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**REPORT ON THE HEALTH
MEASUREMENTS OF
YEAR 9 AND YEAR 10
STUDENTS AT
LINWOOD COLLEGE**

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Executive Summary

This report details the methods used in the Health measurements of Year 9 and Year 10 Linwood College students using the internationally recognised BMI charts, the waist, Fat Index and Blood Pressure measurements.

It examines the 2006 Ministry of Health paper “An Analysis of the Usefulness and Feasibility of a Population Indicator of Childhood Obesity” and utilises its recommendations and validates the study undertaken in this project.

It details the efforts taken to ensure consistency and accuracy of these measurements and the results obtained. Barriers to learning, medical ones in particular were to be targeted in 2006 at Linwood College as part of an ongoing study by LANE – (Literacy And Numeracy Empowerment project)

The Collaborative for Research and Training in Youth Health and Development would have a team of health professionals examining the Eyes, Ears, Nose and Throat, and a Dental check and Linwood College would examine the Demographics, Aerobic Fitness, Health measurements, HEADSS assessment for mental health and academic performance and pastoral care of the students.

Rather than just testing the year 9 and year 10 students, which may become a negative experience, Linwood College turned it into an Expo on Health and made it a positive experience with a number of freebies and pamphlet takeaways. This was achieved in addition to the assessments of the students and the following exhibited. NZ Blood Service, Cancer Society, Auhi Kore / Smokefree, Diverse café / 198 Youth, Heart Foundation, Sports & Rec Kaiwhakahaere, Mental Health Foundation, Sport Canterbury.

The Health measurement is one facet of this larger study and produced some surprising results when compared to the results quoted in An Analysis of the Usefulness and Feasibility of a Population Indicator of Childhood Obesity. Ministry of Health, 2006. Wellington.

Some 30% of New Zealand students are reported to be obese.

Obesity is related to exercise and aerobic fitness levels.

This Linwood College study places 17% of its students in the obese category and 13% of students in the overweight category.

What this probably really means is the BMI charts used in the Obesity study which are for European, North American students are not equipped to take cognisance of the Maori and Pacifica makeup of our population and that some research needs to be done on standardising some charts specifically for New Zealand children.

It does raise some other issues for SPARC, the Ministry of Education, the Ministry of Health and others charged with our children’s health and wellbeing. Perhaps the children are not as unfit or obese as the official message is being painted and some other research needs to be done elsewhere to either confirm the picture portrayed at Linwood or to confirm that Linwood students are indeed less obese than those in the rest of New Zealand.

It recommends that there needs to be a comprehensive study to ascertain relevant New Zealand BMI charts and this needs to be linked to Aerobic Fitness rather than arbitrary percentage population levels.

Background

The future of our society is dependent on the health, wellbeing and educational achievement of the young people of today. It is therefore important that society promotes and enables young people to be healthy, happy, well educated and productively employed. The study of the effects of early economic inactivity on young people has identified a link between early inactivity with a high probability of inactivity at a later stage (Maloney, 2004). Maloney initially defined economic inactivity as "...occurring when an individual is not enrolled in education or training, and not working in the labour market" Consequences of this economic inactivity or non-participation are negative both for the young person and wider society (Flemming, Kainuku-Walsh, Denny, Watson 2004).

In his address to the inaugural Council Meeting on 27th October 2004, Mayor Garry Moore said.

"I'd like to give some new guarantees.

To our young people I'd like to guarantee that:
in this city they will get to certain levels of literacy and numeracy. If you can read and count then you've got a very good start in life. This, however, cannot be undertaken by our schools on their own. There are squads of retired people out there who could really spend some of their time teaching one of our future ratepayers how to read or count.

There is a great deal of anecdotal evidence about the abilities, or lack of, of our youth. For Christchurch we need to find out what the problems are. Young people with these problems will probably fall into one or more of three categories – never been taught or learnt, not enough teaching to enable skill retention, or unable to be taught through mental or physical or emotional conditions. The education system can identify and perhaps deal with those in its care, but we all know that schools never have enough staff, funding or time to support all students' individual needs. Other Government agencies appear to be stretched or just not coping. The youth that don't fit into those categories, and those who do, need extra support to reach the literacy and numeracy benchmarks that society demands to enable them to be a positive contributor to our great city."

Denny, Clark and Watson (2004) have pointed out that students who are failing in education also have exceptionally high health needs and research suggests that the earlier students receive appropriate health interventions the greater the effect on the students' educational opportunities. This study of Linwood College students is based on a rationale that ill health may result in non-participation and aims to identify rates of problems among the year 9 and 10 students of Linwood College by measuring their health through utilising the Body Mass Index (BMI) and quantifying this using the same BMI charts as used in Ministry of Health, An Analysis of the Usefulness and Feasibility of a Population Indicator of Childhood Obesity. Wellington 2006.

Method

Participants

All year 9 and year 10 students at Linwood College were individually invited to participate in this project. Parents were informed through the official school newsletter that it was happening and that they had the opportunity of not allowing their child to participate. Each parent was also sent an individual consent form with information sheet detailing what was to happen.

