold standard' for measuring the success of human development efforts. (Kul Gautam, UNICEF Deputy Executive Director, address to the United Nations meeting on Nutrition, 13 April 2000[1])

KEY MESSAGES

- Growth is the most important determinant of health status of a child and is an indirect reflection of the well being of the entire community.
- In Australia and in Queensland obesity is increasing among children as well as adults, and is directly linked to several major national and State health priority areas - cardiovascular disease, hypertension, diabetes and certain cancers.
- 19% to 24% of school age children in Australia are overweight or obese* and these rates are among the highest in the world.
- Overweight and obesity are also occurring among Indigenous children, particularly in urban centres but in rural communities as well.
- Poor intrauterine growth coupled with suboptimal childhood growth patterns may be predictive of chronic diseases in adulthood - coronary heart disease, hypertension, diabetes and even renal disease.
- Under-nutrition, as expressed by low weight for age, low height for age or low weight for height has been reported in several Indigenous communities in Queensland, and is directly related to increased rates of hospitalisation for infectious diseases in early life and chronic diseases in adult life.
- Child Growth Assessment and Action programs in the Northern Territory have reported significant decreases in the numbers of undernourished Indigenous children since the programs were established.
- Childhood overweight and obesity and under-nutrition are crises facing Australian and Queensland children today. Action must be taken now to prevent and manage both overweight and poor growth among the children of the State and the country.
- The cost savings of instituting growth assessment and action programs in Queensland are potentially enormous - in the short term in reducing hospitalisation of undernourished

* See Definitions for Overweight and Obesity (a) on page 10

Indigenous children, and in the long term in reducing the burden of disease among children who will become obese adults.

- There is a critical need for a regular systematic program to assess growth among children in Queensland. The above issues cannot be addressed until we establish routine growth statistics and provide action programs aimed at prevention and management of abnormal growth patterns.

- Efforts to both prevent and manage over- and under-nutrition must involve appropriate and culturally sensitive intervention programs, education and research.

Introduction

Australia and Queensland face two major issues related to child growth. Firstly, as in many industrialised countries of the world today, childhood obesity /overweight is emerging as a critical public health problem. Secondly, as in most developing countries of the world, under-nutrition is having a major impact on the health of Indigenous children and other children in disadvantaged circumstances.

There is abundant evidence in Australia that social inequity has a profound effect on health. Data show that children from lower socio-economic (SES) backgrounds are more likely to be shorter, have higher Body Mass Index (BMI*) and higher skinfold thickness than those of higher SES backgrounds.[2] Children from low SES backgrounds have also been shown to have lower dietary intakes of vitamins A, C, folate and thiamine, lower intakes of iron, calcium and fibre and higher intakes of sugar, fat and energy than children from higher SES groups.[2]

Assessing the growth of individual children has been the cornerstone of child health care services in some areas of Queensland for decades. Simple measures of weight, height and age have been considered the most appropriate parameters to define the health and nutritional status of a child. Ideally, when abnormal growth is detected, nutritional, medical or social interventions are instituted. The service of growth assessment and action, while common in many health care settings, may not be reaching all children, especially those most in need. The importance placed on including growth assessment and action as part of child health services also varies from one health service to the next.

In Queensland, there is currently no regular systematic program to address the issues of over- and under-nutrition or to monitor changes in these conditions. Without regular routine statistics on growth parameters of children it is impossible to determine the scope of the problem or to institute appropriate strategies to address these concerns.

There is an urgent need to take action to both prevent and manage childhood obesity and under-nutrition. Such action needs to include intervention, education, and research. Intervention programs need to be culturally sensitive and have an emphasis on training community-based health workers, and be designed with community input. Educational efforts should be directed towards policy makers, health professionals, community leaders and parents. Research needs to address psychological, behavioural, environmental, financial and health implications of obesity and under-nutrition.

