child and adolescent *physical activity* and *nutrition* (CAPANS) survey 2003

REPORT

premier's physical activity taskforce

child and adolescent *physical activity* and *nutrition* (CAPANS)

survey 2003

REPORT

AN INITIATIVE OF THE PREMIER'S PHYSICAL ACTIVITY TASKFORCE, WESTERN AUSTRALIA

ACKNOWLEDGEMENTS

This report is a joint project of the Premier's Physical Activity Taskforce (PATF), Healthway and the Department of Health, Western Australia. The survey was undertaken from September – December 2003 under contract to the University of Notre Dame Australia.

University of Notre Dame Australia:
Research Team - Dr Beth Hands (Project Director), Professor Helen Parker, Colleen Glasson, Sally Brinkman and Helen Read.

Project Officers - Bailey Bosch and Jessica Rose.

Report Writers - Paola Chivers and Tahlia Maslin.

Field Team - Dragina Basanovic, Carine Bishop, Darcy Bosch, Kezia Bosch, Susan Bosch, Saul Bosch, Lucy Chaffer, Laura Davies, Beverley de Salis, Fiona Flood, Tracy Fuhrmann, Rolanda Geneff, Alina Griffiths, Shana Jamieson, Dianne Lunt, Shona MacLeod, Leigh Marian, Renee Myles, Sarah Priest, Emma Spillman, Vanessa Stansbie, Glenda Trevaskis, Danielle Waring, Rachael Wood and Melinda Wright.

Data Entry - Susan Bosch, Erica Chisholm, Rob Duffield, Holly Hands, Kim Hands, Melanie McNeill and Helen Ostrick.

Food Coders - Dragina Basanovic and Laura Davies.

Evaluation and Monitoring Working Group:
Physical Activity Sub Group - Dr Fiona Bull, Associate Professor Billie Giles-Corti, Rex Milligan, Gavin McCormack, Trevor Shilton and Dr Jo Clarkson.

Nutrition Reference Group - Margaret Miller, Professor Colin Binns, Dr Deborah Kerr, Dr Janine Barkess and Christina Pollard.

PATF Secretariat:
Project Manager - Jennifer Riatti

Funding Provided by - Healthway and the Department of Health.

Pilot Schools - Ashburton Drive Primary School, Clarkson Primary School, West Greenwood Primary School, Carine SHS and Halls Head SHS.

SUGGESTED CITATION

Hands, B., Parker, H., Glasson, C., Brinkman, S. & Read, H. (2004). *Physical Activity and Nutrition Levels in Western Australian Children and Adolescents: Report.* Perth, Western Australia: Western Australian Government.

Any enquiries regarding this publication should be directed to Premier's Physical Activity Taskforce Secretariat, Department of the Premier and Cabinet, Subiaco, Western Australia, PO Box 1239, 6904.

ISBN: 0 7307 0230 8

This report is available at: http://www.patf.dpc.wa.gov.au

Published by the Western Australian Government.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

FOREWORD

Physical activity and good nutrition are now recognised as two of the most important factors for developing and maintaining good health.

To determine the levels of physical activity and nutritional habits of Western Australian children and adolescents, the Children and Adolescent Physical Activity and Nutrition Survey (CAPANS) was conducted in 2003.

The preliminary data from this survey was released in November 2004 in the form of a brief report. This latest report provides the full results and accompanies two technical reports. This is the first state-wide survey of children and adolescents' physical activity levels. Many of the nutrition results however are compared to those from a similar survey carried out in Western Australia in 1985.

The survey of 2,880 children and adolescents shows that over the past 18 years the number of children who are overweight or obese increased from just over 9% of males and 10% of females in 1985 to 23% of males and 30% of females in 2003.

The nutritional habits of children have also changed. More children than before are eating confectionery and snack foods while the consumption of foods vital to their health such as fruit and vegetables has declined.

It is clear that children are being active in a variety of ways. The most popular activities for both boys and girls were bike riding, playing with pets, walking for exercise and walking the dog. It is also clear however, that as children get older their levels of physical activity decline. This has important implications for their health in the future, as physical inactivity is associated with coronary heart disease, stroke, some cancers, type 2 diabetes and mental illness.

The Premier's Physical Activity Taskforce is putting in place a range of programs to encourage children to stay active, as they get older. The Taskforce has members drawn from many government departments, local government, community groups and academia. The results from this important study will be used for many years to guide the policies and programs that promote physical activity and good nutrition among our children.

Activity needs to be part of every child's day, whether at school, after school or at home. School canteens and parents need to provide the range of foods that contribute to children's wellbeing. The formation of partnerships between the relevant government agencies and parent and community groups will provide the best opportunity for success in improving children's physical health and nutritional status.

This study was a collaborative effort of the Physical Activity Taskforce, the University of Notre Dame Australia, the Department of Health and Healthway.

Dr GEOFF GALLOP MLA
PREMIER

KEY FINDINGS

The key findings of the Western Australian Child and Adolescent Physical Activity and Nutrition Survey 2003 (CAPANS) are outlined in brief below. Some of these findings have been published in an earlier report entitled *Children and adolescent physical activity and nutrition survey 2003: A preliminary report*.

1. PARTICIPATION IN DIFFERENT TYPES OF PHYSICAL ACTIVITY

1.1 Levels of Physical Activity

- More secondary students in comparison to primary students reported participating in no vigorous intensity sport, exercise or dance;
- Almost 30% of primary students and over 50% of secondary students reported doing no active play; and
- On average males recorded a greater number of pedometer step counts than females for both primary and secondary students.

1.2 School-based Activities

- Of all activities reported, physical education (PE) and school sport classes were the most prevalent for both males and females across primary and secondary school levels;
- Participation in PE and sport was reportedly higher for non-metropolitan than metropolitan secondary females; and
- 11.8% of primary males and 7.6% of primary school females, and 10.3% of secondary males and 16.7% of secondary females reported that they did not participate in PE or if they did, they were rarely active.

1.3 Non School-based Activities

- When compared by age and gender, a slight downward trend in time spent in physical activity was apparent across age groups for both males and females;
- More secondary females reported no activity than did secondary males or primary students; and
- A significant percentage of children across primary and secondary school reported participation in physical activity during the previous weekend; in most cases physical activity occurred two or three times.

1.3.1 Sport, Exercise and Dance

- For males, both soccer and Australian Rules Football were the most popular activities;
- Among females, dance, netball and swimming laps were the most popular activities;
- The overall number of activities participated in was similar for students whether they attended metropolitan or non-metropolitan schools; and
- The current Western Australian sample reported much higher participation in sports over the past twelve months than the Australian average (Australian Bureau of Statistics, 2004, Report No. 4901.0).

1.3.2 Active Play

- Bike riding, playing with pets, walking for exercise and walking the dog were the most prevalent activities for males and females in both metropolitan and non-metropolitan areas; and
- There is a steady decline with age in the number of activities participated in.

1.3.3 Household Chores

- Primary and secondary school females reported household chores as the most prevalent activity, after school PE and sport;
- Primary males rated household chores as the third most prevalent activity; and
- Secondary males rated household chores as the second most prevalent activity.

2. Active Transport

- Approximately 50% of the sample reported 'no active transport' at any time;
- In general, more students walked or cycled home from school rather than to school; and
- The percentage of males and females who reported walking or cycling to and from school on the day of the survey increased with age.

3. Physical Inactivity and Sedentary Behaviour

3.1 Physical Inactivity

- Less than one in seven primary school students reported no sport, exercise or dance activities;
- Approximately one in four secondary males and one in three secondary females reported no physical activity; and
- Metropolitan females reported much higher rates of non-participation compared with non-metropolitan students.

3.2 Sedentary Activities

- 33% percent of all males spent ten or more hours on sedentary behaviours on week-days and on weekends;
- Just fewer than 50% percent of females spent ten or more hours on all sedentary behaviours; and
- Secondary school males spent more time than primary school males engaged in sedentary activities during the week.

4. Attitudes Towards Physical Activity

4.1 Motivators to Participate in Physical Activity

- A very high percentage of male and female students agreed that physical activity *keeps me healthy, makes me feel good about myself,* and *keeps me fit;*
- More metropolitan than non-metropolitan primary school females agreed physical activity helps them *to study and learn better*, *improves their appearance*, makes their *parents/carers happy* and *helps them make new friends*; and
- The level of agreement among females about physical activity *providing fun* reduced with age.

4.2 Barriers to Participation in Physical Activity

The main barriers for primary and secondary students include:

- Current physical activity perceived to be sufficient;
- No one to be physically active with;
- A preference for TV/electronic games; and
- Not being very good at physical activity.

5. Nutrition

5.1 Types of Food Eaten on the Day of the Survey

- At least half ate breakfast cereals, including muesli and porridge;
- About 90% consumed milk and milk products;
- 75% ate meat, poultry and game products and dishes;
- 70% ate vegetables;
- 55% of males and 60% of females ate fruit;
- 70% ate biscuits, cakes, pastries or pizza;
- 44% of younger (8 to11-year-old) and 50% of older (12 to 15-year-old) students ate confectionery like lollies, chocolates and snack bars;
- 30% of students ate snack foods like crisps;
- 20% of younger (8 to 11-year-old) and 30% of older (12 to 15-year-old) students drank soft drinks; and
- 33% of students ate foods from the school canteen.

5.2 Food Groups Compared to Recommended

- Average reported fruit and vegetable intakes fell well short of minimum recommended daily intakes for primary and secondary school students;
- Average reported milk and dairy food intake of secondary school females was two-thirds of the amount recommended; and
- Average intakes of meat and alternatives including poultry were substantially greater than the minimum recommended, particularly for the younger age group.

5.3 Dietary Differences Between Males and Females

Compared to females, males:

- Ate larger quantities of food and beverages;
- Were less likely to eat fruit and confectionery but more likely to eat meat, poultry and cereal foods;
- Were less likely to eat cakes, biscuits and snack foods; and
- Consumed diets with a higher nutrient density for a number of vitamins and minerals.

5.4 Dietary Differences Between Metropolitan and Non-Metropolitan Students

Compared to students living in the metropolitan area, students living in non-metropolitan areas:

- Had higher energy and total fat intakes;
- Were more likely to eat fruit, cereal foods and fats and oils; and
- Were less likely to eat meat and alternative foods including poultry, dairy milk, eggs and snack foods.

5.5 Changes in Diet

Compared to similar dietary surveys in 1985[1] and 1995[2], the 2003 survey showed:

Increases in the percentage consuming:

- Confectionery;
- Fish and fish products, but only for females; and
- Snack foods, for males only.

Decreases in the percentage consuming:

- Meat and alternative foods including poultry, but an increase in the average amount consumed;
- Eggs;
- Vegetables;
- Fruit (particularly among males);
- Milk and milk products;
- Fats and oils; and
- Sugar and sugar products.

Increases in the amount consumed of:

- Confectionery; and
- Snack foods.

Decreases in the amount consumed of:

- Vegetables;
- Eggs; and
- Fats and oils.

6. Anthropometric Measures

Height, weight and umbilicus waist girth measures were compared with the findings from the 1985 Australian Health and Fitness Survey[3].

- Males were taller by an average of 3.2 centimetres;
- Females were taller by an average of 2.8 centimetres;
- Male mean weight increased by as much as 12kg;
- Female mean weight increased by up to 6.6kg;
- Mean increases were 5.1kg for both males and females;
- Waist girths were larger at all ages;
- Males' girths increased by as much as 5.8 centimetres;
- Females' girths increased by up to 11 centimetres;
- Male mean waist girths increased by 5.6 centimetres; and
- Female mean waist girths increased by 7.4 centimetres.

7. Body Mass Index

Body Mass Index (BMI) was derived for each student. This is a height to weight ratio (kg/m^2) widely used as a means of identifying the overweight and obese. Findings showed that the prevalence of overweight and obesity in 7 to 15-year-old students increased from 9.3% of males and 10.6% of females in 1985 to 21.7% of males and 27.8% of females in 2003.

Aside from age, variables considered as main predictors of BMI include:

- Lower levels of physical activity;
- Regularly skipping breakfast; and
- Eating fast food more than once a week.

1. Department of Community Services and Health (1989) National Dietary Survey of Schoolchildren (10-15 years): 1985 no 1-Foods consumed, AGPS, Canberra
2. Australian Bureau of Statistics and Department of Health and Aged Care (1999) National Nutrition Survey Foods Eaten Australia 1995, ABS cat. no. 4804.0, Canberra: ABS.
3. Pyke, J. E. (1987). *Australian Health and Fitness Survey 1985.* Parkside, SA: Australian Council for Health, Physical Education and Recreation.

WESTERN AUSTRALIAN CHILD AND ADOLESCENT PHYSICAL ACTIVITY AND NUTRITION SURVEY 2003

Executive Summary

Introduction

Physical inactivity is recognised as one of the most important risk factors for ill health in Australia. Of particular concern is the rapid increase in the prevalence of overweight and obesity among children and adolescents. This survey was undertaken by the Premier's Physical Activity Taskforce (PATF) to provide a measure of physical activity levels among Western Australian children and adolescents.

Survey Method and Sample

Data on physical activity and nutrition was collected via three visits per school during Term 3 (August 18 to September 26) and Term 4 (October 20 to December 9) of the 2003 Western Australian school year. The overall response rate was 60% (n=2,274). The sample was generally representative of the Western Australian population of males (49.7%) and females (50.3%). This survey also included an objective measure of physical activity (i.e. pedometers).

Participation in Different Types of Physical Activity

Physical education and sport classes were the most prevalent types of activities for both males and females across primary and secondary levels. When looking at non school-based activities, males reported higher levels of activity than females, and as students got older, both males and females reported spending less time on non school-based physical activities. Among males, both soccer and Australian Rules Football were the most popular activities reported. Among females, dance, netball and swimming laps were the most popular activities. The most prevalent activities classified as 'active play' were bike riding, playing with pets, walking for exercise and walking the dog. A steady decline with age in the number of 'active play' activities participated in was identified. Approximately 50% of the sample reported no 'active transport' at any time. In regards to physical inactivity, less than one in seven primary school students reported no physical activity, while for secondary students, this figure increased to one in four males and one in three females. In addition primary school males spent an average of 2.2 hours per day watching TV and primary school females 2.1 hours, which increased to 3.9 for males and 4.3 hours for females in secondary school.

Motivation to be Physically Active

A vast majority of students agreed that physical activity *keeps me healthy, makes me feel good about myself, and keeps me fit.* Secondary students are motivated more by *improving my appearance* than primary school students are. Secondary school females agreed more strongly than males with the importance of physical activity for weight loss or weight control.

Barriers to Prevent Participation to be Active

The main barriers to participation in physical activity for primary and secondary students include the perception that *current physical activity levels were already sufficient,* that there was *no one to be physically active with,* and that they *would prefer to use TV/electronic games.* Other important barriers included *not being very good at physical activity,* the *lack of parks and sports grounds* and *not liking the way physical activity made them feel.*

Daily Steps Taken by Children and Youth

On average, primary school males recorded 12,464 steps on school days, while primary school females acquired 10,673 step counts per school day. Similarly, secondary school males took more steps on average on a school day (13,741 per day) than females (11,309 per day). On weekends, primary school males and females reduced the number of steps taken in comparison to school days. Conversely, there was a slight increase in steps taken by male and female secondary students on weekend days compared to school days.

Overweight and Obesity

In comparison to findings from the 1985 Australian Health and Fitness Survey, male mean weight increased by as much as 12kg, and female mean weight increased by up to 6.6kg. In addition, waist girths were larger at all ages. The prevalence of overweight and obesity in 7 to 15-year-old students increased from 9.3% of males and 10.6% of females in 1985 to 23.1% of males and 30.5% of females in 2003. Lower levels of physical activity were identified as a key predictor for overweight and obesity.

Nutrition

Average reported fruit and vegetable intake fell well short of minimum recommended daily intakes. In contrast, average intakes of meat and alternatives including poultry were substantially greater than the minimum recommended, particularly for the younger age group. Furthermore, average reported milk and dairy food intake of secondary school females was only two-thirds of the amount recommended.

Future Efforts in Promoting Physical Activity and Nutrition

Given the decline in the number of Western Australian children and adolescents that meet current physical activity guidelines, and the rising levels of overweight and obesity, increased efforts are required to reverse trends. Benefits would include improved physical, mental and social health and greater wellbeing. There is a need for a combined effort across all sectors to increase awareness and implement effective programs. Evidence suggests that the most effective programs are comprehensive and innovative and often incorporate mass media campaigns. The creation of supportive environments, including access to safe, convenient facilities and promotion of existing facilities is also vital for creating effective and sustainable programs.

RECOMMENDATIONS

With consideration of the results of the CAPANS study and existing policies, programs and infrastructure in Western Australia, the Premier's Physical Activity Taskforce recommends:

1. Enhancing the policy and curriculum emphasis on the physical activity and healthy lifestyles program that is delivered in schools, with monitoring and evaluation of the educational outcomes in line with literacy and numeracy outcomes.