This project was part of an overall Health assessment programme held in February 2006 and only six out of 450 parents declined permission for their child to take part. Students also had the opportunity to decline to participate at any stage and a number did not complete the assessments.

Procedure

Three qualified registered Nurses were coordinated to administer the assessment in our Health Centre in three separate small rooms. This was to ensure the assessments were all consistently administered and each student was seen by themselves to ensure their privacy.

We purchased standardised height measuring equipment, borrowed identical blood pressure measuring equipment, fat index callipers and scales.

Small groups of three at a time were put through the assessment in form groupings, so that the students were comfortable with other peers that they knew.

All of these procedures followed the Ethic guidelines from both the Otago University Medical School and the guiding principles for conducting research with human participants at the University of Auckland.

Results were recorded on a specially designed sheet that only had the students Education enrolment identity number on it, not their name. This ensured that individual students could not be identified. A specialist data entry person recorded the entries on a prepared database. Access to this database is restricted to the researcher and to the Deputy Principal. The individual result sheets are filed in a secure unit and will be destroyed in accordance with Ethics requirements.

Students who were absent during the week were followed up over the next school term to obtain a more complete coverage.

Body Mass Index (BMI)

In An Analysis of the Usefulness and Feasibility of a Population Indicator of Childhood Obesity. Wellington: Ministry of Health it is stated:

“Because there is no simple, accurate direct method for assessing body fat in children and adolescents, anthropometric measures are usually used as surrogates for body composition (Sardinha et al 1999). Among these, waist circumference, waist-to-hip ratio, skinfold thickness and BMI (derived from height and weight measures) are the most commonly used. However, it is worth noting that the accuracy of all these measures depends on the

skill of the operator and the precision of the equipment (National Health and Medical Research Council 2003). In a 1997 review, Power et al stated: Anthropometry is used not only at the individual level, as a clinical screening aid, but also at the population level to assess the health of groups. As a screening aid the assessment of obesity should be sensitive and specific, while as a public health tool it should detect differences between groups concurrently or over time. In the epidemiological situation there is less need for a cut-off, since the degree of obesity can be handled satisfactorily as a continuously varying quantity (Power et al 1997). Power et al (1997) define the ideal measure of body fat as: ... accurate in its estimate of body fat; precise, with small measurement error; accessible, in terms of simplicity, cost and ease-of-use; acceptable to the subject; and well-documented, with published reference values (Power et al 1997). They conclude that no current measure meets all these criteria, but that BMI is the single best measure of adiposity in childhood and adolescence. Ideally, population specific reference data is needed (Matyka and Barrett 2004).

This was backed up by other research and advice from Otago Medical School provided by Dr Ray Kirk. Consequently, this study used the BMI but also did the Fat Index measurements, Blood pressure and waist measurements.

Further quoting from An Analysis of the Usefulness and Feasibility of a Population Indicator of Childhood Obesity, Ministry of Health 2006

“Calculating BMI

Body mass index (BMI) is a weight-to-height ratio defined as weight (in kilograms) divided by the square of height (in metres):

$$\text{BMI} = \text{weight (kg)} / (\text{height (m)})^2$$

Weight is measured with the child wearing light clothing and no footwear, standing on scales and to the nearest 0.1 kg (National Health and Medical Research Council 2003). Height should be measured with the child (two years and over) standing without footwear, using a fixed wall or portable stadiometer and taken to the nearest mm.

BMI percentiles

BMI changes with age and gender, so an absolute BMI for a child must be calculated using an age and gender reference standard. Usually BMI-for-age percentile charts are used, with individual children being described as above or below percentile lines. These percentile charts are derived from data from a reference population. Some countries (eg, Britain, France and North America) have their own locally derived BMI-for-age charts (Burniat et al 2002; Must et al 1991; Power et al 1997). Neither New Zealand nor Australia have locally derived, nationally representative BMI-for-age reference charts, and therefore are reliant on reference charts from other countries. Williams et al have published smoothed BMI reference curves derived from the longitudinal data of the 1972 birth cohort from the Dunedin Multidisciplinary Health and Developmental Study in 2000, but these are not nationally representative or suitable for Maori and Pacific children (Williams 2000). Problems may arise if the chosen reference population does not represent the target population well, which is a concern in our multiethnic society. This

will be examined further in the Ethnicity and BMI section to follow. Widely accepted adult cut-off points for BMI; 25 kg/m² for overweight and 30 kg/m² for obesity correlate well with adverse health outcomes. There is no definite BMI level in childhood at which the risk of adverse health outcome is increased, although there is emerging evidence that metabolic syndrome is developing in children with BMIs in the higher range. Currently there are two widely used international BMI reference charts for children, the Cole et al (Cole 2000) and the Centers for Disease Control and Prevention (CDC 2000), which are recommended for different purposes. The Cole cut offs, which were supported by the International Obesity Task Force and based on internationally pooled data sets from six countries, are recommended for research and epidemiological purposes (Cole et al 2000). Whereas the CDC 2000 charts, which are based entirely on US data of national health examinations between 1963 and 1994, are recommended for clinical use (CDC 2000).”