Overweight and Obesity in Children

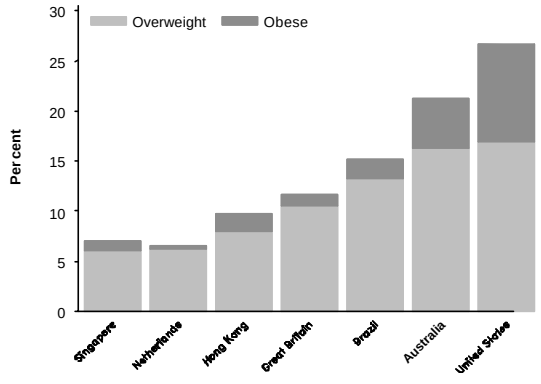
The increasing prevalence of childhood obesity is considered a major epidemic in many of the industrialised countries of the world today. Recent reports from the United Kingdom,[3] Canada,[4] the United States[5] and Europe[6] identify childhood obesity as a growing and significant public health concern. While it is difficult to compare rates in various countries due to different age groupings and criteria used to determine overweight, the prevalence of childhood obesity in Australia may be one of the highest in the world.

Figures 1 and 2 compare rates of overweight and obesity for Australian children[7] with rates from the United States[8] and five other countries[9] using

* BMI-weight in kilograms divided by height in metres squared - kg/m^2

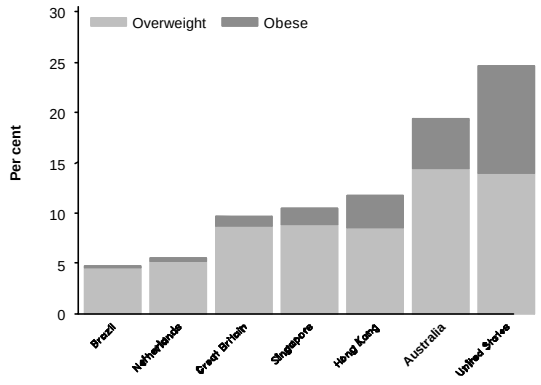
the same criteria for assessing overweight and obesity.*

Figure 1: Prevalence of overweight and obesity among female children in Australia* compared with the United States† and five other countries‡



Data Source: * Booth, 2001[7]
Data Source: † Popkin and Udry, 1998[8]
Data Source: ‡ Cole, 2000[9]

Figure 2: Prevalence of overweight and obesity among male children in Australia* compared with the United States† and five other countries‡



Data Source: * Booth, 2001[7]
Data Source: † Popkin and Udry, 1998[8]
Data Source: ‡ Cole, 2000[9]

Data from large population-based surveys in these six countries were used to develop these criteria. For the Australian children, Booth[7] analysed data from three independent surveys: the 1997 NSW Schools Fitness and Physical Activity Survey,[10] the 1995 National Nutrition Survey (NNS)[11] and the 1997 Health of Young Victorians Study.[12] All three surveys measured weight and height of children selected at random from large populations. Each study included over 3000 children, but age ranges differed between the surveys.

The data show that 19% to 24% of Australian school-age children are either overweight or obese. The researchers noted that overweight/obesity was 3.6% higher in urban than in rural areas for boys, but there was no difference for girls.

Magarey and Daniels[13] also applied the recently developed obesity criteria[9] to the 1995 NNS data.[11] This analysis found that among 2 - 18 year olds, 16% of girls and 15% of boys were overweight, and a further 4.9% and 4.5% of girls and boys, respectively, were obese. The highest prevalence of overweight /obesity among the girls was in the 8 - 11 year age group (25%), and for boys was in the 12 - 15 year age group (26.1%). The prevalence of overweight at 18 years among Australian youths was considerably higher than in any of the six international reference populations from which these criteria were derived.

Using criteria based on US National Health and Nutrition Examination Survey I (NHANES I) survey data, the 1995 NNS[11] reported that 21.2% and 23.3% of girls and boys, respectively, were *at risk of overweight* or were *overweight*† across 3 age categories 9 to18 years.