2. Implementing a professional learning program and resources for teachers in the K-10 years of schooling, to support the delivery of quality physical activity and healthy eating programs. This will include expanded Fundamental Movement Skills training for K-3 teachers so that all schools have access to trained staff.

3. Initiating communication and mass media campaigns promoting the National Child and Youth Physical Activity Recommendations to parents and children with an emphasis on decreasing sedentary behaviour.

4. Providing ongoing funding for the monitoring of child and adolescent physical activity levels, nutrition and growth status.

5. Focusing on nutrition at school and ensuring adequate accreditation in all school canteens, and sustained funding of the WA School Canteen Association to administer the accreditation and professional development of canteen staff.

6. Developing a set of resources and a professional development program for teachers around healthy eating habits for life and a corresponding mass media campaign linked to the above physical activity campaign.

7. Implementing professional development of the health work-force to promote physical activity and healthy eating.

8. Increasing the skills and capacity of community sport and recreation service providers to target children's participation needs.

9. Promoting physical activity opportunities both in and outside of school hours with an emphasis on programs that encourage the participation of female secondary students.

10. Continuing to support and expand programs which inform and encourage active transport, such as walking and cycling, among school-aged children, their parents and their teachers.

1. INTRODUCTION

In June 2001, the Premier's Physical Activity Taskforce was established to oversee the development and implementation of a whole of community approach to increasing levels of physical activity in Western Australia. This was in response to an increasing awareness at the state, national and international level of significant reductions in community physical activity levels. Similarly, there was growing concern about the increasing prevalence of overweight and obesity, which is related to both physical activity level and nutrition. While information about adult physical activity levels had been gathered through two surveys (Bull, Milligan, Rosenberg, & MacGowan, 2000; McCormack, Milligan, Giles-Corti, & Clarkson, 2003), little was known about child and youth patterns in Western Australia. The Premier's Physical Activity Taskforce initiated a survey of the physical activity levels of children and youth, which was funded by Healthway and the Department of Health. In addition, given the increasing concern about overweight and obesity, the Health Department was approached to include measures of nutrition.

In 2003, the Premier's Physical Activity Taskforce and Department of Health commissioned the University of Notre Dame Australia to gather information on current levels of physical activity, nutrition, and anthropometric measures in Western Australian children and adolescents. Few studies have investigated nutrition and physical activity together, particularly in the Western Australian population of children and adolescents. Thus, the results presented in this report provide baseline information for tracking future trends and for informing and monitoring health promotion interventions.

1.1 The Importance of Physical Activity

Physical inactivity is one of the major underlying causes of death, disease and disability in Australian adults. In terms of overall burden of disease it is the second most preventable risk factor after tobacco use (Mathers, Vos & Stevenson, 1999). Physical inactivity is reported to 'increase all causes of mortality, double the risk of cardiovascular diseases, diabetes, and obesity, and substantially increase the risks of colon cancer, high blood pressure, osteoporosis, depression and anxiety' (World Health Organization, 2003c; World Health Organization, 2003d).

Trend data over the last twenty years suggests there has been a rapid increase in the prevalence of overweight and obesity in children and adolescents (Olds, Dollman, Norton, & Harten, 2001). Moreover it appears that children and adolescents are less active on a daily basis than ever before. Some chronic illnesses have their genesis in childhood. In children, as with adults, physical activity reduces heart disease risk factors (Watts et al., 2004), body fat (Lemura & Maziekas, 2002; Pikosky, Faigenbaum, Westcott, & Rodriguez, 2002), visceral fat, and risk of Type 2 diabetes (Ferguson et al., 1999).

In general, regular physical activity provides substantial benefits to the development of physical, mental and social health in children and adolescents. Benefits include the building and maintenance of healthy bones, muscles and joints; weight control; fat reduction; efficient heart and lung function; movement skill development; social skill development (such as self-confidence, rules of fair play) and prevention and control of mental conditions (such as anxiety and depression) (Trost, 2003). A physically active lifestyle also appears to be associated with the avoidance of unhealthy behaviours such as smoking, alcohol abuse, drug use and violent behaviours, as well as the adoption of healthy behaviours such as a

nutritional diet, adequate rest and generally safe lifestyle practices (Zubrick et al., 1997). Research findings suggest "patterns of physical activity acquired during childhood and adolescence are more likely to be maintained throughout the life span, thus providing the basis for an active and healthy life" (Pate, Baranowski, Dowda, & Trost, 1996, p. 314).

Australian and international guidelines currently recommend participation in at least 60 minutes (and up to several hours) of moderate to vigorous intensity activity per day for children and adolescents (Cavill, Biddles, & Sallis, 2001; Corbin & Pangrazi, 2003, Commonwealth Department of Health and Ageing, 2004).

1.1.1 Children's Participation in Physical Activity

A number of Australian and Western Australian studies have provided limited information about the physical activity levels of children and adolescents at various time-points in the past twenty years.

In 1988 in Western Australia, data on physical activity and fitness were reported on 1,311 Perth school children aged 11–12 participating in a controlled trial of nutrition and physical activity (Jenner, Vandongen, & Beilin, 1992). Over 94% of boys and 91% of girls reported some exercise or sport after school on at least one day per week. The Western Australian Child Health Survey (Zubrick et al., 1997) of 2,737 children found that 52% of 12 to 16-year-olds engaged in moderate exercise each day, however 64% had not engaged in aerobic activity on two or three of the previous seven days.

Overall, most studies consistently reported girls to be less active than boys and identified an age-related decline for both boys and girls. Similarly, Rowland (1990) reported a 50% decline in physical activity for youth between the ages of 6 and 16 years, with the decline steepest between the ages of 13 and 18 years. The decline rate may differ for boys and girls, as Sallis (1993) found the rate was 2.7% per year for boys but 7.4% per year for girls.

1.1.2 Measurement of Physical Activity

Physical activity is defined as "any bodily movement produced by the skeletal muscles that results in energy expenditure" (Casperson, Powell, & Christenson, 1985, p. 423), and as a behaviour, it must be assessed in the field. Various methods of measuring physical activity in children and adolescents have been developed (Saris, 1986; Welk, Corbin, & Dale, 2000). Methods include self-reports such as questionnaires and diaries; and objective assessments such as heart rate monitors, accelerometers and pedometers (Kohl, Fulton, & Casperson, 2000; Trost & Brown, 2000). Self-report questionnaires are convenient and low cost, and have been widely used with children and adolescents over the age of 10 years (Baranowski, 1988; Sallis, 1991), however they are not usually suitable for younger children. For studies involving large samples, most objective measures are generally neither financially viable nor easy to administer. Pedometers, however, provide valid assessments of total volume of physical activity, are easy to use, of low cost, and ideally suited to large-scale studies (Tudor-Locke & Myers, 2001; Welk et al., 2000). After careful consideration, the chosen method for the measurement of physical activity consisted of both self-report and a pedometer measure (McCormack & Giles-Corti. 2002).

1.1.3 Pedometers

Pedometers are small motion sensor devices that record vertical movement, or each step taken, as one count. The recorded count provides a measure of overall volume of physical activity. Physical activity, therefore, is determined by the number of steps or counts taken over a period of time. Recent advances

in design have significantly improved the accuracy (Bassett et al., 1996), validity (Bassett et al., 2000; Eston, Rowlands, & Ingledew, 1998; Kilanowski, Consalvi, & Epstein, 1999; Rowlands, Eston, & Ingledew, 1997) and reliability (Gretebeck & Montoye, 1992; Tryon, Pinto, & Morrison, 1991) of the instruments. While they are unable to provide detail on frequency or intensity of physical activity, pedometer measures are highly correlated with physical activity (Kilanowski et al., 1999), and with fitness and obesity measures for children (Eston et al., 1998; Kilanowski et al., 1999; Rowlands, Eston, & Ingledew, 1999). The protocol for their use is now well established among researchers (Tudor-Locke & Myers, 2001) and some information is available about the expected daily values. Tudor-Locke and Myers (2001) report between 12,000 and 16,000 steps per day as typical for 8 to 10-year-old children, with girls expected to be lower than boys. Healthy young adults record values between 7,000 and 13,000 steps per day. Once again, females are likely to record fewer steps than males.

A limitation of the pedometer is the inability to record non-ambulatory activities such as swinging on bars, cycling, skateboarding or riding a scooter, water-based activities and those involving physical contact such as football or rugby.

1.2 The Importance of Nutrition

The importance of good nutrition and establishing healthy eating habits for children and adolescents has long been recognised. The diet adopted during these developmental years sets the stage for life-long habits that can mean the difference between good and poor health in later years (National Health and Medical Research Council, 2003).

During childhood and adolescence, good nutrition is required for normal growth and development. Too little or too much food can have an effect on this development. The optimal diet is one that provides sufficient energy, protein, vitamins and minerals to ensure that appropriate growth and development takes place. Such a diet should include plenty of grains, fruits, vegetables and legumes and adequate amounts of dairy products, lean meats, fish, poultry, eggs and nuts (National Health and Medical Research Council, 2003).

Obesity is an increasing problem for children and adolescents (Booth et al., 2003). In addition to obesity, many young people show early signs of heart disease, high blood pressure and diabetes, and rates of diagnosis are increasing (National Heart Foundation of Australia and the Cardiac Society of Australia and New Zealand, 2001; McMahon, et al., 2004). Excess energy intake and high intakes of saturated fat, salt and sugar contribute to these problems, which compound in the adult population. Developing good eating habits that can be carried into adulthood is an important aspect in determining the short and long-term health of young people.

1.3 The Interrelationship Between Physical Activity and Nutrition

Changes in levels of physical activity and nutrition are thought to be a result of globalisation, industrialisation, urbanisation, environmental change and economic development. Modern environments support and encourage sedentary behaviours and over consumption of food (Hill et al., 2003, Swinburn, Egger, & Raza, 1999). The implication is that poor nutrition and low physical activity

levels are preventable risk factors associated with 45.9 percent of the global disease burden (including cardiovascular conditions, diabetes, stroke, cancers and respiratory diseases) (World Health Organization, 2004).

The link between physical activity and nutrition has been clearly established, particularly in older children. Children and adolescents who are less active are also more likely to be overweight or obese (Dietz & Gortmaker, 1985; Epstein, Smith, Vara, & Rodefer, 1991), a risk factor for many diseases. In addition, children who are obese will, in a majority of cases, become obese adults (Australian Institute of Health and Welfare, 2003).

Booth and colleagues (2003) analysed the data from five population surveys and determined that, from 1985 to 1997, the prevalence of combined overweight and obesity among Australians aged 7 to 15 years doubled, and the prevalence of obesity trebled. While each of the five individual surveys provided valuable data about the health status of children at the time of collection, it was the subsequent analysis of the trends across time that alerted researchers to increases in the prevalence of obesity in young Australians (Booth et al., 2003). This follows on from the same trend Dollman and colleagues (1999) saw, with Australian children becoming increasingly overweight and declining in health-related fitness.

1.4 Children's Physiques

On an international level, studies have consistently reported that children's physiques are changing, in particular that height, weight and waist girth of children have been steadily increasing. While some of these physique changes are attributable to 'secular trend' (Tanner, 1962) related to healthier living conditions and better access to food than earlier generations, the changes seem to be escalating.

Several large anthropometric surveys of Western Australian children have been conducted since 1940 (Blanksby et al., 1974; Blanksby, Scott, & Foster, 1986; Goodes, 1942). Using these data sets, Hands, Parker, Blanksby and Larkin (2001) compared height, weight and Body Mass Index (BMI) for ages 6 to 16 years. They found that the children were heavier and taller in 2000 than the previous data sets, with a similar trend in both sexes. Of concern was the finding that there was a strong upward trend in weight, particularly between the 1974 and 2000 data sets, and particularly for 10 to 12-year-old children.

2. RESEARCH METHODS

This section describes the study design, sample and data collection procedures for the entire study. For specific technical information and additional information relating to the Physical Activity and Nutrition components, please refer to the supplementary reports: CAPANS Physical Activity Technical Report and CAPANS Nutrition Technical Report.

2.1 Sampling Framework

The target population was Western Australian children and adolescents in the primary school years 3, 5, and 7, and high school years 8, 10 and 11, and the sample was structured to obtain proportional representation according to the State's general population figures. The target sample size of 2,880 participants was based on several requirements:

- The ability to detect a change of 5% in physical activity level in follow-up surveys;
- The ability to take into account intra-cluster correlations; and
- Consideration of current class sizes.

2.1.1 Selection of Schools

A two-stage stratified sample design was used. The sampling frame was divided into four strata: Primary Metropolitan; Primary Non-metropolitan; Secondary Metropolitan; and Secondary Non-metropolitan and was selected by the Australian Centre for Education Research (ACER), through systematic random sampling from the total Western Australian school population inclusive of government and non-government schools. Twelve schools from each of the metropolitan strata and four schools from each of the non-metropolitan strata were selected, totalling 32 schools. Two replacement schools were provided for each school that had similar characteristics (i.e. based on metropolitan/non-metropolitan, Government/Independent/Catholic and school size). Further details on the sampling process and schools excluded are documented in the CAPANS Physical Activity Technical Report and CAPANS Nutrition Technical Report.

2.1.2 School Response Rates

A total of 34 secondary schools were approached with 17 schools agreeing to participate, resulting in a response rate of 50%. A total of 26 primary schools were approached with 19 schools agreeing to participate, resulting in a response rate of 73.1%. Overall, 36 primary and secondary schools agreed to participate from a total of 60 schools approached. The overall response rate was 60%.

2.1.3 Parental Consent

Active consent from both parents/carers and the student was sought prior to participation in the survey. Information sheets and parental consent forms (see CAPANS Technical Reports) were provided to each school for distribution to parents. The form allowed for parents or students to refuse consent to participate in the physical measurements component of the study. In addition, students could withdraw from participation at any time during the study. Students with any physical or intellectual disability were encouraged to participate in all aspects of the survey.

2.1.4 Participant Response Rates

Based on the total number of consent forms distributed per school, the average individual response rate for the study was 55.8%. There was no obvious trend in response rates for primary schools across the sampled years. However in secondary schools, the response rate decreased with increasing age of

students, year 11 students had the poorest response rates. This may have been due to the timing of the data collection in Term 4 of the school year.

2.2 Ethics Approval

The University of Notre Dame Australia Ethics Committee approved the protocol for the study.

2.3 Timing of Data Collection

The data was collected during Term 3 (August 18 to September 26) and Term 4 (October 20 to December 9) of the 2003 WA school year. Weather information was collected for each school location on all data collection days.

2.4 General Procedures

The research team visited each school on three occasions over nine days.

2.4.1 School Visit 1

Each student was allocated a unique ID and provided with a survey pack containing:
Physical Activity Questionnaire; Pedometer; Pedometer Diary; adhesive seals for the pedometer; 24-hour Food Record; measuring cups and spoons; Food Frequency Questionnaire; and a 2B pencil.

Session 1: Physical Activity Questionnaire, Pedometer and Pedometer Diaries

The students completed the Physical Activity Self-report Questionnaires while in class. After completion of the survey, the children were shown how to wear the pedometer by securing it firmly over the right hip. All students were shown how to complete the pedometer diary each day and a practice page was completed in class.

Session 2: Food Record and Food Frequency Questionnaire

In this session, three trained research assistants (nutritionists) presented the 24-hour Food Record diary to small groups of students. The participants were shown how to record their food intake by using practical examples, and responses were checked for the necessary level of detail. The Food Frequency Questionnaire was then presented. The primary school students were instructed to ask their parents to complete the forms, while the secondary students were asked to complete the questionnaire themselves overnight.

2.4.2 School Visit 2

The day after Visit 1, a research team of five (including three nutritionists) visited the school to collect the Food Frequency Questionnaire, the 24-hour Food Record and measuring cups and spoons, and to record physical measurements. Two research assistants took the anthropometric measurements of height, weight and waist girth in an area where participant privacy was ensured. The 24-hour Food Record was checked onsite for unclear or missing information so that this could be clarified with participants.

2.4.3 School Visit 3

On the ninth day after the commencement of the survey, two research assistants visited the school to collect the pedometers and pedometer diaries, as well as any other survey forms or equipment that had not been collected.

2.5 Pilot Tests

To maximise inter-rater reliability, strict protocols were developed for each of the measures and all research assistants were provided with 4 days training prior to commencement of the data collection process. As part of this training, all research assistants participated in piloting the data collection process.

2.5.1 Test Protocol and Survey tools

The proposed procedure for collecting the data was piloted in two primary and two secondary schools. At the same time, the research team conducted focus groups with students in each year group. As a result several changes were made to the survey tools and the protocol (details appear in the CAPANS Technical Reports).

2.5.2 Reliability of Year 3 Physical Activity Questionnaire

Evidence of the reliability of the Physical Activity Questionnaire was established using a 7-day test-retest procedure. This was deemed important, as children under the age of 10 are less able to report activity reliably and accurately (Baranowski, 1988). The Kappa Coefficient was used to statistically compare the agreement between responses to the same question seven days apart. The Kappa Coefficient ranged from 0.098 (low agreement) to 0.827 (high agreement).