Blood Pressure

Blood pressure was recorded using the standard pressure cuff, in the recommended sitting position. The 3 cuffs were checked and initialised and the nurses each monitored the others measurements to ensure consistency.

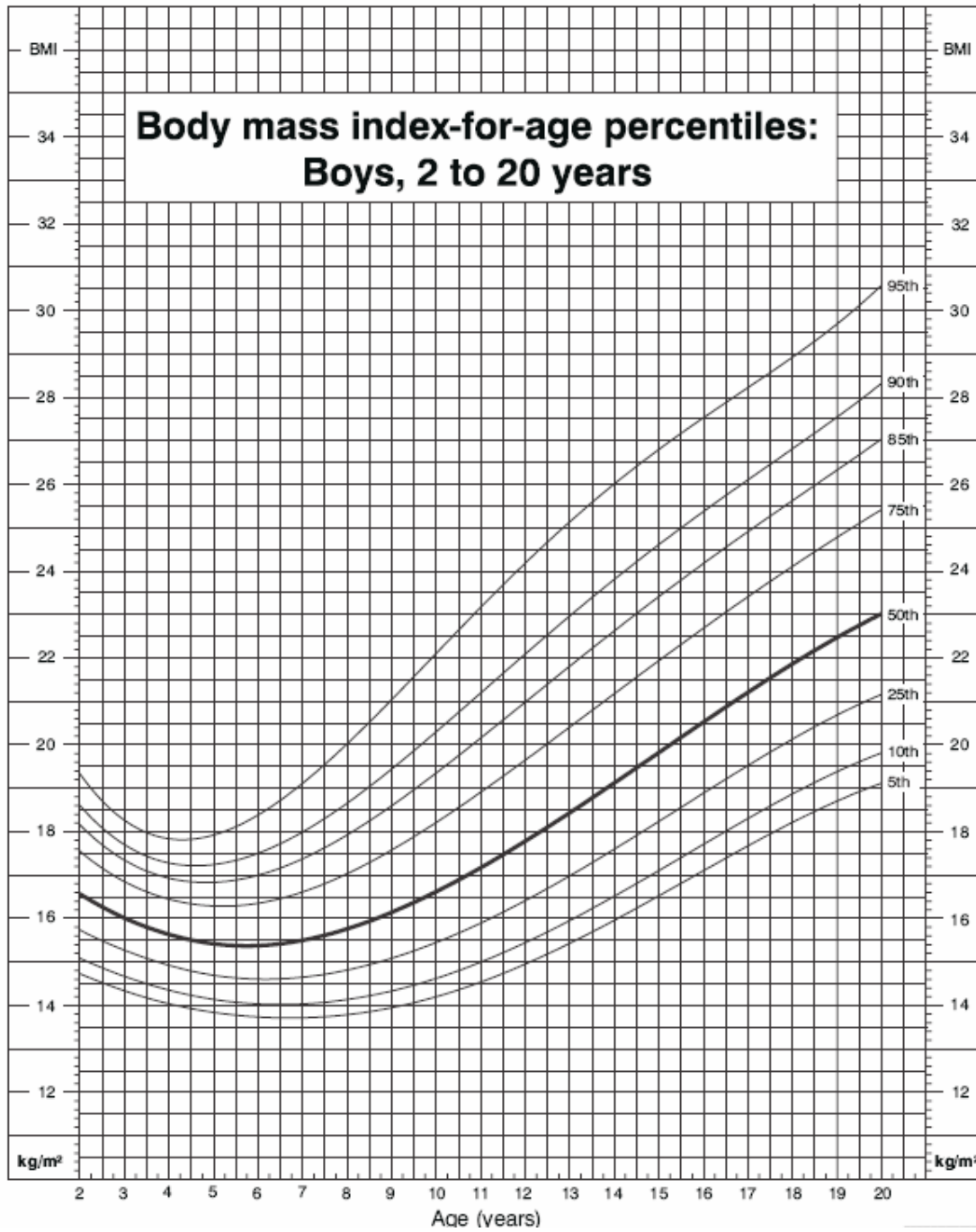
Fat Index

Identical Fat index gauges were obtained and the measurements all taken at the same places on the body as recommended in, An Analysis of the Usefulness and Feasibility of a Population Indicator of Childhood Obesity. Ministry of Health, Wellington 2006. Measurements were under arm bicep and right side waist fold.

BMI-for-age percentiles: boys, 2 to 20 years Published 30 May 2000.