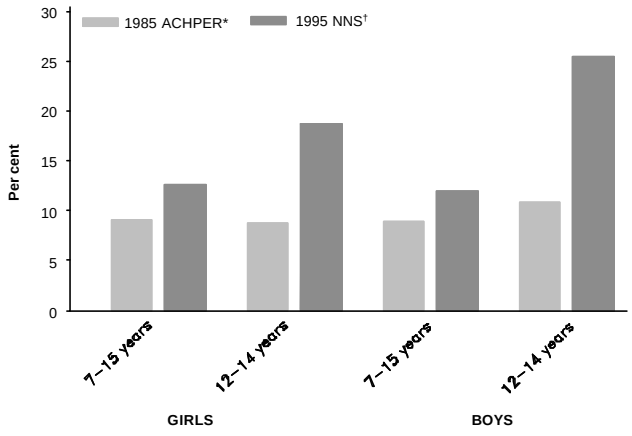
Concerns about childhood obesity have also been raised in other industrialised countries. Reports from the UK[3] suggest that 13 to 16% of girls and 9 to 10% of boys are overweight/obese. Canadian reports[4] indicate that as many as 24% of girls and 29% of boys are overweight/obese (data not shown). Childhood overweight/obesity rates from the Unites States range widely from 11 to 24%, depending on the definitions used.[5] Yet it appears that, using data from several sources and using different criteria, Australian children may rank among the heaviest in the world. These findings should not be surprising given the well documented rates of obesity among Australian adults.

* See Definitions for Assessing Overweight and Obesity (a) on page 10

† See Definition of Overweight (b) on page 10

As in other western countries, there is considerable evidence that overweight among Australian children is increasing dramatically. Figure 3 shows the striking increase in overweight* among school age children, especially among boys, in one decade from 1985 to 1995. These data are taken from the Australian Health and Fitness Survey 1985 conducted by the Australian Council for Health, Physical Education and Recreation[14] and the 1995 NNS.[11] Harvey et al[15] showed that among 8000 children 7 - 15 years of age, approximately 9% were considered overweight in 1985. That rate increased to approximately 12% in the 1995 NNS as shown in Figure 3.

Figure 3: Increasing prevalence of overweight among Australian children - 1985 - 1995



Data Source: * Harvey et al., 1993[15]; † 1995 National Nutrition Survey[11]

Harvey[15] also compared the 12 – 14 year age group, using slightly different cut-off levels of overweight.† According to these criteria, 11.7% of the boys and 8.7 % of the girls were classified as overweight in 1985, but that increased dramatically in 1995 (especially among boys to over 25%).

Other recent surveys have also shown dramatic increases in BMI among Australian school children. In Victoria, height and weight data from two cross-sectional population-based surveys of primary school children revealed a significantly higher BMI in the 1997 Health of Young Victorians Study[12] (N= 2277) compared with the 1985 Australian Health and Fitness[14] survey (N=1421). This increase was found for most age/gender groups, and reflected an increase in BMI of 1.03 and 1.04 for boys and girls, respectively. The increases were most marked in the heavier end of the distribution. This study did not report a prevalence of overweight or obesity among the children.

A similar study was conducted among school children in southeastern Sydney.[16] Height and weight were measured in 3645 children aged 5 - 12 years during 1994-97, and compared with the 1985 ACHPER survey. This study showed an overall increase in BMI of 3.9% among boys and 1.2% in girls during this time period.

Childhood obesity appears to be an emerging concern in Indigenous communities as well. Data from the first National Aboriginal and Torres Strait Islander Survey[17] found that children 5 - 9 years of age were, on average, shorter and heavier than international reference values. Approximately 28% of children 7 - 15 years were at risk of overweight or were overweight compared with Australian growth references. In general, underweight and short stature were more common in rural areas, and overweight was more prevalent in urban centres, yet even in rural areas overweight was greater than expected and in cities underweight was more than expected.[17]

Community health screenings conducted in 11 Indigenous communities in central Queensland[18] reported more obesity than underweight among 534 children screened. More than 6% of children were estimated to be overweight or obese while 3% were considered underweight. The report did not provide the age ranges of the children included in the screening.