2.6 Physical Activity Procedures

2.6.1 Physical Activity Questionnaire (PAQ)

The questionnaire was developed by the Evaluation and Monitoring Working Group of the Premier's Physical Activity Taskforce and comprised items derived from several sources, including Children's Leisure Activities Study Survey (Telford, Salmon, Jolley, & Crawford, 2004), Physical Activity Questionnaire for Adolescents (Kowalski, Crocker & Faulkner, 1997), Physical Activity Questionnaire for Older Children (Kowalski, Crocker & Faulkner, 1997), the NSW Schools Fitness and Physical Activity Survey 1997 (Booth et al., 1997), and the Australian Health and Fitness Survey 1985 (Pyke, 1987). (Refer to the CAPANS Physical Activity Technical Report for detailed information on questionnaire development). The items asked about physical activities undertaken in a typical week, activity level when at school (PE, recess, lunch), after school and on the weekend; whether the survey week was typical; and transport to and from school. Additionally, details on sedentary behaviours; motivations and barriers to physical activity; and some general demographic information were obtained. The survey instrument was modified appropriately for each age group to create three versions, specifically for year 3, years 5 and 7, and years 8, 10 and 11. There were 13 items for the year 3 version and 19 items for the other two versions.

Treatment of Data

The responses to the Physical Activity Questionnaire were entered by hand into Microsoft Access in accordance with the codes created for the study. Ten percent of records for the Physical Activity Questionnaire were re-entered for quality assurance. No significant differences were reported between the two databases.

In general, the mean plus two standard deviations was used as the cut-off point for exclusion of outliers, and provided a sufficient spread of data. Implausible responses were also excluded (refer to CAPANS Physical Activity Technical Report for more detail).

2.6.2 Pedometers and Pedometer Diary

A Yamax Digiwalker SW-700 pedometer was used to record step counts. The pedometer was worn at all times except for occasions when the participant was swimming, bathing or showering, or sleeping. Each day the step count was recorded and the pedometer reset and resealed with a small adhesive sticker (Tudor-Locke & Myers, 2001).

In primary schools, the pedometers were read, reset and resealed at school first thing each morning by the teacher or a trained parent helper. Results were recorded on a specially designed sheet. On Monday mornings, therefore, the step count was an accumulated count for Friday, Saturday and Sunday. In secondary schools, the students read, reset and resealed the pedometer each night, including weekends.

All students completed a daily activity diary over the eight days of the pedometer survey. Physical activities undertaken during the school day (i.e. before school, during school, recess, lunch, after school) and weekends (morning and afternoon) were recorded. The diary prompted participants to note whether the pedometer was placed on in the morning and removed at night as well as occasions it was removed during the day. The terminology used in the diaries differed between primary and secondary school students to accommodate comprehension and compliance differences.

Treatment of Data

The data for participants were included in the analyses only if the counts for at least 4 days were available. This decision was based on earlier research that found four to seven days of activity monitoring was required to achieve reliable (r = 0.7 to 0.8) measurement (Trost & Brown, 2000).
When cleaning the data the following rules were followed:

- If a daily step count was above 40,000 or below 1,000, the record was deleted;
- For primary school data where an accumulated count of Friday, Saturday and Sunday was recorded, Friday was calculated as the average of all ('clean') weekday step count values. The weekend (Saturday and Sunday accumulated) step count values were calculated as the difference between the combined (Fri/Sat/Sun) and the Friday (average weekday) values;
- An average weekday count was derived based on the counts for Monday to Friday. An average weekend day step count was derived based on the counts for Saturday and Sunday; and
- An average daily step count was derived by averaging the data for weekdays and the weekend, providing at least 4 days were recorded.

Pedometer Diaries

- Activities reported in the diaries were assigned energy expenditure codes as follows: 1 (light activity < 3 METs), 2 (moderate intensity activity 3 - 5.9 MET's) or 3 (vigorous intensity activity > 6.0 METs) according to Ainsworth et al. (1993).

- Each day the students reported the amount of time they did not wear the pedometer and why. In many cases, the student was involved in an activity where the wearing of a pedometer was not possible or inadvisable. In these cases, the responses were converted into steps and added into the daily step count based on the following rules:
  - All conversions were based on 'activity duration' (min) x 120 steps (Tudor-Locke, Kasse, Williams & Reis, 2002);
  - Sedentary activities, for example reading, were not included;
  - For surfing or beach activities a maximum of three hours (or 21,600 steps) was allowed; and
  - For activities where the pedometer was off for a majority of the day (5 + hours) a maximum of four hours (or 28,800 steps) was recorded. In these cases, the described activity was probably not constant the whole day, for example, beach carnivals, or swimming competitions.

2.7 Nutrition Procedures

Nutrition habits of children and adolescents were examined using a 24-hour Dietary Food Record (1985) and a Food Frequency Questionnaire obtained from the National Nutrition Survey: Nutrient Intakes and Physical Measurements 1995 (ABS, 1998a).

2.7.1 Food Record

The 24-hour dietary record method required participants to record the type and amount of all foods, beverages and supplements consumed over a 24-hour period. Participants were given specific instructions and were then asked to record everything (food, drink, water, vitamins and supplements) that they consumed over the next 24 hours. Specifically, participants were asked to note the time of consumption; name, type, brand and cooking method; food source (i.e. home, canteen, etc.); and amount eaten.

Food measuring instruments provided for use in the survey included standard metric measuring cups (1 cup, 1/2 cup, 1/3 cup, and 1/4 cup), standard metric measuring spoons (1 teaspoon, 1/2 teaspoon, 1/4 teaspoon), and a 15mL tablespoon measure. A metric ruler (school ruler or printed ruler supplied in the food record book) was used to measure the dimensions of food such as bread and steak.

After completion of the 24-hour food record period, research assistants (trained dieticians and nutritionists) interviewed each student and reviewed their food record. For those students unable to complete the record, a full or partial 24-hour recall was obtained by the research assistant. The accuracy of each participant's food record was then rated excellent, good or poor based on the interview and the food record.

Limitations

A 24-hour food record is not representative of the usual intake of an individual due to the variability of people's food intake from day to day. However, this method can be used as a measure of usual food and nutrient intake across large groups of people. Validation studies have well established that self-report of food intake under-estimates food and nutrient intake (Bandini et al., 1997; Black & Cole, 2001; Briefel et al., 1997; Livingstone et al., 1992) and those who were overweight, obese or concerned about their body weight were more likely to under-report their intake (Bandini et al., 1997; Ballard-Barbash et al., 1996).

Treatment of Data

Coding of Foods Contained in the 24-Hour Food Records

Foods recorded for each child in the 24-hour food record were coded using Foodworks Professional, a nutrition analysis software system (Xyris Software (Australia) Pty Ltd). Foodworks utilises the AUSNUT database (Food Standards Australia, 1999). Food coding clarifications were resolved by a supervisor and detailed in a separate coding manual (Glasson et al., 2004).

The database was constantly updated throughout the coding process, with the addition of 347 newly created foods. The list of new foods, and the foods on which they were based, were included into a coding manual (Glasson et al., 2004).

Exclusion of Data

Due to the poor quality of 209 of the records and the obvious under-reporting of a significant number of foods, these records were removed from the sample.

Age Adjustment of Data

The 9, 11 and 15-year-old age groups were under-represented due to sampling by school year group. Where data were aggregated across age groups, the data analyses were weighted for age and gender against the Western Australian population.

Dietary Intake and BMI

To reduce the methodological limitations of dietary assessment:

- The relationship between dietary intake and BMI was only considered for groups of children with an EI/BMR (Energy Intake/Basal Metabolic Rate) ratio >0.9; and
- The food frequency questionnaire was used to provide a more reliable estimate than the 24-hour dietary record of usual individual food and dietary patterns.

2.7.2 Food Frequency Questionnaire

The food frequency questionnaire was designed to collect information about the children and adolescents' usual pattern of eating over the last 12 months. Only qualitative information was collected; no quantities were specified.

The survey instrument included two sections. Section one asked how often, on average, participants had consumed certain food and drinks during the last 12 months. Section 2 consisted of 12 questions relating to amounts and types of foods, meals and ways of eating, with five questions asking general demographic information.

Treatment of Data

Coding of Food Frequency Questionnaires

The Food Frequency Questionnaires were scanned using an Optical Mark Recognition System. The guidelines used to edit the questionnaires were the same as those used in the 1995 National Nutrition Survey (Australian Bureau of Statistics, 1998b, p. 43). These guidelines are detailed in the CAPANS Nutrition Technical Report.

Age Adjustment of Data

The 9, 11 and 15-year-old age groups were under-represented due to sampling by school year group. Where data were aggregated across age groups, the data analyses were weighted for age and gender against the Western Australian population.

2.8 Anthropometric Procedures

Measures of height, weight and waist girth were recorded with only one participant in the room at a time. No coercion was used if a student decided they did not wish to be measured. Refusal was recorded on the data sheet.

2.8.1 Height

A Mentone Educational Portable Height Scale (PE87) stadiometer was used to measure height. Participants were measured without shoes, feet together flat on the centre of the base plate, and heels against the rod. Their back was as straight as possible, arms hanging loosely by their side, palms facing forwards. The participant's head was moved so that the Frankfort Plane was in a horizontal position (parallel to the floor). They were asked to focus straight ahead and breathe in deeply before a measure was taken. Two measures to the nearest 0.1 centimetre (cm) were taken, a third measure was taken if measures differed by 0.5 cm or more. Measurements that fell between two millimetres were recorded to the nearest even millimetre.

Treatment of Data

If two measurements were taken, then the value was the average of the two measurements. If three measurements were taken, then the value was the average of the two closest measurements (Australian Bureau of Statistics, 1998a).

2.8.2 Weight

An A&D Personal Precision Scale UC-321 was used to measure weight. The scale was placed on a hard, even surface. Participants were weighed with one single layer of light clothing (e.g. shorts, T-shirt or sports top) and without shoes. Participants stood squarely on the scale, feet together, arms hanging loosely at their side and head facing forward, remaining still until asked to move. One single measure was taken to the nearest 0.1 kilogram (kg).

Treatment of Data

Some corrections were necessary for clothing effects such as jeans or tracksuits. These were established by weighing an example of each item, and adjustments made after initial data entry (details in the CAPANS Physical Activity Technical Report).

2.8.3 Waist Girth

A KDS Steel Measurement Tape (PE93) was used to measure waist girth. Measures were taken using two protocols: Waist Girth Umbilicus and Waist Girth 10th Rib and Iliac Crest. Waist Girth Umbilicus follows the protocol for the 1985 Australian Health and Fitness Survey (Pyke, 1987) where the measure was taken at the level of the umbilicus. The 10th rib and iliac crest protocol follows the current practice and is taken midway between the 10th rib and the iliac crest (World Health Organization, 1995).

For participants who were reluctant for the measure to be taken against their skin, the measure was taken over a single layer of clothing and noted on the data sheet. Two measurements were recorded for each protocol to the nearest 0.1cm, with a third measure taken if measures differed by 0.5cm or more (Australian Bureau of Statistics, 1998a).

Treatment of Data

- When the measure was taken over a single layer of clothing, as coded on the data sheet, a correction of 0.5cm was made to the measure prior to analysis (McCarthy, Ellis, & Cole, 2003).
- Where two measurements were taken, the value was the average of the two measurements. If three measurements were taken, the value was the average of the two closest measurements.

2.8.4 Body Mass Index

Body Mass Index (BMI) was derived for each student. This is a height to weight ratio (kg/m^2) widely used as a means of identifying the overweight and obese. Based on the categories devised by Cole and colleagues (2000), the cut-point for overweight and obese was taken as the mid-year point for each age, that is, if 7 years of age, the 7.5 cut point was used, if 8 years of age, the 8.5 cut-point was used (Table 1).

TABLE 1: WEIGHT CATEGORY CUT-POINTS (COLE ET AL., 2000)

	BODY MASS INDEX EQUIVALENT TO 25kg/m² IN ADULTS		BODY MASS INDEX EQUIVALENT TO 30kg/m² IN ADULTS	
Age (Years)	**Males**	**Females**	**Males**	**Females**
7.5	18.16	18.03	21.09	21.01
8.5	18.76	18.69	22.17	22.18
9.5	19.46	19.45	23.39	23.46
10.5	20.20	20.29	24.57	24.77
11.5	20.89	21.20	25.58	26.05
12.5	21.56	22.14	26.43	27.24
13.5	22.27	22.98	27.25	28.20
14.5	22.96	23.66	27.98	28.87
15.5	23.60	24.17	28.60	29.29
16.5	24.19	24.54	29.14	29.56

3. SAMPLE DEMOGRAPHICS

A total of 2,275 Western Australian students participated in all or part of the physical activity and nutrition studies. A breakdown by age, gender, location and other demographic variables is shown in Table 2. The sample consisted of 49.8% males and 50.2% females, which is representative of the Western Australian population.

The majority of these students surveyed were born in Australia (88.9%), spoke English at home (93.4%) and lived in the metropolitan area (72.8%). Only 4% of the sample stated they were of Aboriginal or Torres Strait Islander descent.

TABLE 2: DEMOGRAPHIC PROFILE OF RESPONDENTS

CHARACTERISTICS	NUMBER (n)	PERCENT (%)	WESTERN AUSTRALIA POPULATION %^
Gender			
Male	1133	49.8	49.8
Female	1142	50.2	50.2
Age Group*			
7 years	48	2.1	
8 years	355	15.5	
9 years	79	3.5	Proportion of population in 0 to 14-year-old group = 21.4
10 years	412	18.0	
11 years	73	3.2	
12 years	451	19.8	
13 years	317	13.9	
14 years	82	3.6	
15 years	276	12.1	
16 years	182	8.0	
Location			
Non-metropolitan	619	27.2	
Metropolitan	1656	72.8	
Country of Birth#			
Australia	2023	88.9	67.8
England	61	2.7	UK = 11.0
New Zealand	35	1.5	2.5
South Africa	20	0.9	
Scotland	13	0.6	
Other	123	5.4	
Aboriginality			
Aboriginal or Torres Strait Islander	92	4.0	3.2
Primary Language Spoken #			
English	2124	93.4	84.0^^
Chinese	12	0.5	
Italian	12	0.5	
Vietnamese	12	0.5	
Macedonian	8	0.4	
Other	107	4.7	
School Level			
Primary School (7–12 yrs)	1341	58.9	
High School (13–16 yrs)	934	41.1	

* The 17 years age group was removed due to there being only six respondents.
\# The top five are specified and the remaining items grouped into 'other'.
^ From the Australian Bureau of Statistics (ABS) 2001 Census. Note: Statistics are representative of the entire population, rather than specific to children or adolescents unless stated otherwise.
^^ Indicates where English was the only language spoken.

Results are reported by age rather than year group to facilitate comparison with future surveys. The intake age for commencing formal schooling (kindergarten) in Western Australia changed in 2001, with age determined at June 30th rather than December 30th. This change will affect the age of students in each year group in the future.

The sampled ages ranged from seven to sixteen years of age. The age of each participant was calculated as his or her age in whole years on the first day of the survey. As the data collection was undertaken in school year groups, the numbers for each age group differed although each age group in the core sample was represented by at least 90 participants, with over 150 participants in age groups 8, 10, 12, 13, 15 and 16. The sample size for each survey instrument differs as some participants consented to only parts of the study and younger children completed a simpler version of some questionnaires.