Source: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

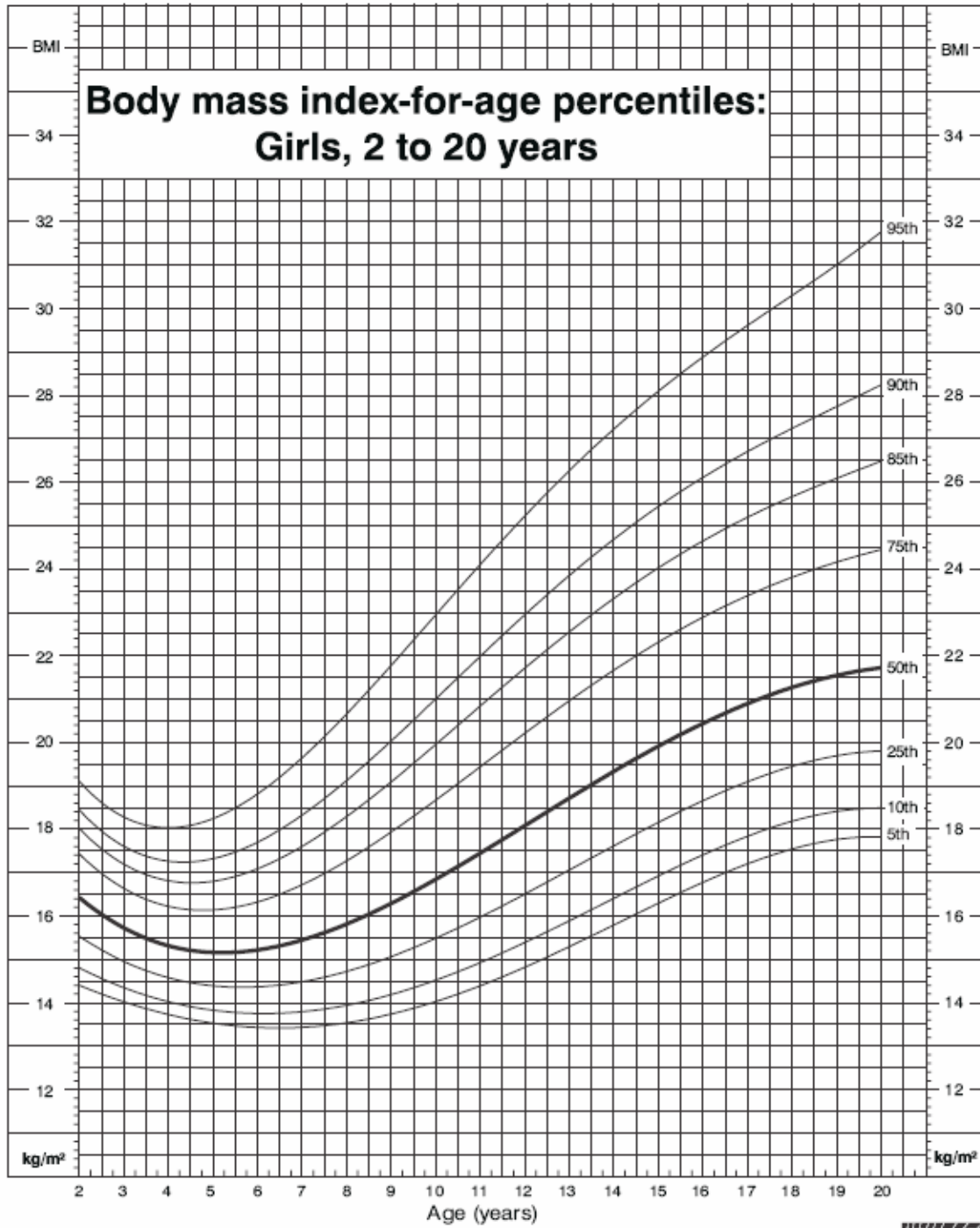
CDC Growth Charts: United States



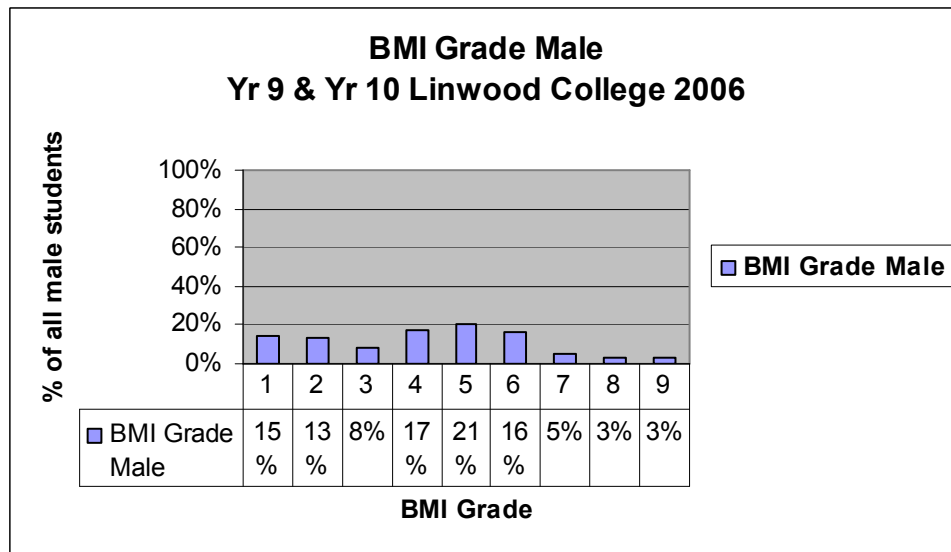
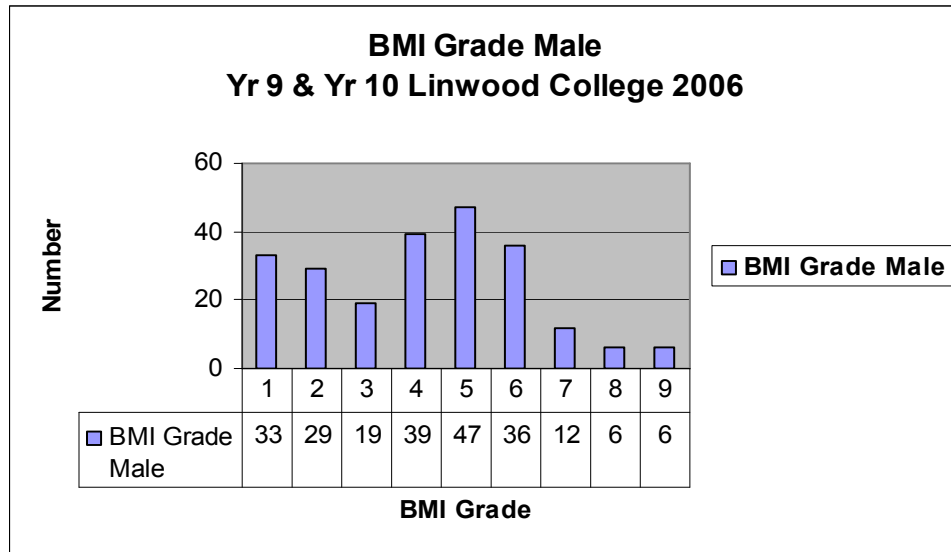