Childhood Obesity Predicts Adult Weight and Chronic Diseases

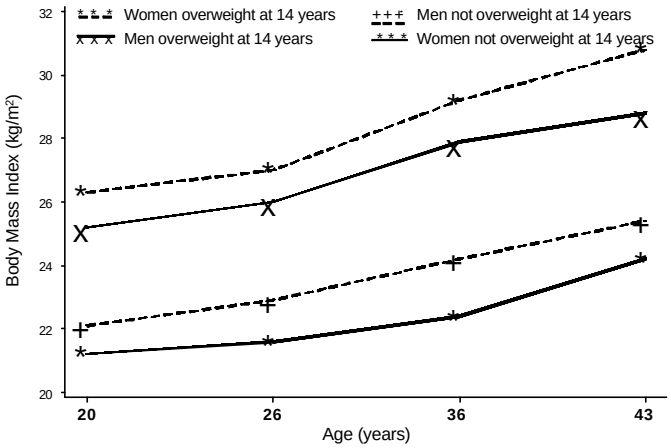
Obesity and overweight in childhood are important predictors of adult adiposity.[19,20] A recent follow-up study[21] of a cohort of 2548 women and 2814 men born in England in 1946, found that adults

* See Definition of Overweight and Obesity (c) on page 10

† See Definition of Overweight (d) on page 10

who were overweight* as children (at 14 years of age) had higher BMIs at all ages of follow up (20, 26, 36 and 43 years) compared with adults who were not overweight as children (Figure 4). BMIs increased with age and were higher for women than men.

Figure 4: Mean body mass index of British women and men at four ages between 20 and 43 by weight at 14 years of age



Data Source: Hardy et al., 2000[21]

At all ages in this British study, those from a *manual social class* had a greater proportion classified as overweight and obese compared with those from *non-manual social classes*. Overall, of those adults who were overweight as children, twice as many were overweight or obese at age 43 and four times as many were obese compared with adults who were not overweight at 14 years (Table 1).

Table 1. Prevalence of overweight and obesity among British adults at age 43 years by overweight status at 14 years of age.

	Percent Overweight or Obese as adults	Percent Obese as adults
Overweight at age 14	80	36
Not overweight at age 14	43	8

Source: Hardy et al, 2000[21]

Few studies have examined the contribution of childhood obesity to adult disease. A 57-year follow-up, the Boyd Orr cohort study,[22] was based on British females (n =1234) and males (n=1165) who were between 2 and 14 years of age in prewar Britain (1937-1939). The study reported a hazard ratio for all-cause mortality of 1.5 (CI 1.1, 2.2) and for ischaemic heart disease of 2.0 (CI 1.0, 3.9) when those whose BMI as children had been > 75th centile were compared with children classified as the reference group with BMI 25th to 49th centile.† This study lends strong support to the view that overweight in childhood is associated with increased mortality in later life.

Cost of Overweight and Obesity

It is well documented that among adults overweight and obesity are major risk factors associated with cardiovascular disease, type 2 diabetes, hypertension and certain types of cancers. The cost of obesity in terms of death and disability in most western countries is enormous. It is estimated that the direct medical costs of obesity could amount to 4 to 5% of total health care costs.[23] A conservative estimate of the health costs of obesity in Australia is $810 million per year, with a further $500 million spent on weight control programs.[24] Mathers[25] estimates that in Australia the proportion of the burden of disease attributable to obesity is 4%. This proportion is greater than that attributable to high blood cholesterol, illicit drugs or unsafe sex.