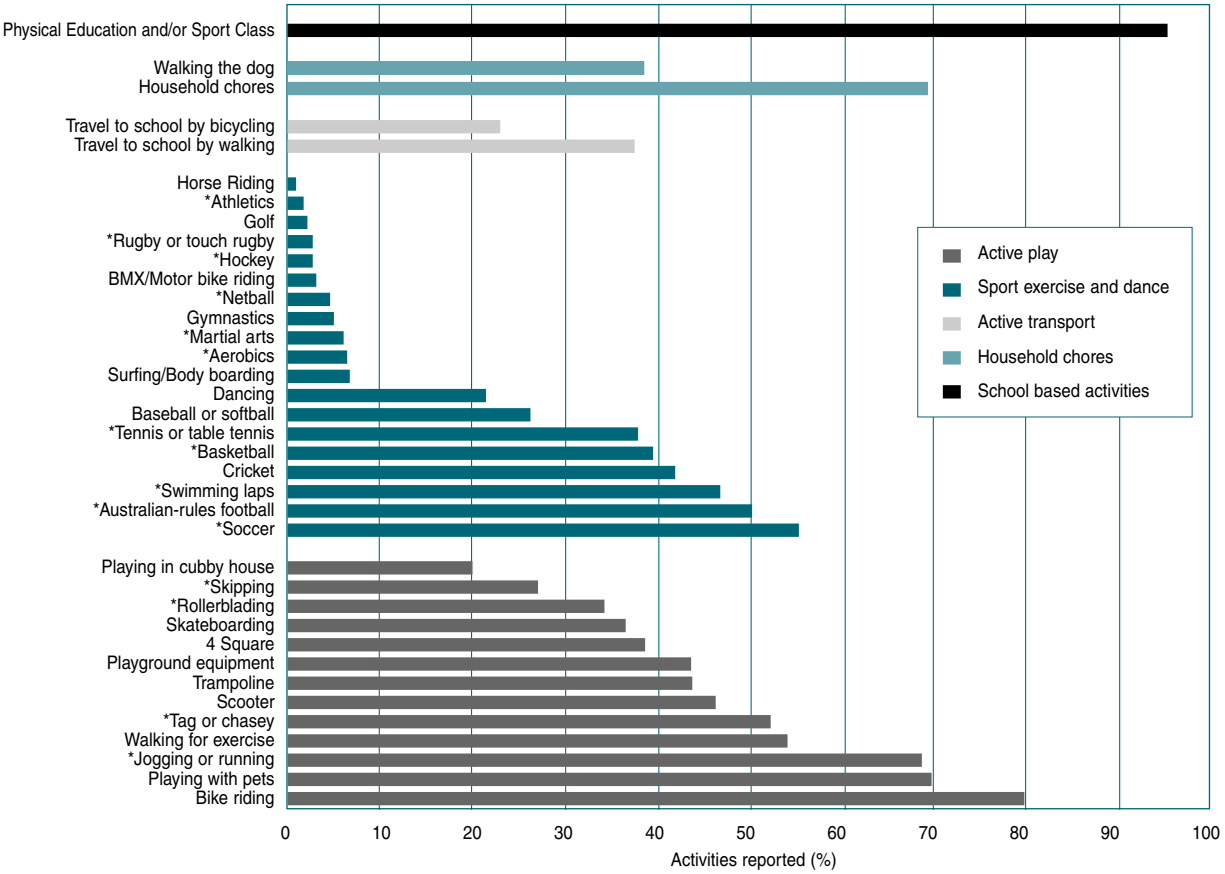
4. PARTICIPATION IN DIFFERENT TYPES OF PHYSICAL ACTIVITIES

This chapter reports the level and pattern of participation in physical activity. Data are reported for various demographic variables including age, gender and location. Participation in physical activity is broken down into four categories: sport, exercise and dance; active play; household chores; and active transport. Within each group, the activities were categorised as moderate or vigorous intensity according to the Ainsworth compendium of physical activities (1993).

Students' physical activity patterns were examined using the Physical Activity Questionnaire. Questions asked about participation in physical activities as well as frequency and duration of those activities, school-based patterns of activity, after-school activity and active transport to and from school. In addition, items addressed sedentary behaviours and attitudes and barriers to participation in physical activity.

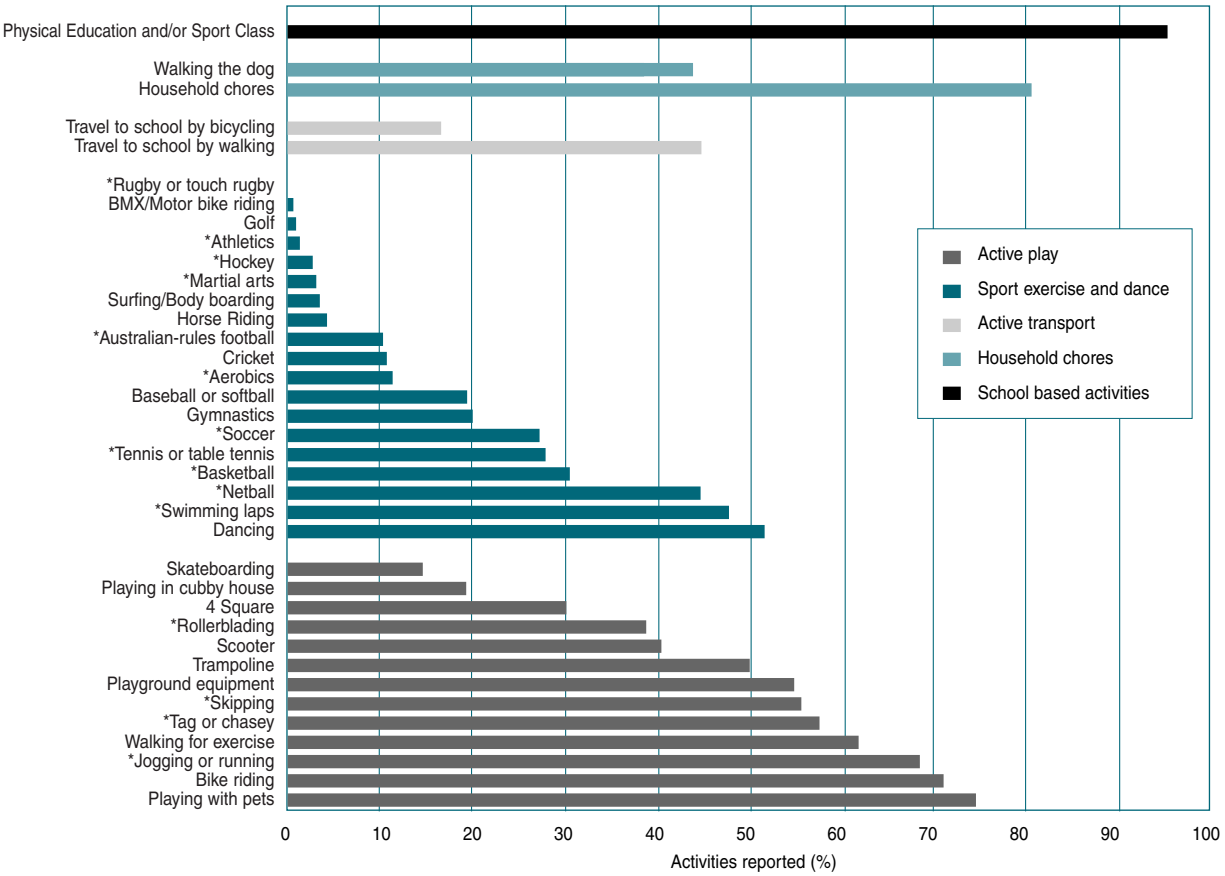
Figures 1 to 4 show the prevalence of physical activities undertaken by males and females attending primary and secondary school. Activities marked with an asterisk indicate a vigorous intensity activity. (Detailed tables for these groupings are reported in the CAPANS Physical Activity Technical Report.)

FIGURE 1: PREVALENCE OF PHYSICAL ACTIVITIES IN PRIMARY SCHOOL MALES



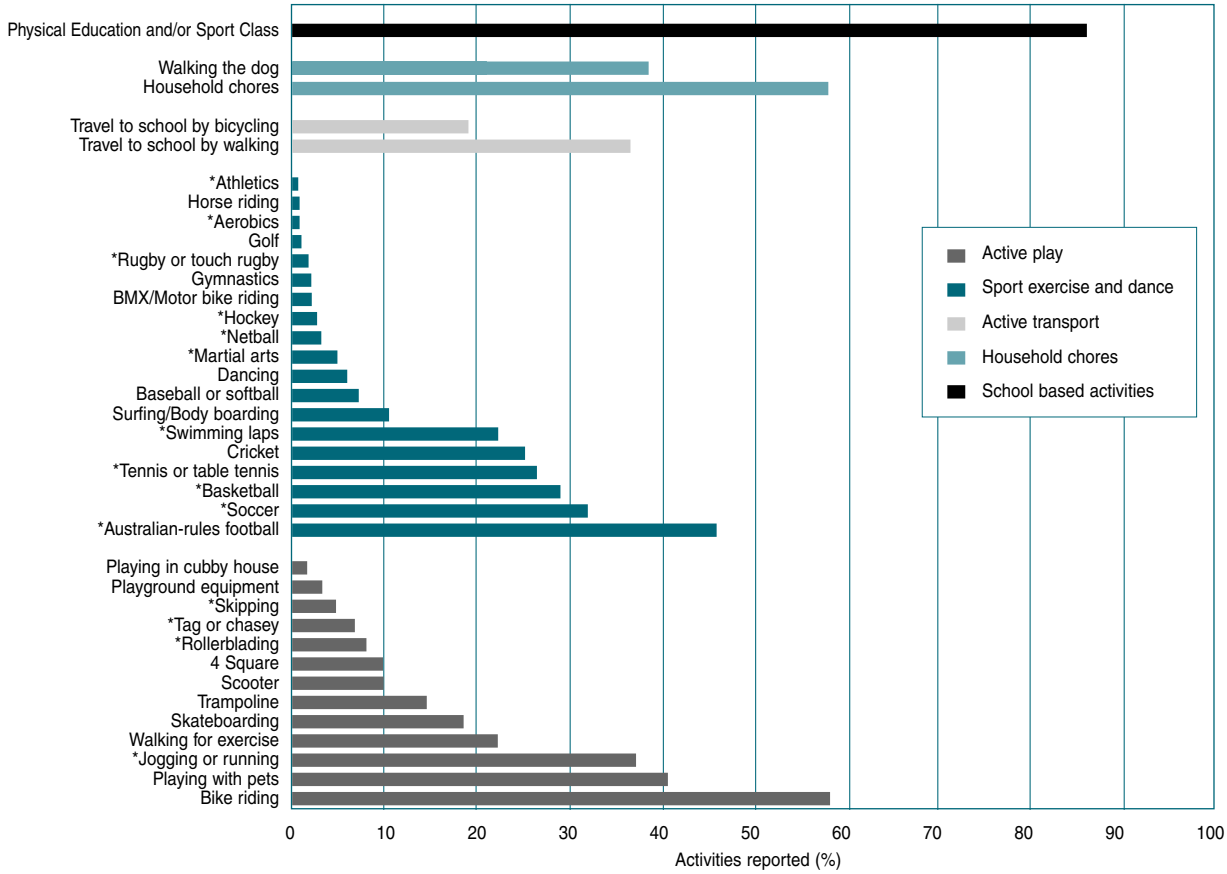
** Indicates an activity classified as of vigorous intensity.*

FIGURE 2: PREVALENCE OF PHYSICAL ACTIVITIES IN PRIMARY SCHOOL FEMALES



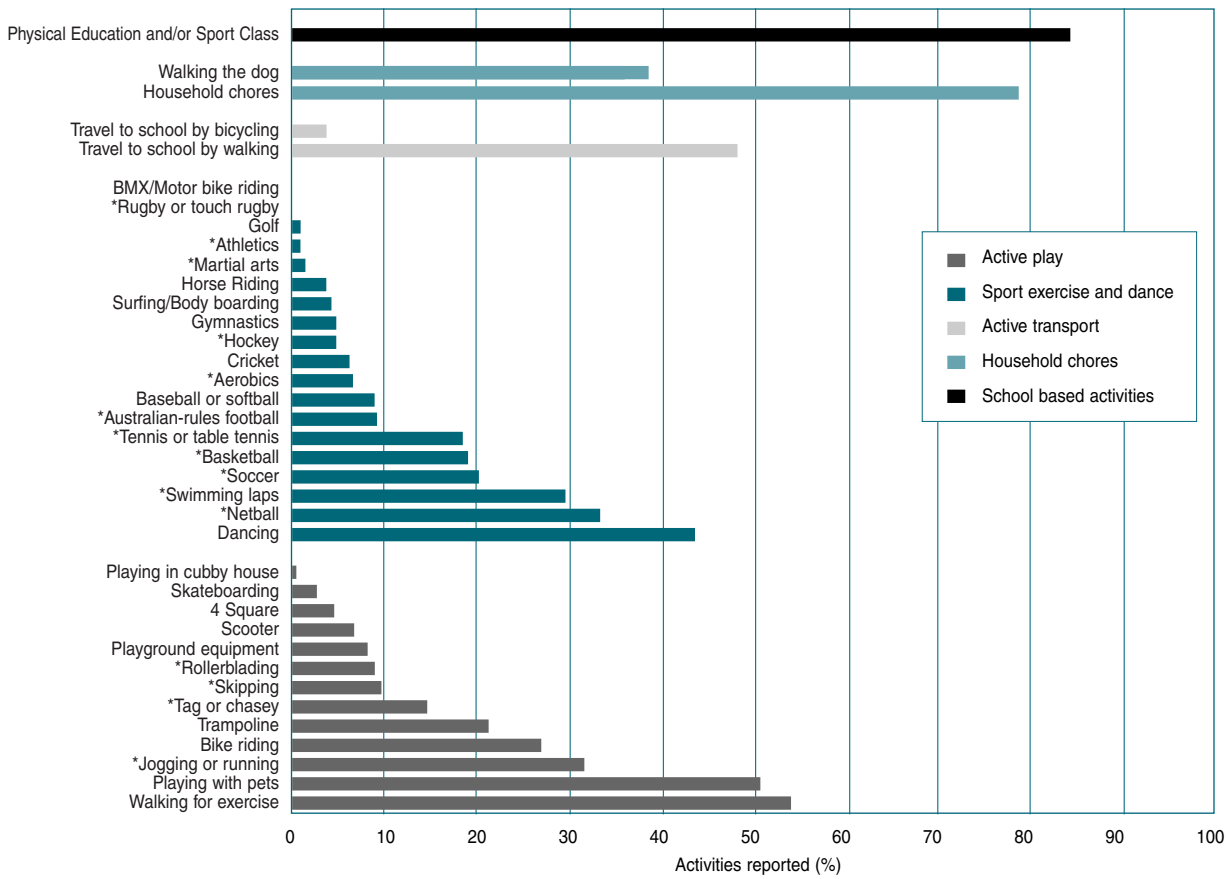
** Indicates an activity classified as of vigorous intensity.*

FIGURE 3: PREVALENCE OF PHYSICAL ACTIVITIES IN SECONDARY SCHOOL MALES



** Indicates an activity classified as of vigorous intensity.*

FIGURE 4: PREVALENCE OF PHYSICAL ACTIVITIES IN SECONDARY SCHOOL FEMALES



** Indicates an activity classified as of vigorous intensity.*

4.1 Physical Activity Levels

In comparison to primary school students, more secondary school students reported doing no vigorous intensity sport, exercise or dance. Furthermore, about half of all students surveyed reported participating in no active transport. While almost 30% of primary school students and 50% of secondary students reported doing no active play, over 90% of all students reported doing some physical education and/or sport at school. The pedometer data show both primary and secondary school males report a greater number of steps per day than females for both categories.

4.2 School-based Activity

4.2.1 PE and Sport

This section reports prevalence, frequency, duration and intensity for physical education and school sport classes. For detailed tables, refer to the CAPANS Physical Activity Technical Report.

Prevalence

Of all activities reported, physical education and school sport classes were the most prevalent for both males and females across primary and secondary school levels (Figures 1–4):

- 95.1% primary and 86.5% secondary males, and 95.1% primary and 84.5% secondary females reported participation; and
- There were minimal differences between metropolitan and non-metropolitan students except for the secondary females where more non-metropolitan females participated in Physical Education or sport (96% vs. 81.7%).

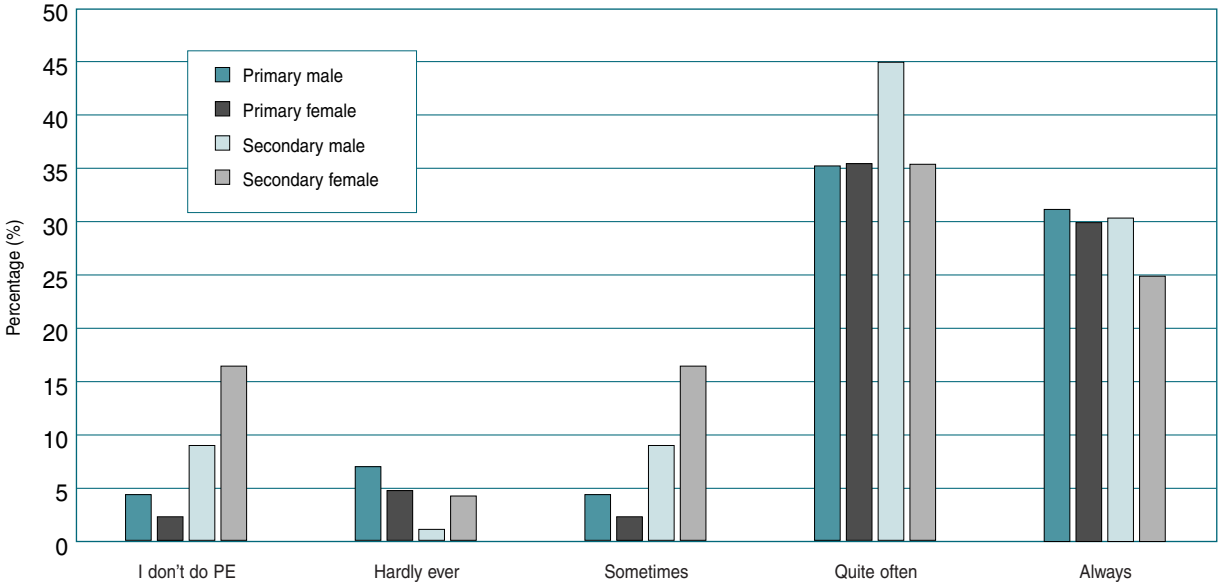
Frequency and Duration

- The frequency (years 5–11) of school-based activities showed no difference between primary school males and females;
- Secondary males participated in sport or Physical Education on more occasions than secondary females (2.5 vs. 1.9 sessions per week); and
- Secondary males also participated for a greater duration than secondary females (152.9 vs. 112.7 minutes).