BMI-for-age percentiles: girls, 2 to 20 years Published 30 May 2000.

Source: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

CDC Growth Charts: United States



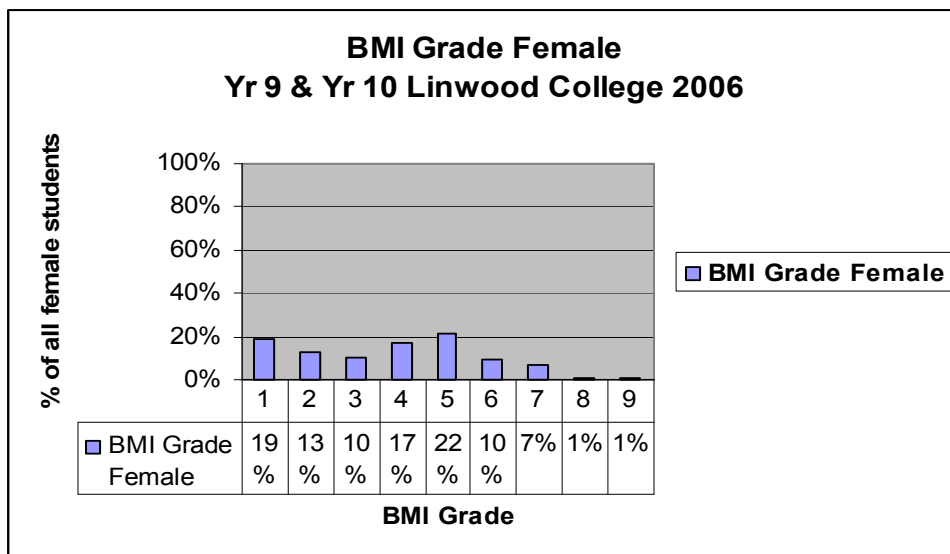
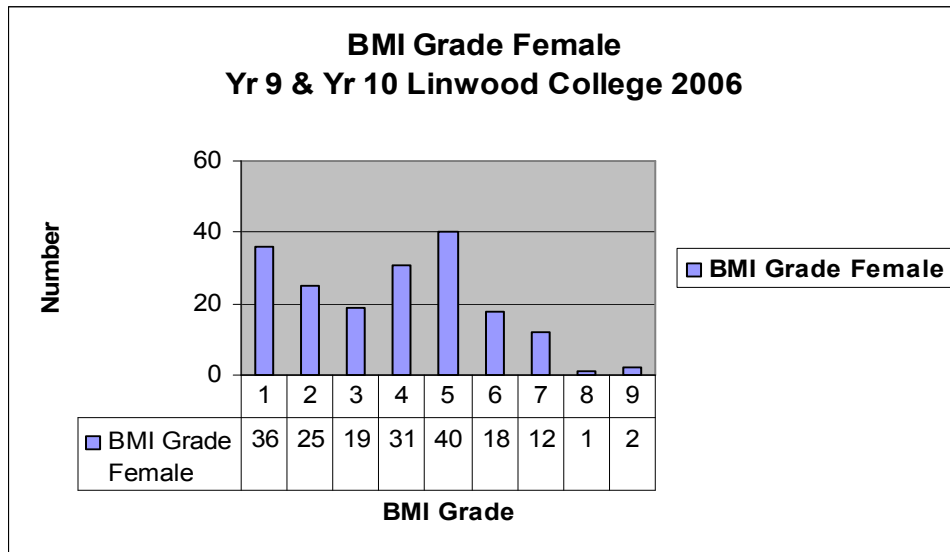
Results