The savings in health care costs in terms of preventing infant and child hospitalisation and adult diseases such as diabetes and renal disease could pay for relatively inexpensive growth assessment and action programs. In the Northern Territory, an evaluation of one nutrition program reported a decrease of 70% in the number of children hospitalised for gastrointestinal disease and nutritional problems.[26] This report estimated that the effect of the nutrition program resulted in an estimated cost saving to the health system of $59,322 - which was just under the cost of the nutrition program ($69,766). Preventing just one child from becoming obese, developing diabetes and acquiring renal disease could save a minimum of $70,000 per year in the cost of dialysis alone.

* See Definition of Overweight (e) on page 10

† See Definition of Overweight (f) on page 10

Indigenous Children – Over- and Under-nutrition

Clinically evident malnutrition, such as kwashiorkor is uncommon among Aboriginal and Torres Strait Islander children today. Yet under-nutrition, defined as weight for age (WAZ), height for age (HAZ) and weight for height (WHZ) more than 2 standard deviations (or *z* scores) below the median of accepted references[27] may be common.[28] Children who live in Aboriginal communities in Western Australia have been reported to be shorter and lighter than non-Aboriginal Australian children.[29] The prevalence of under-nutrition was estimated to be 20% in children less than 2 years of age in the Top End of the Northern Territory. The rate for *stunting* was 10% (HAZ <-2.0) and that for *wasting* was 36% (WHZ <-2.0) - rates that are considerably higher than in many developing countries. These estimates were derived from weight and height measurements of children admitted to Royal Darwin Hospital in 1990-91 and therefore may not be representative of the Top End population.[30]

Few reports of nutritional status of Indigenous children in Queensland have attempted to assess growth. Those few that have been reported used only weight for age in several communities,[31, 32] or measured only small numbers of children in one community.[33]

Dugdale[31] investigated patterns of growth of Aboriginal children from the 1950s through the 1990s in several communities in central and northern Queensland. The data for these studies were weight measurements obtained from child health centre records. The general trend over this time period showed an improved pattern of growth in weight for age in most of the communities in central Queensland and those near Cairns. Mean weight for age increased over this time period in one of the more accessible communities but decreased in a remote community. It appeared that the further north the community, the less likely was an improvement in growth. Remoteness of the community was considered a major factor in growth retardation in these communities.

Cox[32] also reported growth characteristics of over 500 Indigenous children born in the 1970s in five government or mission-organised communities in Queensland. This survey used weight for age and head circumference data recorded by nursing sisters in the Royal Flying Doctor Service. The analyses of these records showed that mean birth weights for males (3.2 kg) and females (3.1 kg) corresponded to the 25th percentile of British references.[34] Mean weights of both girls and boys increased steadily during the early months of life, and by three months of age were at the British 50th percentile. After three to four months of age, however, growth slowed so that by 18 months mean weights compared with the 10th percentile of the British reference. Growth in head circumference showed a similar pattern to weight. Thus by five years of age, Indigenous children were considerably lighter and had a smaller head circumference as compared with British children. This pattern of growth is commonly reported in Indigenous communities today.[35]

> *In some remote and rural areas, a substantial proportion of preschool children over six months have an unacceptable level of malnutrition.*
> (National Health and Medical Research Council, Nutrition in Aboriginal and Torres Strait Islander Peoples: An Information Paper, 2000[35])

Another small study in one central Queensland community assessed growth among 127 school age Aboriginal children in 1992 and again in 1997.[33] Weight and height measurements revealed that z-scores for weight for age (WAZ) and height for age (HAZ) for females were not significantly different from NCHS/WHO reference[36] at either time period. The boys, however, had significantly lower WAZ and HAZ than the NCHS/WHO reference both in 1992 and in 1997. WHZ was not significantly different from the NCHS/WHO reference. Only small numbers of children had z-scores less than -2.0 for WAZ, HAZ, or WHZ (the standard criteria for under-nutrition), and small numbers had BMIs greater than the 95th percentile (4.4% in 1997). These data indicate that for this accessible Aboriginal community, growth among girls compares closely with reference values, but that growth for boys may be lagging.