Intensity

- Most students were very active ‘quite often’ or ‘always’ during PE or sport; and
- 10.3% secondary and 11.8% of primary males, and 16.7% of secondary and 7.6% of primary school females reported that they did not participate in PE or if so, they were rarely active.

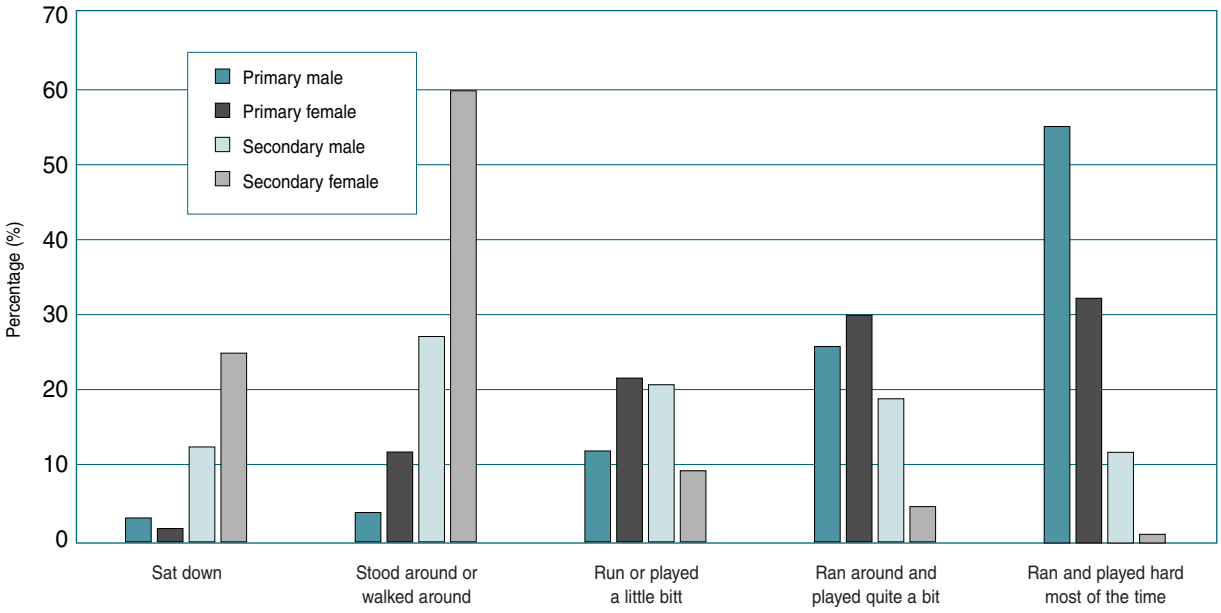
FIGURE 5: OCCASIONS 'VERY ACTIVE' DURING PHYSICAL EDUCATION CLASSES



4.2.2 Recess and Lunch

Each student's typical level of activity during recess and lunchtime was reported for the week prior to the survey (Figure 6). A very similar pattern emerged for both recess and lunch, with males reporting higher activity levels than females. Primary school students were more active than secondary school students, and secondary students, particularly females, were most likely to sit or stand around.

FIGURE 6: ACTIVITY INTENSITY DURING RECESS AND LUNCH



4.3 Non School-based Activity

Students reported how often they were 'very active' over the previous 7 days right after school, in the evenings and on the last weekend (Figures 7 to 9).

Overall, males reported a slightly higher 'out of school' activity level than females. When compared by age and gender, a slight downward trend was apparent across age groups for both males and females. In general, students were more likely to be engaged in physical activity right after school or on the weekend than in the evening.

FIGURE 7: NUMBER OF TIMES PARTICIPATED IN PHYSICAL ACTIVITY RIGHT AFTER SCHOOL IN PAST SEVEN DAYS

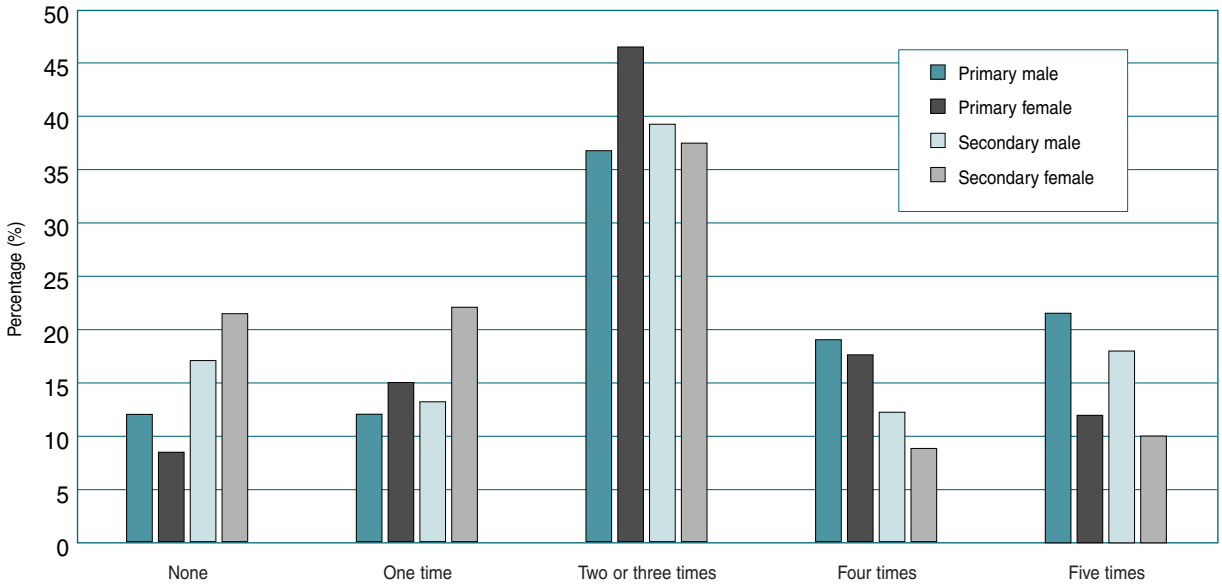
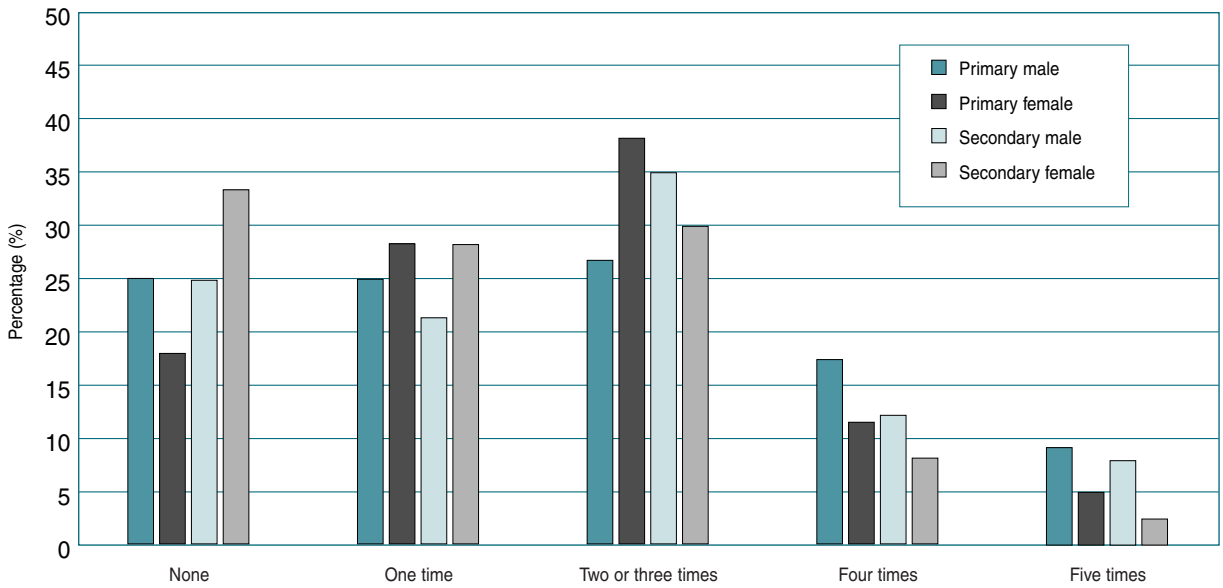


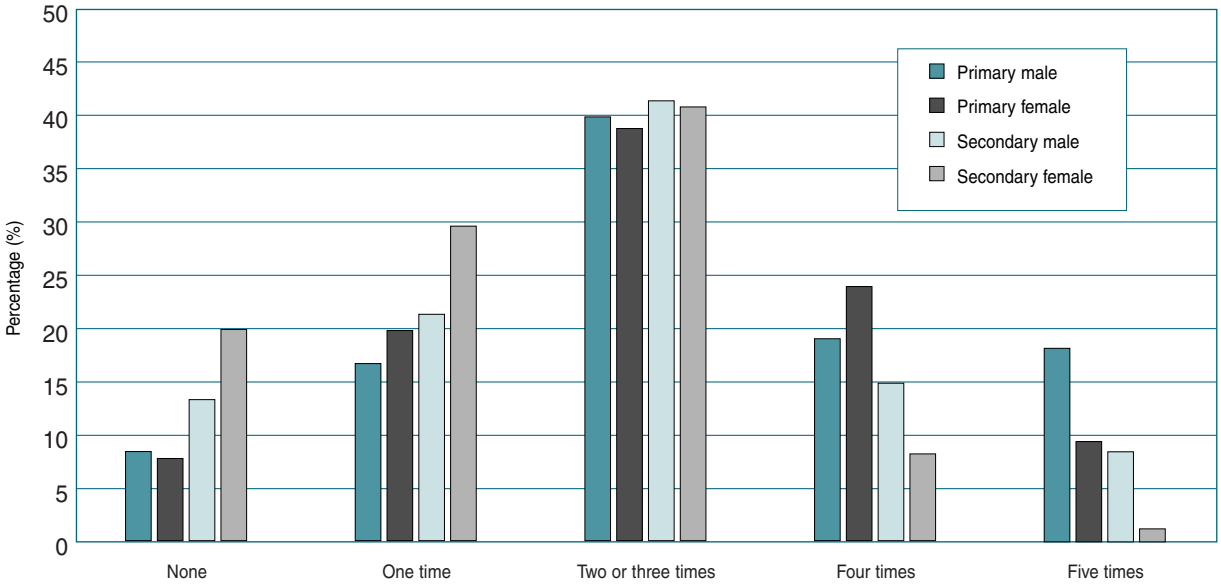
FIGURE 8: NUMBER OF TIMES PARTICIPATED IN PHYSICAL ACTIVITY IN THE EVENING IN PAST SEVEN DAYS



Physical Activity Last Weekend

More males than females reported involvement in sports, dance or games at least six times the previous weekend. More secondary females reported no activity than secondary males or primary students.

FIGURE 9: NUMBER OF TIMES PARTICIPATED IN PHYSICAL ACTIVITY IN PREVIOUS WEEKEND



4.4 Sport, Exercise and Dance

This section of the questionnaire recorded moderate intensity activities such as baseball, cricket, dance and gymnastics, and vigorous intensity activities such as Australian Rules Football, basketball, netball and soccer. Vigorous intensity activities are identified in the text, figures and tables by an asterisk.

Prevalence

- Soccer* was the most common activity among primary school males (55.2%) whereas Australian Rules Football* was more popular in secondary school males (46.2%) (see Figures 1 & 3);
- After dance (51.5% primary, 43.6% secondary), swimming laps* (47.7% primary and 29.6% secondary) was second most popular with primary school females but was replaced by netball* (44.6% primary and 33.3% secondary) for the secondary school females (see Figures 2 & 4);
- The overall number of activities was similar for metropolitan and non-metropolitan students (Table 3), although a higher percentage of non-metropolitan students did not report participation in any sport, exercise or dance;
- In general, primary school students reported more activities than secondary students;
- The drop-off in participation rates between primary and secondary schools for many of the activities was not as great for non-metropolitan students; and
- The Western Australian sample reported much higher participation in sports over the past twelve months (81.6% of males and 76.8% of females) than the Australian average (69% of males and 54% of females) (Australian Bureau of Statistics, 2004, Report No. 4901.0).

TABLE 3: PARTICIPATION IN SPORT, EXERCISE AND DANCE ACTIVITIES BY GENDER, SCHOOL GROUP AND LOCATION (% YES)

	MALES				FEMALES			
	PRIMARY SCHOOL		SECONDARY SCHOOL		PRIMARY SCHOOL		SECONDARY SCHOOL	
	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro
Aerobics*	7.5	2.7	0.7	0.9	12.8	7.7	7.5	3.3
Athletics*	1.0	2.6	0.8	0.0	1.0	1.6	0.2	1.0
Australian-rules football*	50.9	48.4	42.0	57.1	7.5	17.5	8.4	10.6
Baseball or softball	28.7	18.1	6.3	8.9	20.2	16.5	8.7	8.9
Basketball*	39.3	40.7	26.6	35.7	29.8	32.5	12.3	36.6
BMX/Motor bike riding	3.5	2.1	2.5	0.0	0.3	0.0	0.0	0.0
Cricket	44.9	33.0	23.4	30.4	10.9	10.3	6.6	4.9
Dance	24.5	12.1	6.3	5.4	52.6	48.5	45.9	37.4
Golf	2.4	1.1	1.1	0.0	0.5	1.6	0.2	1.0
Gymnastics	5.1	3.8	1.7	2.7	21.5	16.0	5.7	1.6
Hockey*	2.4	4.7	2.5	2.6	2.6	2.0	5.1	4.0
Horse Riding	1.2	0.0	0.3	1.3	6.2	7.7	4.1	1.0
Martial arts*	7.3	5.8	5.4	6.6	2.1	4.5	1.2	1.0
Netball*	4.2	4.9	1.4	7.1	45.3	42.8	29.4	43.9
Rugby or touch rugby*	2.0	4.2	1.7	1.3	0.5	0.8	0.5	2.0
Soccer*	53.6	59.9	35.3	24.1	25.7	30.9	19.8	20.3
Surfing/Body boarding	6.7	6.8	9.3	10.5	3.6	2.8	3.4	7.1
Swimming laps*	50.0	37.4	21.0	25.9	49.8	42.3	27.3	35.8
Tennis or table tennis*	38.4	36.8	23.4	34.8	28.5	26.3	18.9	16.3
No sport, exercise or dance reported	7.3	6.8	18.9	22.4	5.4	5.7	15.4	16.2

**Vigorous intensity activity*

Frequency and Duration

Primary school students (years 5 and 7) and all secondary students reported the number of times (sessions) they participated in each physical activity per week. In addition year 8, 10 and 11 students also reported the duration of each activity session (see Table 4).

For vigorous intensity activities (see items with asterisk in Table 4):

- Primary school males participated in a greater number of sessions for all sports activities (except for netball and swimming laps). A similar pattern was seen among secondary students, although males reported swimming laps more often than females; and
- Secondary school males reported longer durations in all sports activities than females with the exception of aerobics, netball, and tennis/table tennis.

For moderate intensity activities where the frequency of a sport, exercise or dance activity was similar for students, the duration for males and females was sometimes quite different. For example, secondary males spent longer playing baseball and cricket for than secondary females, whereas females reported longer duration for dance and gymnastics than males.

TABLE 4: FREQUENCY (SESSIONS/WEEK) AND DURATION (MINUTES/WEEK) OF SPORT, EXERCISE AND DANCE ACTIVITIES BY GENDER AND SCHOOL GROUP

	PRIMARY SCHOOL		SECONDARY SCHOOL			
	MALE	FEMALE	MALE		FEMALE	
	Frequency (sessions/wk)	Frequency (sessions/wk)	Duration (minutes/wk)	Frequency (sessions/wk)	Duration (minutes/wk)	
Aerobics*	3.0	2.8	5.7	59.8	2.6	84.5
Australian rules football*	4.0	3.4	3.9	232.0	2.2	113.3
Baseball or softball	2.4	2.1	2.7	235.0	2.1	166.2
Basketball*	3.7	2.6	3.0	150.3	2.2	110.4
Cricket	3.6	2.6	2.8	271.1	2.3	98.3
Dance	1.6	2.9	2.7	122.3	3.5	195.6
Gymnastics	5.0	2.9	2.3	92.2	2.5	170.4
Netball*	1.5	2.3	1.3	110.6	2.5	139.0
Soccer*	3.5	3.1	3.3	184.6	1.9	106.7
Swimming laps*	3.5	3.9	3.6	192.9	3.2	153.4
Tennis or table tennis*	3.1	2.8	2.6	120.8	2.3	138.8

** vigorous intensity activity.*

4.5 Active Play

This category included moderate intensity activities such as bike riding, playing with pets, skateboarding, walking for exercise, and playing in a cubby house. Vigorous intensity activities (identified in text, figures and tables by an asterisk) included jogging/running*, rollerblading*, skipping*, and tag or chasey*.