BMI Grade Conversion as per the CDC Chart									
BMI Grade	1	2	3	4	5	6	7	8	9
%	>95%	95-90%	90-85%	85-75%	75-50%	50-25%	25-10%	10-5%	<5%

Grade 1 are considered to be obese - 15%
 Grade 2 are considered to be overweight - 13%
 Grade 9 are considered to be considerably at risk - 3%

The shape of the graph is skewed towards the top end and this is a cause for concern with 28% in the overweight or obese categories. It is still however far less than the official 30% obese rate for New Zealand children.



BMI Grade Conversion as per the CDC Chart									
BMI Grade	1	2	3	4	5	6	7	8	9
%	>95%	95-90%	90-85%	85-75%	75-50%	50-25%	25-10%	10-5%	<5%

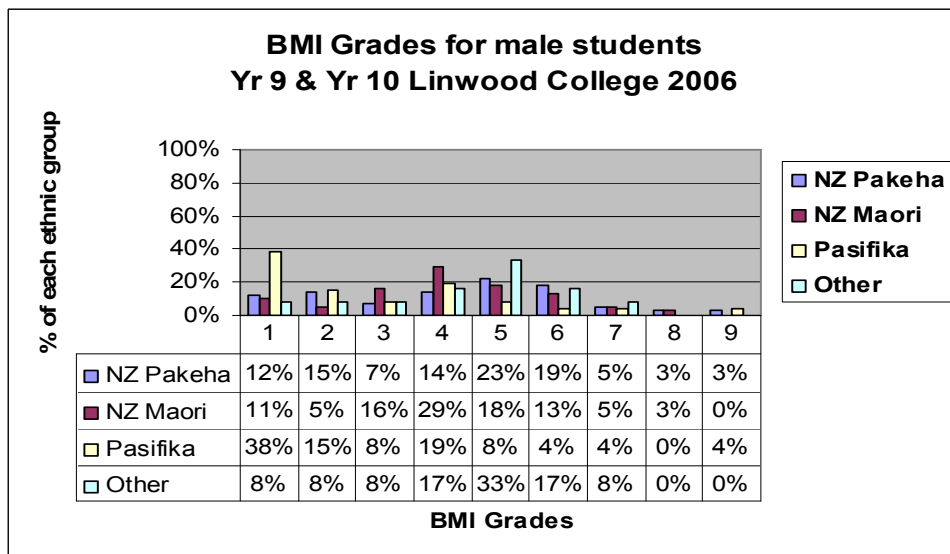
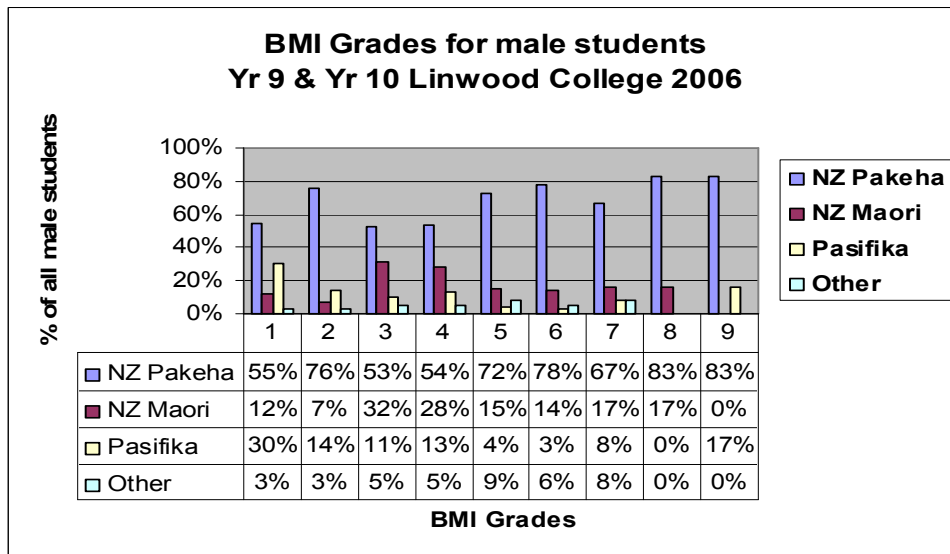
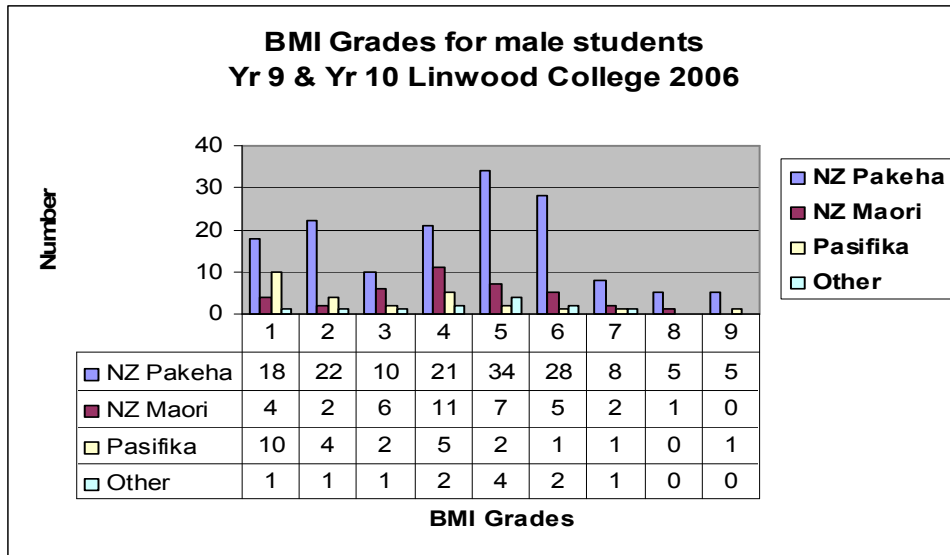
Grade 1 are considered to be obese - 19%