The above studies are among the few attempts to assess growth patterns of Indigenous children in Queensland. They highlight the paucity of information regarding growth parameters among these children and the need to accurately and systematically ascertain the nutritional status of Indigenous children, not only in remote communities but in urban centres as well.

Both under-nutrition and over-nutrition may point to broader issues such as access and capacity, as well as availability of food storage and preparation facilities and not just carer/parent lack of knowledge.

Effects of Under-nutrition

The synergism between under-nutrition and infectious disease has been recognised for decades.[37] Under-nutrition affects defence mechanisms which results in increased susceptibility to infectious diseases. These illnesses, in turn, cause further deterioration of nutritional status through reduced food intake, malabsorption of nutrients, increased mobilisation of body stores, and increased nutrient losses.[37]

A recent World Health Organization bulletin[38] reviewed studies related to malnutrition and mortality. The authors concluded that the strongest and most consistent relationship was between under-nutrition and increased death from diarrhoeal disease and acute respiratory infections. They estimated that up to 50% of all childhood mortality is associated with malnutrition. Worldwide it is estimated that malnutrition among 0 – 4 year olds is responsible for 16% of the total global burden of disease.[39]

Analysis of hospital separation data for Aboriginal and Torres Strait Islander children in northern Queensland reveals extremely high rates of hospitalisation for gastrointestinal disorders, respiratory diseases, skin diseases, and nutritional conditions. Hospital separation rates for Indigenous children in the northern zone are four to six times higher than for non-Indigenous children.[40]

Under-nutrition has also been linked with reduced intellectual capacity. Malnourished children have lower levels of activity, which reduces their interest in environmental exploration. Severe malnutrition in the first few years of life, if coupled with social deprivation, can have a detrimental effect on mental development throughout childhood.[35]

Growth Assessment and Action

> *Growth assessment is the single measurement that best defines the health and nutritional status of children, because disturbances in health and nutrition, regardless of their etiology, invariably affect child growth.* (de Onis, Rome, 1992[41])

Growth assessment, also referred to as *growth monitoring*, is defined as:

> *the regular measurement, recording and interpretation of a child's growth in order to counsel, act and follow-up results.*[42]

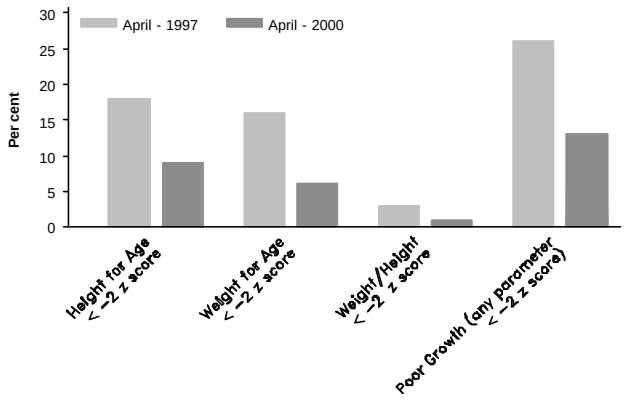
It is clear that measuring a child is not an intervention in itself but is a strategy or a process used to generate action. The most common purposes of growth assessment and action are as: (1) an educational and promotional tool, (2) an integrating strategy and (3) a source of information. As an educational tool, through the use of growth charts, assessment can make health promotion action-oriented, timely, relevant and specific, and thus more effective. As a promotional tool or motivational tool, growth assessment can create an awareness of the importance of growth problems and a demand for their solution. As an integrating strategy, growth assessment has the capacity to improve child growth and health by reducing morbidity through a more efficient and effective delivery of health services and with the potential to integrate a variety of health and nutrition interventions. As a source of data, growth assessment can be used to evaluate the health status of the individual child and direct appropriate actions. At the community, state or national level data can be used for decision-making and resource allocation, as well as for monitoring and evaluating the health care delivery system and the success of targeted programs or projects.