Prevalence

- Bike riding, playing with pets, walking for exercise, and walking the dog were the most prevalent activities for males and females (Table 5);
- Primary and secondary school males reported bike riding as the most popular activity whereas primary school females reported playing with pets and secondary school females reported walking for exercise;
- Generally, secondary students reported lower participation in active play than primary students; and
- A higher percentage of metropolitan secondary males than non-metropolitan males did not report any active play activities.

TABLE 5: PARTICIPATION IN ACTIVE PLAY BY GENDER, SCHOOL GROUP AND LOCATION (% YES)

	MALES				FEMALES			
	PRIMARY SCHOOL		SECONDARY SCHOOL		PRIMARY SCHOOL		SECONDARY SCHOOL	
	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro
4 square	37.5	42.3	7.7	15.2	28.7	33.5	4.2	4.9
Bike riding	80.4	79.7	55.2	66.1	67.8	78.9	24.0	34.1
Jogging or running*	70.0	64.3	36.4	40.2	68.0	69.1	33.3	26.8
Playground equipment	45.5	37.9	3.5	2.7	56.3	50.5	9.6	2.4
Playing in cubby house	18.4	25.3	1.7	1.8	19.4	18.6	0.3	0.0
Playing with pets	70.5	67.6	42.0	37.5	72.7	78.9	46.5	61.8
Rollerblading*	36.5	27.5	9.1	5.4	40.3	34.5	9.3	6.5
Scooter	49.5	36.3	11.5	5.4	44.7	29.4	6.9	4.9
Skateboard	36.5	36.8	15.4	26.8	14.4	14.9	2.7	1.6
Skipping*	29.5	20.3	3.8	7.1	55.1	56.7	12.6	1.6
Tag or chasey*	52.5	52.5	5.2	10.7	57.9	56.2	15.0	13.0
Trampoline	43.1	45.1	11.5	22.3	49.2	51.5	19.2	26.0
Walking for exercise	53.5	56.0	22.0	23.2	60.7	63.4	54.1	52.8
No active play reported %	1.0	0.5	11.0	7.9	1.0	0.4	10.0	10.1

**Vigorous intensity activity*

Frequency and Duration

- Bike riding, particularly for males, followed by playing with pets, was the most frequently undertaken activity by all students (see Table 6);
- Playing with pets lasted for similar durations, however males spent a greater amount of time bike riding than females;
- Female secondary students spent considerably more time walking for exercise (119.2 min) than their male counterparts (14.9 min) although the frequency of walking was similar for all students;
- Frequency of active play for primary males and females was quite similar and ranged between 3.1 and 4.5 sessions per week; and
- For secondary pupils, the key difference was the shorter time that females spent in most activities.

TABLE 6: FREQUENCY (SESSIONS/WEEK) AND DURATION (MINUTES/WEEK) OF ACTIVE PLAY BY GENDER AND SCHOOL GROUP

	PRIMARY SCHOOL		SECONDARY SCHOOL			
	MALE	FEMALE	MALE		FEMALE	
	Frequency (sessions/wk)	Frequency (sessions/wk)	Duration (minutes/wk)	Frequency (sessions/wk)	Duration (minutes/wk)	
Jogging or running*	4.5	4.5	2.9	111.9	2.9	84.3
Rollerblading*	3.4	3.1	3.0	119.7	2.3	101.6
Skipping*	3.4	3.8	3.4	42.4	2.9	39.7
Tag or chasey*	4.1	3.3	3.3	71.1	3.2	57.3
Bike riding	6.2	4.7	6.0	216.6	3.4	82.1
Playing with pets	6.9	7.0	7.0	101.6	6.9	105.2
Scooter	4.5	3.8	4.5	135.1	2.6	48.7
Skateboard	4.3	3.5	4.2	266.4	2.1	55.3
Trampoline	5.4	5.1	3.5	53.1	3.2	46.8
Playground equipment	3.7	3.5	2.6	56.7	2.3	46.8
4 square	4.0	3.7	4.7	127.8	2.1	34.1
Walking for exercise	4.6	4.3	4.6	14.9	3.7	119.2
Playing in cubby house	3.9	3.7	4.1	199.3	1.5	22.5

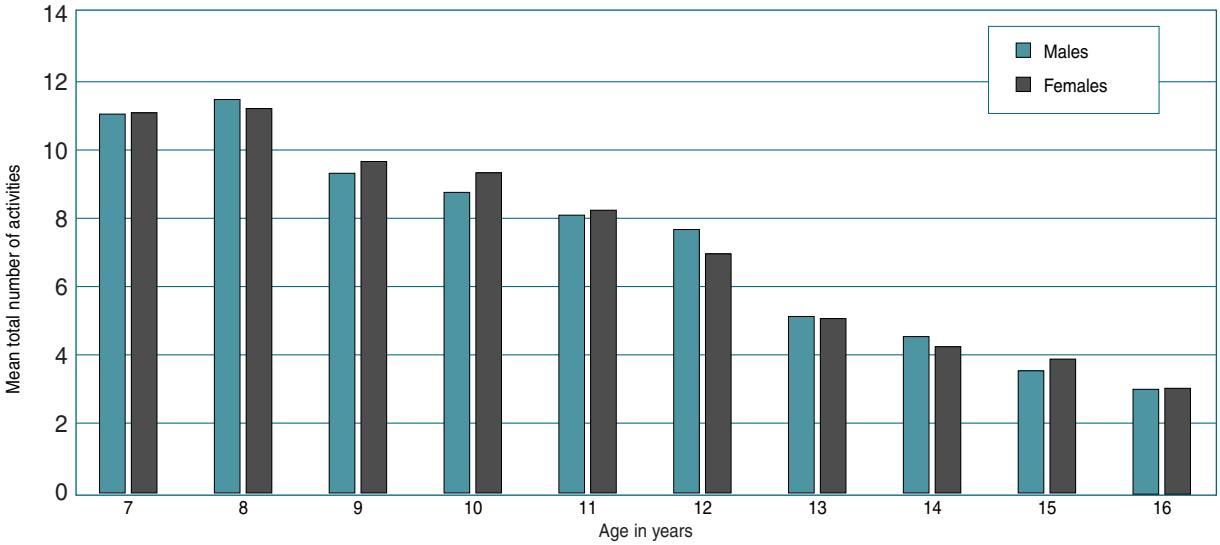
**vigorous intensity activity.*

4.6 Moderate and Vigorous Intensity Activities

The mean totals of all reported moderate and vigorous intensity sport, exercise, dance and active play activities are presented in Figure 10. The main points to be noted include:

- A steady decline with age in the number of activities can be seen with a sudden drop for students at secondary school;
- Male and females reported similar numbers of activities in any age group ranging from a peak of 11.5 at 8 years to 3.2 activities at 16 years; and
- On average, primary males and females report 9.3 and 9.4 activities, respectively, compared to male and female secondary students with 4.2 activities.

FIGURE 10: MEAN TOTAL OF ALL MODERATE AND VIGOROUS INTENSITY ACTIVITIES



4.7 Household Chores

In this category, walking the dog was included as a general household chore.

Prevalence

- Primary and secondary school females reported household chores as the second most prevalent activity (Figures 1 to 4);
- Among males, household chores rated third and second for primary and secondary school students respectively;
- Fewer secondary than primary metropolitan students undertook household chores;
- For non-metropolitan students secondary males maintained, and females increased, their reported level of activity in household chores in comparison to primary; and
- Non-metropolitan females did not report a decrease in occasions walking the dog between primary and secondary school (see Table 7).

TABLE 7: PREVALENCE OF HOUSEHOLD CHORES BY GENDER, SCHOOL GROUP AND LOCATION (% YES)

	MALE				FEMALE			
	PRIMARY SCHOOL		SECONDARY SCHOOL		PRIMARY SCHOOL		SECONDARY SCHOOL	
	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro
Household chores	69.6	69.2	54.9	67.0	81.4	77.3	76.9	84.6
Walking the dog	39.3	36.8	21.7	19.6	43.1	44.8	33.0	43.9

Frequency and Duration

Generally there was little difference between males and females in primary school (see Table 8). Within the secondary group, males tended to participate more frequently in household chores. Females reported spending more time on household chores, with males spending more time on walking the dog.

TABLE 8: FREQUENCY (SESSIONS/WEEK) AND DURATION (MINUTES/WEEK) OF HOUSEHOLD CHORES BY GENDER AND SCHOOL GROUP

	PRIMARY SCHOOL		SECONDARY SCHOOL			
	MALE	FEMALE	MALE		FEMALE	
	Frequency (sessions/wk)	Frequency (sessions/wk)	Duration (minutes/wk)	Frequency (sessions/wk)	Duration (minutes/wk)	
Household chores	6.4	6.4	5.8	104.3	5.4	137.8
Walking the dog	3.8	4.0	3.6	98.4	3.2	88.3

4.8 Active Transport

Students reported travel to and from school in three ways. The Physical Activity Questionnaire asked about travel to school on the day of the survey and travel home from school the previous day (Tables 9 and 10 respectively), and also the typical mode of travel over the school year. Finally, students noted in the pedometer diary how they travelled to and from school each day for the eight days of the study. Detailed results are available in the CAPANS Physical Activity Technical Report.

It was found that:

- The percentage of males and females who reported walking or cycling to and from school on the day of the survey increased with age;
- More secondary school students walked from the bus or train station than primary school students;
- The percentage of males and females who walked or cycled to or from school on one or more days of the previous week, rather than just on the day of the study, was slightly higher among the primary school students; and
- In general, more students walked or cycled home from school rather than to school.

TABLE 9: PERCENTAGE OF STUDENTS WHO WALKED OR CYCLED TO SCHOOL

	YEAR 3		YEAR 5 AND 7		YEAR 8, 10 AND 11	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
	n= 210	*n= 205*	*n= 493*	*n= 433*	*n= 433*	*n= 509*
Total % walked or cycled to school on day of survey	25.4	26.0	36.5	35.9	45.9	36.5
Walked all the way to school	17.4	19.1	20.5	26.4	19.2	20.0
Walked to bus/train station	2.9	4.9	2.7	3.7	14.8	14.5
Cycled all the way to school	4.8	2.0	12.9	5.8	10.2	1.9
Cycled to bus/train station	0.5	0.0	0.4	0.2	1.4	0.0
Total % walked or cycled to school over study week	27.4	39.3	36.6	32.0	41.2	33.1

TABLE 10: PERCENTAGE OF STUDENTS WHO WALKED OR CYCLED HOME FROM SCHOOL

	YEAR 3		YEAR 5 AND 7		YEAR 8, 10 AND 11	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
	n= 210	*n= 205*	*n= 493*	*n= 433*	*n= 433*	*n= 509*
Total % walked or cycled from school day before survey	29.7	30.4	44.4	39.9	49.4	47.0
Walked all the way from school	22.0	23.0	24.1	29.4	21.5	26.7
Walked from bus/train station	2.9	3.4	2.9	4.7	17.3	19.3
Cycled all the way from school	4.3	2.9	16.3	5.6	8.9	1.0
Cycled from bus/train station	0.5	1.0	0.2	0.2	1.9	0.0
Total % walked or cycled from school over study week	24.5	42.4	38.6	32.5	40.8	42.5

The responses to the question asking about typical transport since the beginning of the school year were similar and are presented in Table 11. In general:

- Approximately 50% of the sample reported 'no active transport' at any time;
- A comparison between metropolitan and non-metropolitan students showed the number of students who walked to or from school decreased from primary school to secondary school for non-metropolitan males, although this was the reverse for non-metropolitan females;
- Metropolitan males used bicycling as a mode of transport less in the secondary years, compared to non-metropolitan males where the prevalence was stable; and
- Both metropolitan and non-metropolitan females used bicycling less as a mode of transport in their secondary years compared to primary.

TABLE 11: PREVALENCE OF ACTIVE TRANSPORT BY GENDER, SCHOOL GROUP AND LOCATION

	MALES				FEMALES			
	PRIMARY SCHOOL		SECONDARY SCHOOL		PRIMARY SCHOOL		SECONDARY SCHOOL	
	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro
Travel to or from school by walking	36.9	40.1	38.5	32.1	44.1	46.4	46.2	53.7
Travel to or from school by cycling	26.4	21.8	17.5	23.2	17.8	13.9	3.6	3.3
% No active transport reported	51.8	47.3	48.3	49.1	50.4	49.5	52.0	44.7

Bicycling was a more popular mode of transport to and from school for males than females in both primary and secondary school (see Table 11). In addition, the results in Table 12 suggest most students travel actively to school on 2 to 3 days per week. There was little difference between males and females for walking, although females reported spending more time, on average, walking or bicycling.

TABLE 12: FREQUENCY (SESSIONS/WEEK) AND DURATION (MINUTES/WEEK) OF ACTIVE TRANSPORT BY GENDER AND SCHOOL GROUP

	PRIMARY SCHOOL		SECONDARY SCHOOL			
	MALE	FEMALE	MALE		FEMALE	
	Frequency (sessions/wk)	Frequency (sessions/wk)	Duration (minutes/wk)	Frequency (sessions/wk)	Duration (minutes/wk)	
Travel to or from school by walking	5.8	5.5	6.4	78.5	6.3	96.5
Travel to or from school by bicycling	5.6	4.2	6.4	104.0	4.1	123.2

Note: There and back = 2 trips.

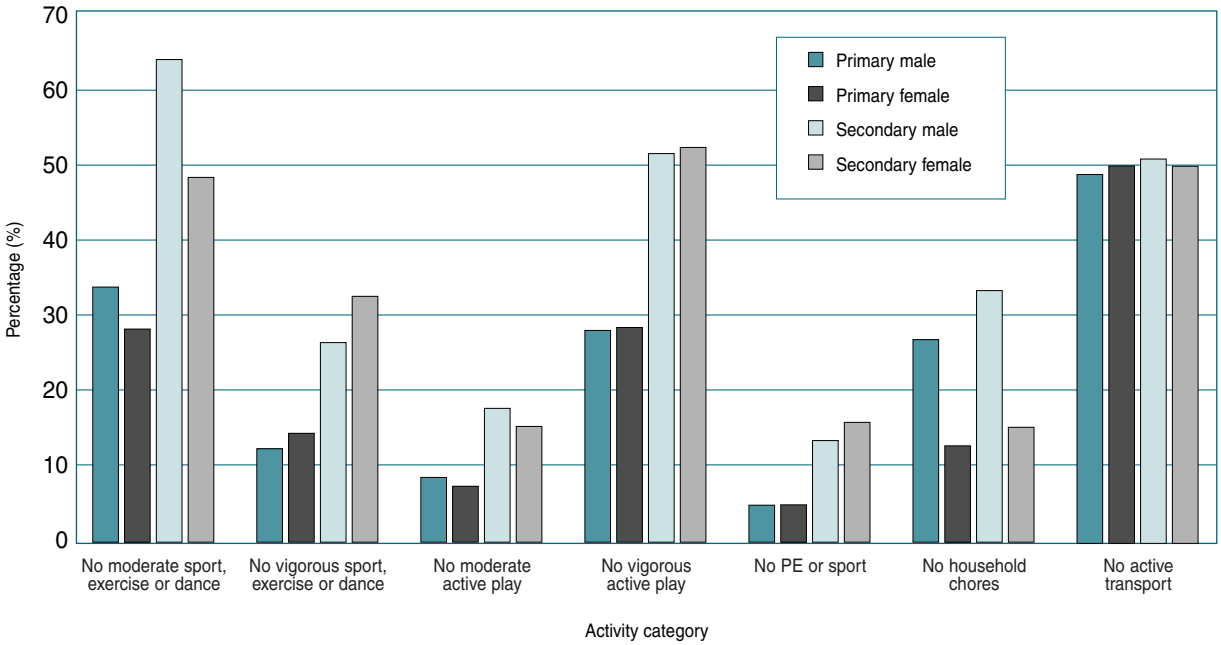
4.9 Physical Inactivity and Sedentary Behaviour

This section reports the prevalence of 'no reported activity' for any activities listed in the first question of the Physical Activity Questionnaire and reported sedentary behaviours.

4.9.1 No Reported Activity

Some students did not report participation in any of the activities listed. These results, grouped into category and then moderate or vigorous intensity activity, are presented for school level and gender in Figure 11 (see CAPANS Physical Activity Technical Report for tabulated data).