Grade 2 are considered to be overweight - 13%

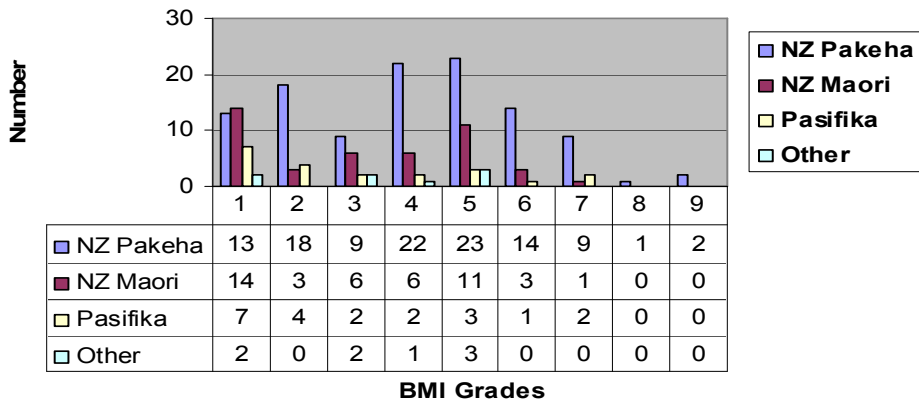
Grade 9 are considered to be considerably at risk - 1%

There are considerably fewer girls in the below 25% category compared to boys but there are more in the highest two categories. The graph is also skewed to the higher end.