Effectiveness of Growth Monitoring

The benefits of monitoring the growth of children in developing countries have been well described. Pinstrup-Anderson[43] and Jelliffe[44] advise that assessing growth, providing feedback to caregivers and referring at risk children for specialised intervention is one of the most effective strategies in reducing or preventing malnutrition among children in developing countries.

Co-ordinated, systematic growth assessment and action programs (GAA) have been established in remote Aboriginal communities in the Alice Springs area since 1996. A recent evaluation (Figure 5) revealed that under-nutrition (as assessed by WAZ, HAZ or WHZ (z-score <-2.0) decreased in several communities from 26% in April 1997 to 13% in April 2000 among children under 5 years.[45] These programs demonstrate that early identification of poor growth or "failure to thrive" allows for early and appropriate interventions. The GAA programs also provide feedback on growth assessment to parents, caregivers, communities and health policy-makers.

Figure 5: Percentage of children <5 years in Alice Springs Remote District with poor growth - 1997 and 2000



Data Source: Territory Health Services, 2000[45]

Although the effectiveness of growth monitoring in industrialised countries has not been well defined, a multi-professional group met in Coventry, England in 1998[46] and concluded that the potential benefits of growth monitoring in the UK included:

- identification of chronic disorders,
- provision of assurances to parents,
- monitoring the health of the nation's children, and
- support of future research.

These experts suggested that a major justification for systematic growth monitoring is to identify children with growth hormone deficiency and Turner's syndrome[46].

Growth and Health Outcomes

Over the past decade, several large observational studies have shown a strong association between birth weight and adult chronic diseases including coronary heart disease (CHD),[47] hypertension[48] and diabetes.[49] Reports from countries such as the United Kingdom,[50] Sweden[51] and the United States[52] have shown an association among both males and females between the development of CHD and low birth weight in relation to length of gestation.

Forsen and colleagues[53] in Finland described men born between 1924 and 1933 and death rates from coronary heart disease. Low birth weight was strongly associated with CHD, but a stronger association was found with thinness at birth (birth weight/length^3).

> *We found the highest death rates from coronary heart disease occurred in boys who were thin at birth but whose weight caught up so that they had an above average body mass from the age of 7 years.* (Eriksson, 1999[54])

Some investigators suggest that the associations between low birth weight and CHD, blood pressure and diabetes may be more influenced by the change in relative body size between birth and adulthood rather than birth weight alone. Lucas[55] suggests that it is the change in relative weight in childhood or adulthood, or *centile crossing* that must also be considered.

Lucas[55] reported that insulin concentration at 9 to12 years of age was unrelated to birth weight in pre-term babies. However, when he adjusted for weight at 9 - 12 years there was a significant negative effect

of birth weight on insulin concentration. This suggests that change in relative weight between birth and 9 - 12 years may have been influential.

Other researchers[56] suggest stunting (low height for age) early in life plays a significant role in the development of obesity. Studies in Brazil[57] compared metabolic rates and fat oxidation rates among stunted children (height for age z-scores < 1.5) and normal height children. Although the stunted children had normal resting metabolic rates, they had significantly lower fat oxidation rates. Impaired fat oxidation rates have been shown to be associated with excess weight gain - because fat that is not oxidised must be stored. These findings may help to explain increases in body fatness and prevalence of obesity in stunted adults and in developing countries. These data highlight the importance of monitoring not only birth weight and birth length in the total population, but of systematically monitoring growth throughout childhood.

Recommendations for Growth Assessment and Action in Queensland

In order to address the concerns of childhood obesity and subsequent adult lifestyle diseases, Australian experts in paediatrics, nutrition and sports medicine have published recommendations[58] for nutrition and physical activity for Australian children. For the management of healthy body weight, two major recommendations are:

- *body mass index (weight/height^2), based on accurately measured height and weight, is the most convenient way to assess a child's degree of fatness;* (O'Connor and Eden, 2000[58]) and
- *growth measures, such as height and weight, should be monitored for early detection of overweight or obesity, especially within families with a high risk of type 2 diabetes or early atherosclerosis.* (O'Connor and Eden, 2000[58])