FIGURE 11: NO REPORTED ACTIVITY FOR EACH ACTIVITY CATEGORY BY GENDER AND SCHOOL GROUP



Main points of interest include that:

- Overall, the percentage of secondary students who did not report any activity was double that of primary students for moderate and vigorous intensity sports, exercise, dance, active play and school-based activities;
- There were minimal differences in the percentage reporting no participation in household chores and active transport;
- In contrast, a higher proportion of females did no vigorous intensity sport, exercise or dance compared to males;
- Less than one in seven primary school students reported no sport, exercise or dance activities compared with approximately one in four secondary males and one in three secondary females;
- Nearly one in five metropolitan secondary females and one in seven metropolitan males reported no school-based physical education or sport; and
- It appeared that non-metropolitan students reported much lower rates of non-participation in comparison to their metropolitan counterparts, especially among secondary female students.

Further details of these comparisons are available in the CAPANS Physical Activity Technical Report.

4.9.2 Sedentary Activities

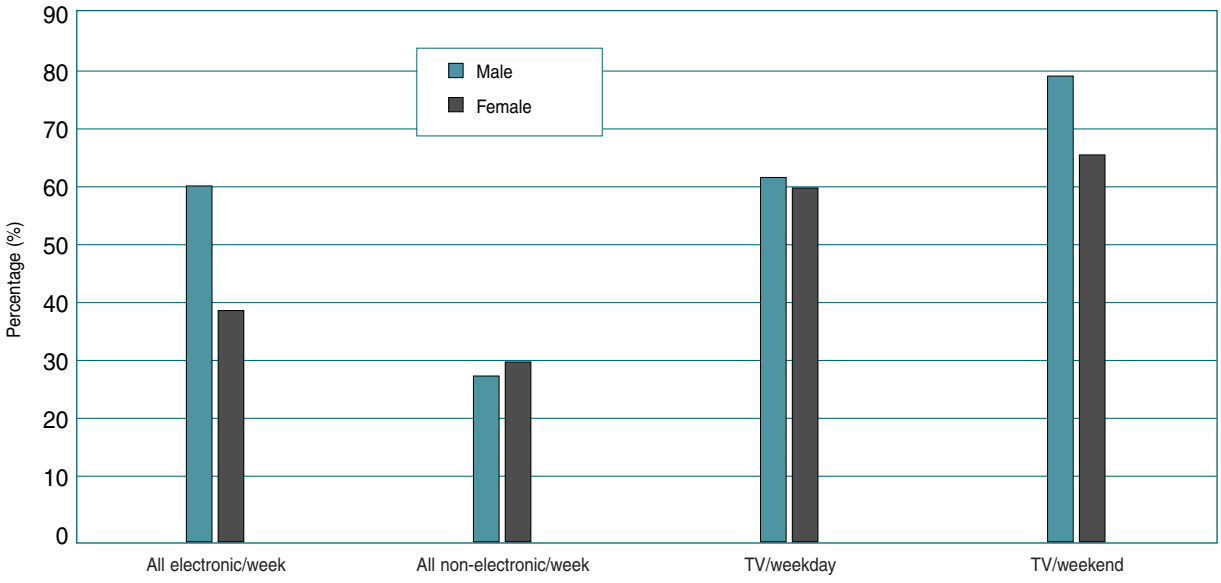
Sedentary activities, such as watching television or videos, playing computer games, reading, studying or talking on the phone were reported for weekdays, Saturday and Sunday. Years 5 to 11 reported duration in hours and/or minutes, whereas year 3 students used a simple coding system (0 = never, √ = a little bit, √√ = quite a bit, √√√ = a lot). Time spent on sedentary activities is reported in detail in the CAPANS Physical Activity Technical Report. For Years 5 to 11, results for hours per weekend was a combined score for both Saturday and Sunday (i.e. two days), while weekday scores were an average daily score.

Year 3

The breakdown for some sedentary activities by gender and age for Year 3 students is shown in Figure 12 (with tabulated results provided in the CAPANS Physical Activity Technical Report). Overall:

- More males than females spent time engaged in electronic based activities, such as watching TV or videos, or playing computer games;
- This trend was reversed for non-electronic activities such as reading or talking on the telephone;
- Males watched more television than their female counterparts, especially on weekdays; and
- Students watched more television on weekends than weekdays (higher percentage of males to females).

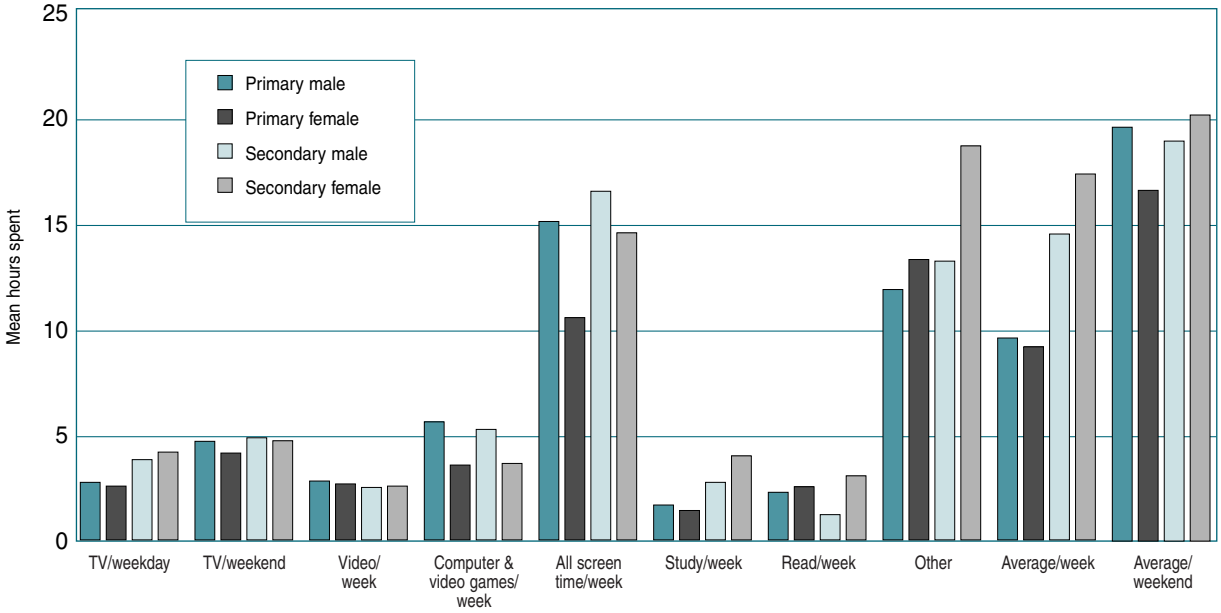
FIGURE 12: PERCENTAGE OF YEAR 3 STUDENTS REPORTING 'QUITE A BIT' OR 'A LOT' FOR SEDENTARY ACTIVITIES



Year 5 to 11

For older primary and secondary students, interesting gender differences were revealed in the way sedentary time was spent (refer to the CAPANS Physical Activity Technical report for detailed results). Figure 13 summarises sedentary activity time per category for gender across school groups, and Tables 13 and 14 provide detailed information regarding patterns of television watching.

FIGURE 13: ALL SEDENTARY ACTIVITY FOR GENDER AND SCHOOL GROUP



On average:

- Secondary school males spent more time than primary school males engaged in sedentary behaviours during the week;
- During the week, primary school males spent an average of 2.2 hours per day watching TV. This time increased for secondary school males to an average of 3.9 hours per day (Table 13);
- This trend across age groups was also seen for watching videos during the week (1.7–3.2 hours) and playing computer or video games (4.3–8.8 hours);
- Males spent between 14.7 and 20.6 hours a week on screen based sedentary behaviours, compared to 10.2 to 17.3 hours for females;
- Primary and secondary school males both spent approximately 3.5 hours a day studying or reading;
- At least one third of all males spent 10 or more hours on sedentary behaviours during the week and on weekends;
- During the week, primary school females spent fewer hours per day watching TV than secondary school females; and
- Unlike males, primary school females' weekend TV watching was 3.7 hours per weekend and increased to 4.6 hours for secondary school females (see Table 14).

Television viewing has been associated with overweight and obesity among children in both cross-sectional and longitudinal studies (Dietz & Gortmaker, 1985). One of the Australian Physical Activity Recommendations for Children and Youth states "*children and youth should not spend more than 2 hours per day using electronic media for entertainment (e.g. computer games, Internet, TV), particularly during daylight hours*" (Commonwealth Department of Health and Ageing, 2004). Among the 9 to 16-year-old students in this survey, fewer than 4.3% of males at any age group (in this case the 9-year-olds) and 2.0% (14-year-olds) to 13.9% (7-year-olds) of females met this recommendation with respect to all screen use per week. Given that the survey asked students to report only their leisure time use of a computer (not homework), these figures represent high levels of screen-based use.

TABLE 13: PERCENTAGE (%) REPORTING WATCHING TV FOR MALES BY AGE AND SCHOOL GROUP

Age in Years	9	10	11	12	13	14	15	16	Primary	Secondary
	n=29	*n=205*	*n=40*	*n=232*	*n=157*	*n=32*	*n=125*	*n=76*	*n= 478*	*n = 430*
Hours TV/weekday										
None	7.4	5.9	10.0	4.7	2.5	3.1	3.2	3.5	5.6	3.3
< 1 hour	18.5	8.8	12.5	6.5	5.1	9.4	8.0	15.1	9.0	7.9
1 to 2 hours	25.9	28.8	17.5	26.7	19.7	9.4	24.0	26.7	28.2	20.7
2 to 3 hours	14.8	27.3	20.0	24.6	26.8	31.3	20.0	17.4	24.9	23.3
3 to 6 hours	29.6	26.3	35.0	31.9	33.8	25.0	28.8	22.1	29.3	29.3
6 to 10 hours	3.7	2.9	5.0	3.9	1.9	3.1	5.6	3.5	2.9	4.2
10 + hours	0.0	0.0	0.0	1.7	10.2	18.8	10.4	11.6	0.0	11.4
Mean (Hours)	1.9	2.1	2.5	2.6	3.7	4.4	3.8	3.9	2.2	3.9
Hours TV/weekend										
None	10.3	6.6	2.4	7.7	7.6	3.1	4.8	4.7	7.1	5.6
< 1 hour	3.4	4.7	0.0	0.9	4.4	0.0	3.2	2.3	2.7	3.0
1 to 2 hours	13.8	8.5	19.0	9.0	6.3	0.0	8.8	5.8	10.0	6.5
2 to 3 hours	20.7	14.7	14.3	12.0	12.7	15.6	12.0	15.1	14.3	12.5
3 to 6 hours	10.3	30.3	35.7	36.3	32.3	34.4	36.0	27.9	31.4	33.9
6 to 10 hours	27.6	25.1	21.4	22.6	27.8	34.4	23.2	36.0	24.5	27.6
10 + hours	13.8	10.0	7.1	11.5	8.9	12.5	12.0	8.1	10.0	10.9
Mean (Hours)	4.5	4.9	4.4	4.9	4.7	5.7	5.1	5.1	4.8	5.0

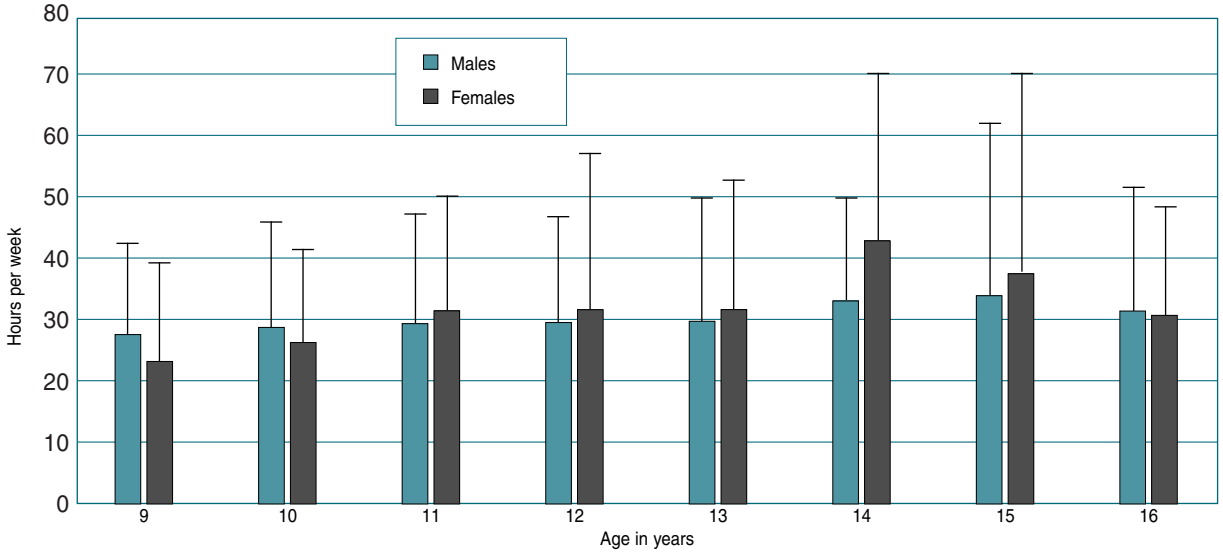
TABLE 14: PERCENTAGE (%) REPORTING WATCHING TV FOR FEMALES BY AGE AND SCHOOL GROUP

Age in Years	9	10	11	12	13	14	15	16	Primary	Secondary
	n=35	*n=189*	*n=29*	*n=215*	*n=158*	*n=50*	*n=148*	*n=96*	*n= 418*	*n = 507*
Hours TV/weekday										
None	15.0	10.1	3.4	1.4	3.8	0.0	3.4	5.2	6.7	3.4
< 1 hour	18.3	15.9	0.0	7.0	10.1	12.0	10.8	12.5	12.2	10.7
1 to 2 hours	28.3	24.9	24.1	21.4	22.2	10.0	18.2	22.9	25.1	18.5
2 to 3 hours	11.7	23.3	20.7	27.4	23.4	24.0	22.3	17.7	25.6	20.5
3 to 6 hours	23.3	22.2	37.9	27.4	22.2	24.0	29.7	27.1	25.6	25.8
6 to 10 hours	3.3	3.7	13.8	6.0	8.2	8.0	8.8	6.3	4.8	8.3
10 + hours	0.0	0.0	0.0	9.3	10.1	22.0	6.8	8.3	0.0	12.8
Mean (Hours)	1.7	1.9	2.9	3.8	4.1	5.5	3.6	3.1	2.1	4.3
Hours TV/weekend										
None	13.9	8.6	0.0	7.4	10.1	4.0	8.0	11.5	7.9	8.8
< 1 hour	13.9	2.5	10.0	1.9	3.8	4.0	4.7	3.1	3.5	3.9
1 to 2 hours	16.7	13.6	3.3	13.9	13.9	8.0	13.3	13.5	14.0	12.6
2 to 3 hours	19.4	19.2	10.0	15.7	13.9	8.0	12.7	16.7	18.6	12.6
3 to 6 hours	22.2	35.4	30.0	37.0	31.6	28.0	27.3	35.4	35.3	30.3
6 to 10 hours	8.3	14.6	33.3	16.2	20.9	24.0	20.7	13.5	15.1	20.2
10 + hours	5.6	6.1	13.1	7.9	5.7	24.0	13.3	6.3	5.6	11.6
Mean (Hours)	2.9	3.6	6.1	4.2	4.0	6.1	4.8	3.7	3.7	4.6

During the week, almost 50% of females reported spending 10 or more hours on all sedentary behaviour, while on the weekend, this percentage increased to around 66%. The pattern for males showed a similar trend, with a slightly lower percentage of participants being inactive on weekdays in comparison to females, and a similar percentage of inactive participants on weekends.

Figure 14 shows hours spent per week for all sedentary activities across ages and by gender. Of most significance was the high variability in reported hours in the older age groups.

FIGURE 14: HOURS PER WEEK FOR ALL SEDENTARY ACTIVITIES BY GENDER

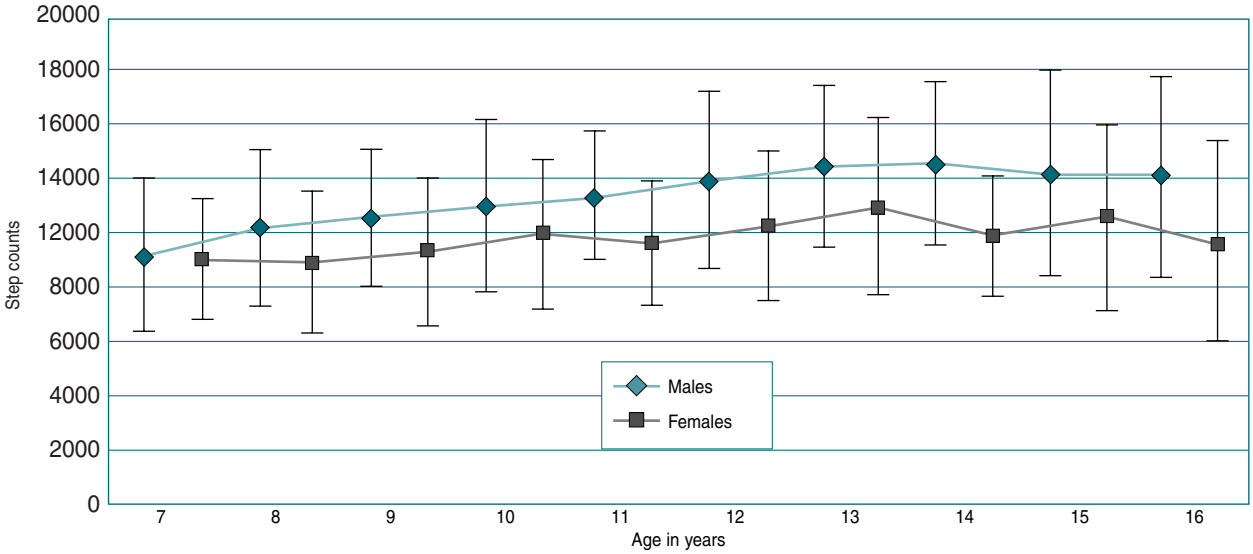


5. PEDOMETER STUDY

Participants recorded the number of steps per day over seven days (i.e. five weekdays and one weekend). The data are presented in Tables 15, 16 and Figure 17.