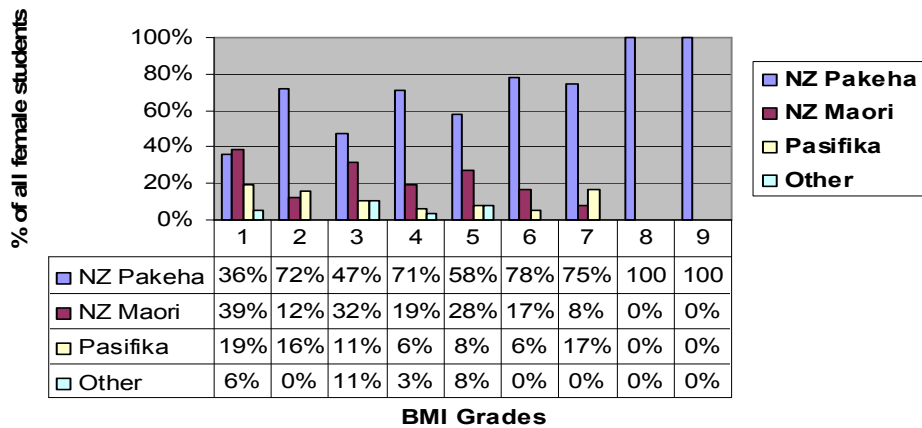
Separating by Ethnicity



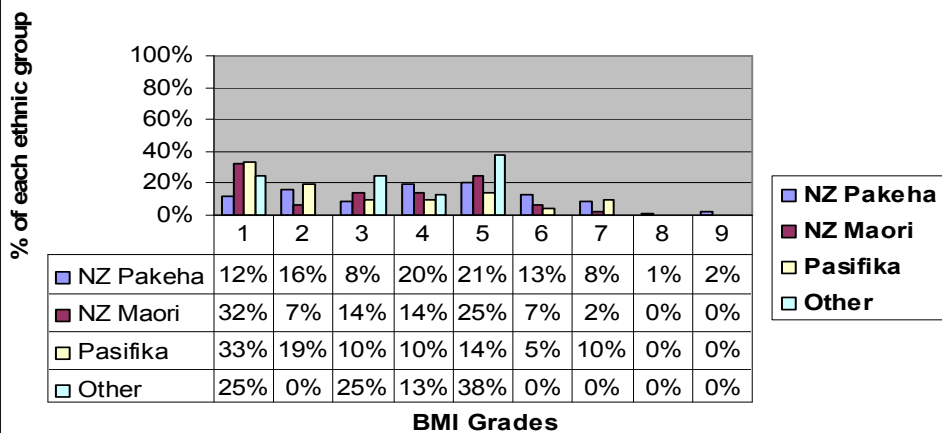
BMI Grades for female students Yr 9 & Yr 10 Linwood College 2006



BMI Grades for female students Yr 9 & Yr 10 Linwood College 2006



BMI Grades for female students Yr 9 & Yr 10 Linwood College



Discussion

The Ministry of Health recommendation for BMI to be used in preference to waist or Fat Index as it is more reliable meant the results for waist measurement and Fat Index were not needed.

There appears to be conflicting medical opinion on what constitutes a normal Blood Pressure range in adolescents. The results for Blood Pressure for Linwood College were such that every reading was within the bounds of a 'normal reading'. Hence there was no discrimination produced with any of the Blood pressure readings.

This is in itself good news in that no student had an abnormal reading. There was one curious result in that some of the larger Samoan girls were larger than a standard cuff can accommodate and they needed an electronic reading.

These results for BMI were compiled using the Health measurement of BMI adjusted for age in line with Ministry 2006 paper.

15% of boys in obese category
13% of boys in overweight category

19% of girls in obese category
13% of girls in overweight category

Combined 17% of students in obese category
13% of students in overweight category

Compare this with the 2006 Government datum that 30% of NZ students are obese.

This means 30% of Linwood College students are in the overweight or obese categories.

Obesity is related to exercise and aerobic fitness levels.

The Report on the levels of Aerobic Fitness of Year 9 and Year 10 students at Linwood College, A. Parris, 2007, places 72% of the student population in the Superior or Excellent fitness category and 87% in the Superior, Excellent or Good fitness categories. Only 1 % are very poor, 3% poor and 9 % are fair. No girls were in the Very Poor category and there were only 13% of the students in the Fair and below categories.

If this is to align itself with the 30% in the overweight or obese categories, then there appears to be something amiss. It would tend to suggest that there are a significant percentage of students who are overweight or obese but who are in Good or Excellent Aerobic Fitness categories.

Whilst this is a desirable condition to be in it suggests that the BMI measuring tool may have some disadvantages.

New Zealand has an ethnically diverse population. Among adult New Zealanders:

- 80% identified as New Zealand European

- Maori 14.7%
- Asians 6.6%
- Pacific 6.5% (Statistics New Zealand 2004).

Children were found to be more ethnically diverse compared to adults in the recent census (2001), with 18% (versus 6% in adults) identifying with more than one ethnic group.

Looking at the proportions for New Zealand children:

- 75% identified as New Zealand European
- 24% as Maori
- 11% as Pacific
- 7% as Asian

Quoting from quoting from An Analysis of the Usefulness and Feasibility of a Population Indicator of Childhood Obesity, Ministry of Health 2006 again

“The appropriateness of international BMI-for-age cut-offs for New Zealand children from different ethnic groups remains controversial. If these reference levels are inappropriate for Maori and Pacific children, any results would overestimate the prevalence of overweight and obesity in these ethnic groups. A small study of New Zealand children (n = 79) by Rush found higher BMIs in Maori and Pacific compared to European children, but similar levels of percentage body fat (PBF) (Rush et al 2003a). Another study (n = 172) by the same research group found Maori and Pacific girls (ages 5–14 years) to have 3.7% lower body fat levels compared with European girls for any given BMI, which conversely meant that for any level of percentage body fat the equivalent BMI was 2 to 5 units higher (Rush et al 2003b). Similar differences in body composition were not demonstrated in boys. A larger study (n = 2273) by Tyrrell in Auckland primary school children found a significant difference in the relationship between body composition and BMI in Pacific children in the higher BMI (over 30) range only (Tyrrell et al 2001). The authors concluded that this difference was not clinically significant and cautioned that accepting higher BMI values for Pacific children would be accepting a different level of health in these children, who are already at higher risk of obesity-related disease. They recommended that the same BMI cut-offs be used for New Zealand children of all ethnicities.”

This study and the Aerobic Fitness report would tend to suggest that there is a difference in the BMI of our ethnic makeup in New Zealand compared to those used in the northern hemisphere and currently used here.

Recommendation

There needs to be a comprehensive study to ascertain relevant New Zealand BMI charts and this needs to be linked to Aerobic Fitness rather than arbitrary percentage population levels.

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