Also, because of the critical issues related to growth; obesity, infectious disease and intellectual potential, Aboriginal and Torres Strait Islander health and nutrition advisory groups have voiced concerns about the importance of growth and development among Indigenous children. The National Aboriginal and Torres Strait Islander Nutrition Strategy and Action Plan[59] emphasises the importance of childhood growth and recommends that measures be taken to:

> *…… Identify and facilitate local and State/ Territory activities designed to achieve outcomes of: healthy birth weight, promotion of breastfeeding, healthy childhood growth, healthy lifestyles and the treatment and management of diet related diseases affecting Indigenous people*. (NATSINSAP, 2000[59])

Measures to improve Aboriginal and Torres Strait Islander children's health and well-being must address those factors that may prevent families and communities from meeting the broader health and nutritional needs of their children.

Factors which are embedded in social and structural inequities impact significantly on families' and communities' capacity to fully address the health and nutritional needs of their children. These factors include dispossession, unemployment, income level and financial security, education, housing tenure (adequate storage and food preparation areas and cooking facilities) and access issues (supply and availability of fresh food in remote communities, choice and range of food at an affordable cost).

In Queensland, a nutritional surveillance working party in 1999 recommended strategies to:

- *Establish systems to access growth monitoring data for children under five and from school screenings.* (Nutrition Surveillance Working Party, 1999[60])

It is clear from reports from Queensland, Australia and around the world, that combating the increasing rates of childhood overweight and obesity and the continuing occurrence of under-nutrition in Queensland will require programs of growth assessment and action. A regular systematic program needs to be a high priority for Queensland and should ensure that:

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- timely and accurate assessment of the nutritional status of individual children is undertaken at regular intervals in childhood;
- appropriate and timely action is taken when assessment indicates that growth is outside designated parameters;
- feedback on the growth and nutritional status of children is provided to parents, caregivers and communities so that they can make decisions about family and community level responses to the problem and lobby for resources to develop programs;
- standard practice training is provided to community-based health workers, community and child health nurses, and general practitioners; and
- data on the prevalence of over- and under-nutrition are available to policy makers, health service providers and planners in health centres, districts and zones in Queensland to inform decisions about resource allocation and to ensure communities have access to the programs needed to improve the health of children.

The second recommendation in the National Health and Medical Research Council's *Dietary Guidelines for Children and Adolescents*[61] reads:

> *Children need appropriate food and physical activity to grow and develop normally. Growth should be checked regularly.* (NHMRC,1995[61])

A consistent policy response and resources to ensure effective implementation of growth assessment and action strategies are urgently required for Queensland.

Definitions for Assessing Overweight and Obesity Used in Surveys

A variety of indices and cut-points have been used in international and Australian studies and surveys to assess overweight and obesity in children. The indicators and cut-points used in the surveys reviewed in this paper are summarized below:

a) BMI - relates a child's age-adjusted BMI z-score to a BMI of 25 (overweight) or 30 (obesity) at age 18 years.[9]
b) BMI - *at risk of overweight* and *overweight* based on the 85th and 95th percentiles, respectively, derived from US NHANES I survey data.[62]
c) BMI - overweight defined as BMI 85th percentile of NHANES II 1976-80[63] BMI for girls $23.4 and for boys[3] $23.0 (obesity not defined).
d) BMI - overweight defined as BMI$85th percentile US NHANES II 1976-1980 weighed and smoothed by Harlan[64] (BMI for girls $23.5 and for boys $22.5) (obesity not defined).
e) Overweight at 14 years defined as 20% above standard weight for height of British reference values.
f) Centiles based on 1990 British reference values for BMI.[65]

This paper was prepared by Terry Coyne, Nutritional Epidemiologist, Epidemiology Services Unit, in collaboration with Public Health Services Nutritionists; Ros Gabriel, Anita Groos, Amanda Lee, Dympna Leonard, Simone Lowson and Helen Valentini.

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