The level of compliance with the study protocol varied. In general, secondary school students were more likely to wear the pedometer all day. Between 44% and 58% of primary school students, and between 31.9% and 48.3% of secondary students reported removing the pedometer at some stage during the day. In many instances, the reason was to participate in an activity where the wearing of a pedometer was not possible (swimming, surfing, shower, bath) or inadvisable (rugby, football). A small percentage of students however, simply forgot to wear the pedometer. The number of students not wearing the pedometer all day increased to 57.6% on Saturday and 59.5% on Sunday for primary school students and 43.8% on Saturday and 45.7% on Sunday for secondary school students.

FIGURE 15: MEAN STEP COUNTS FOR WEEKDAYS AND WEEKENDS BY AGE AND GENDER



The mean daily step count shown in Tables 15 and 16, and Figure 15 was derived for students who reported step counts for at least 4 days. On average:

- Boys accumulated more step counts per day than girls;
- There was a slight increase with age for steps per day for both males and females, however counts started to decline among the older students;
- Secondary students achieved more steps per weekday and per weekend in comparison to primary school children; and
- Primary school children showed greater activity on weekdays than weekend days, whereas the reverse was true of secondary students. These findings conflict with previous research that has found young children to be more active on weekends than weekdays (Janz, Paulos, Bursns & Lery, 1999; Trost, 1999).

TABLE 15: MEAN DAILY STEP COUNTS FOR MALES BY AGE

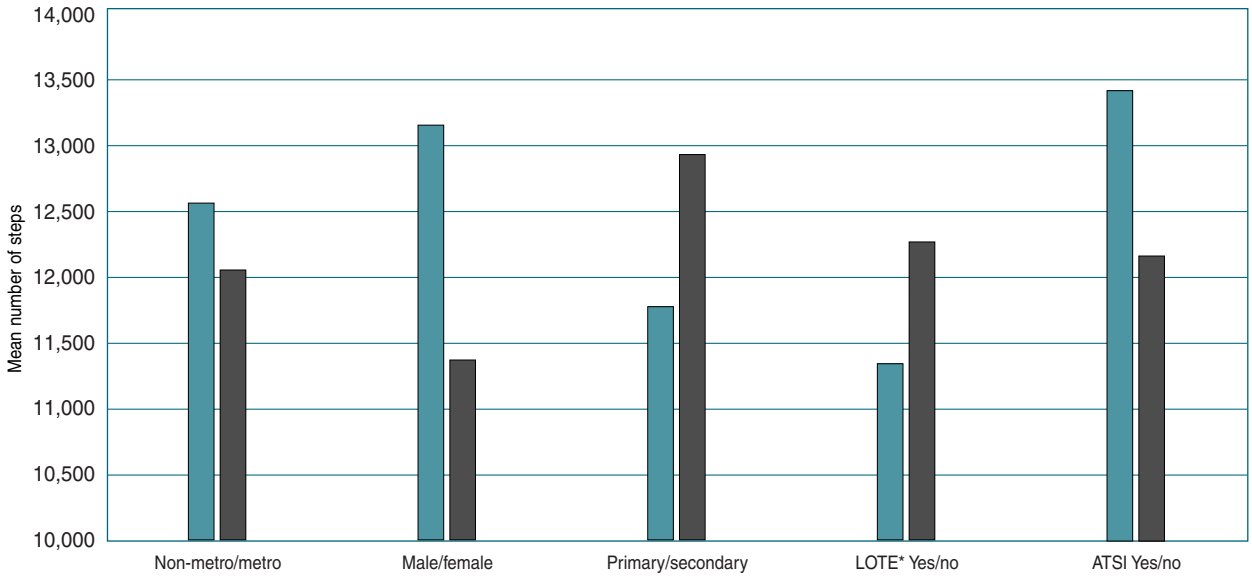
AGE	MEAN STEP COUNT PER WEEKDAY	MEAN STEP COUNT PER WEEKEND DAY	MEAN DAILY STEP COUNT
Age 7	9,886	9,209	10,337
Age 8	11,482	10,529	11,578
Age 9	12,211	9,861	12,039
Age 10	12,303	11,434	12,572
Age 11	13,530	9,725	13,056
Age 12	13,424	11,585	13,793
Age 13	13,906	14,501	14,441
Age 14	14,240	13,898	14,553
Age 15	13,729	14,509	14,124
Age 16	13,482	12,566	13,962
Primary School	12,464	10,956	12,602
Secondary School	13,741	14,101	14,167

TABLE 16: MEAN DAILY STEP COUNTS FOR FEMALES BY AGE

AGE	MEAN STEP COUNT PER WEEKDAY	MEAN STEP COUNT PER WEEKEND DAY	MEAN DAILY STEP COUNT
Age 7	10,157	10,259	10,116
Age 8	9,740	9,760	9,989
Age 9	10,311	10,321	10,461
Age 10	10,690	9,490	11,266
Age 11	11,437	7,889	10,817
Age 12	11,481	10,243	11,621
Age 13	11,967	11,809	12,577
Age 14	10,901	10,504	11,160
Age 15	11,477	11,936	12,028
Age 16	10,235	10,450	10,869
Primary School	10,673	9,839	10,846
Secondary School	11,309	11,440	11,925

Figure 16 illustrates the differences in step counts for various demographic categories. Students recorded a greater number of steps per day if they attended a non-metropolitan school, were male, attended a secondary school, spoke English as their first language or were of Aboriginal or Torres Strait Islander descent.

FIGURE 16: MEAN DAILY STEPS FOR DEMOGRAPHIC VARIABLES



** LOTE indicates that English was not the primary language spoken at home.*

5.1 High and Low Activity Levels

The students were grouped into high, medium and low level activity groups based on the tertiles of the mean daily step counts (Table 17). Almost twice as many females as males were allocated into the lowest active group, with the reverse trend evident in the high active group. Comparisons between the high and low active groups also reveal differences in reported physical activities, as well as motivators to be active and barriers to further participation. Refer to later sections headed Body Mass Index and Attitudes Towards Physical Activity.

TABLE 17: TERTILE GROUPINGS OF MEAN DAILY STEP COUNTS

	PRIMARY SCHOOL		SECONDARY SCHOOL	
	MALE	FEMALE	MALE	FEMALE
1 (low active)	*n=159*	*n=240*	*n=62*	*n=169*
	8080	7858	8176	8208
2	*n=192*	*n=195*	*n=100*	*n=140*
	11852	11853	11989	11832
3 (high active)	*n=218*	*n=108*	*n=181*	*n=124*
	16560	15667	17422	17096

5.1.1 Participation in Physical Activity

Participants reported their participation in physical activities over the past year in the Physical Activity Questionnaire (See CAPANS Physical Activity Technical Report). Comparisons between students in the highest and lowest activity groups and the number and type of reported physical activities show differences between primary and secondary students (see Figures 17 and 18). The most active primary students participated in slightly more vigorous intensity sports activities and active transport bouts, and generally reported similar numbers of all other activities compared to their low active peers. On average, the high active group of secondary students reported more activities in all categories, although the difference with respect to household chores was minimal.

FIGURE 17: HIGH VERSUS LOW ACTIVE GROUPS – PRIMARY STUDENTS

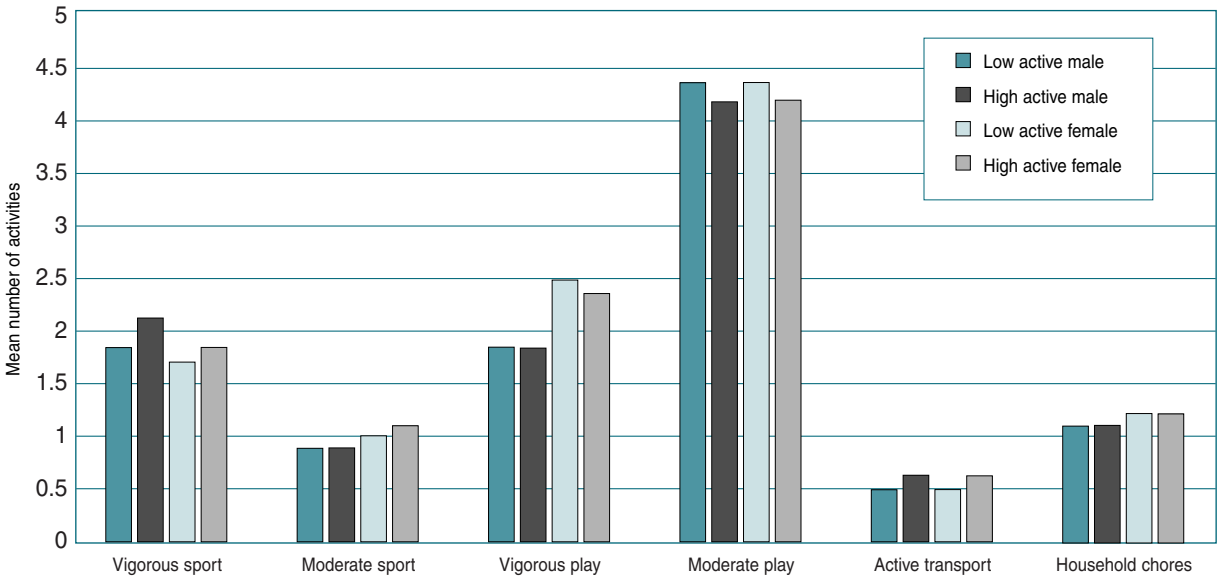
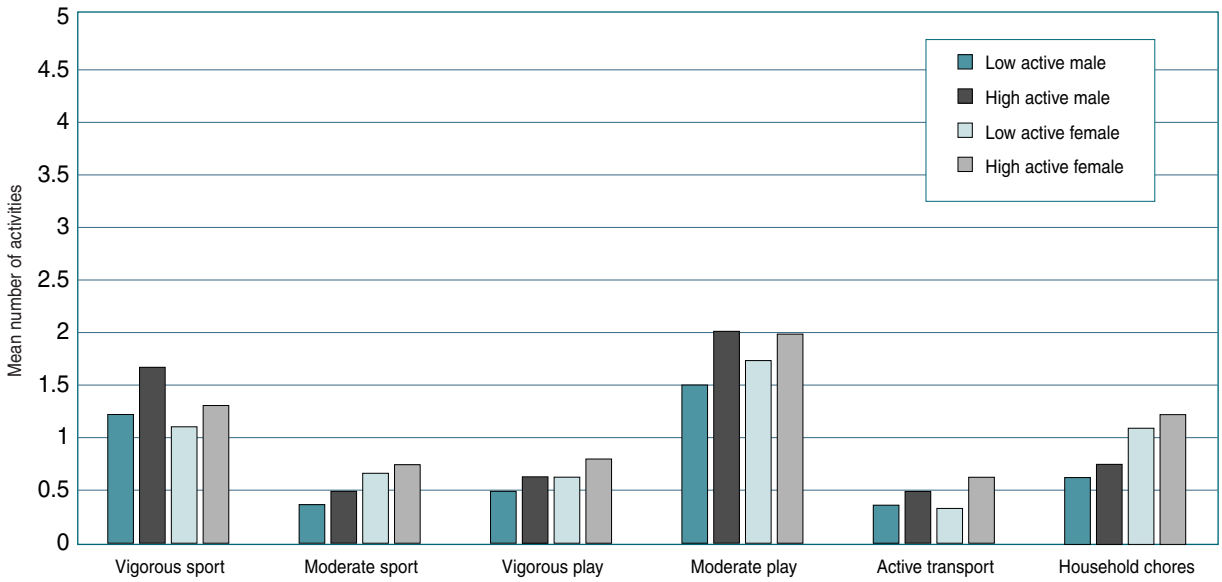


FIGURE 18: HIGH VERSUS LOW ACTIVE GROUPS – SECONDARY STUDENTS



5.2 Time Spent in Moderate and/or Vigorous Intensity Activity

During the 7-day pedometer study, each student kept a diary in which they recorded their physical activities for weekdays and weekends. These activities were coded as low, moderate or vigorous intensity. Students in years 5 to 11 also recorded the time spent in each activity. On analysis of the time spent in moderate and vigorous intensity activities (bouts of at least 10 minutes), excluding school-based PE or sport and active transport, it was found (Table 18):

- Average time spent on weekdays was generally less than on weekends for both moderate and vigorous intensity activities (approx.1 hr compared to at least 1 1/2 hrs);
- Relatively few students reported moderate or vigorous intensity activities on Saturday; and
- High numbers of students reported engaging in moderate intensity activity on Sunday.

TABLE 18: MEAN (±SD) AND MEDIAN TIME SPENT IN MODERATE AND VIGOROUS INTENSITY ACTIVITY FOR EACH STUDY DAY

		n	MEAN (sd) MINUTES	MEDIAN
Day 2	Moderate activities	824	71.7± 67.7	55.0
	Vigorous activities	609	62.2± 62.6	50.0
Day 3	Moderate activities	735	69.5±64.3	55.0
	Vigorous activities	546	60.5±52.9	50.0
Day 4	Moderate activities	743	67.4±64.3	55.0
	Vigorous activities	567	62.1±50.0	55.0
Day 5	Moderate activities	705	71.1±72.6	52.5
	Vigorous activities	545	62.4±62.1	50.0
Day 6	Moderate activities	423	73.4±72.4	55.0
	Vigorous activities	575	59.5±60.2	45.0
Saturday	Moderate activities	227	121.6±135.0	90.0
	Vigorous activities	277	96.2±96.2	60.0
Sunday	Moderate activities	721	159.6±161.7	120.0
	Vigorous activities	297	119.3±115.3	75.0

Table 19 highlights the percentage of students who met different cut-off levels of time spent in physical activity per day. In summary:

- Only 3% of the 9 to 16-year-old students reported 60 minutes of daily moderate and vigorous intensity physical activity;
- There was minimal difference when the cut off point was changed to 45 minutes daily. Reducing the cut level to 30 minutes daily almost doubled the number to 6%; and
- Although the average daily activity duration was shown to be at least 60 minutes for those students reporting activity, very few students met this level every day, especially on weekends.

It is important to note that these times were for leisure time activity and did not include school PE and sport time or active transport time, which are other prevalent and important ways of being active during the day. Also, only activity bouts of at least 10 minutes duration were coded, which was consistent with adult physical activity guidelines for accumulating activity during a day. Nevertheless, the accuracy of diary records must be considered. While the quality of diary records was rated as good by data coders, students may still have under-reported or failed to provide complete records of their daily physical activity. Face validity for the pedometer diary information was indicated by the significant correlation between students' average pedometer count and their weekly total minutes of moderate and vigorous intensity activity (r = .257, n=1418).

TABLE 19: PREVALENCE OF STUDENTS MEETING 30, 45, AND 60 MINUTES OF DAILY MODERATE AND VIGOROUS INTENSITY PHYSICAL ACTIVITY*

NUMBER OF DAYS IN THE WEEK	NUMBER OF DAYS 30 MINS PER DAY		NUMBER OF DAYS 45 MINS PER DAY		NUMBER OF DAYS 60 MINS PER DAY	
	COUNT	%	COUNT	%	COUNT	%
0	91	5.9%	156	10.0%	211	13.6%
1	216	13.9%	277	17.8%	279	18.0%
2	225	14.5%	253	16.3%	251	16.2%
3	239	15.4%	252	16.2%	250	16.1%
4	254	16.4%	241	15.5%	209	13.5%
5	248	16.0%	198	12.7%	183	11.8%
6	188	12.1%	128	8.2%	124	8.0%
7	92	5.9%	48	3.1%	46	3.0%

** Includes time in bouts of at least 10 minutes. Does not include curricular physical education and sport, or active transport.*

6. MULTI-VARIATE ANALYSIS OF PHYSICAL ACTIVITY LEVELS

This section provides the results of the mathematical modelling of selected variables used to predict physical activity. The outcome variable utilised for these analyses was the average pedometer count where at least 4 days of pedometer data were available.

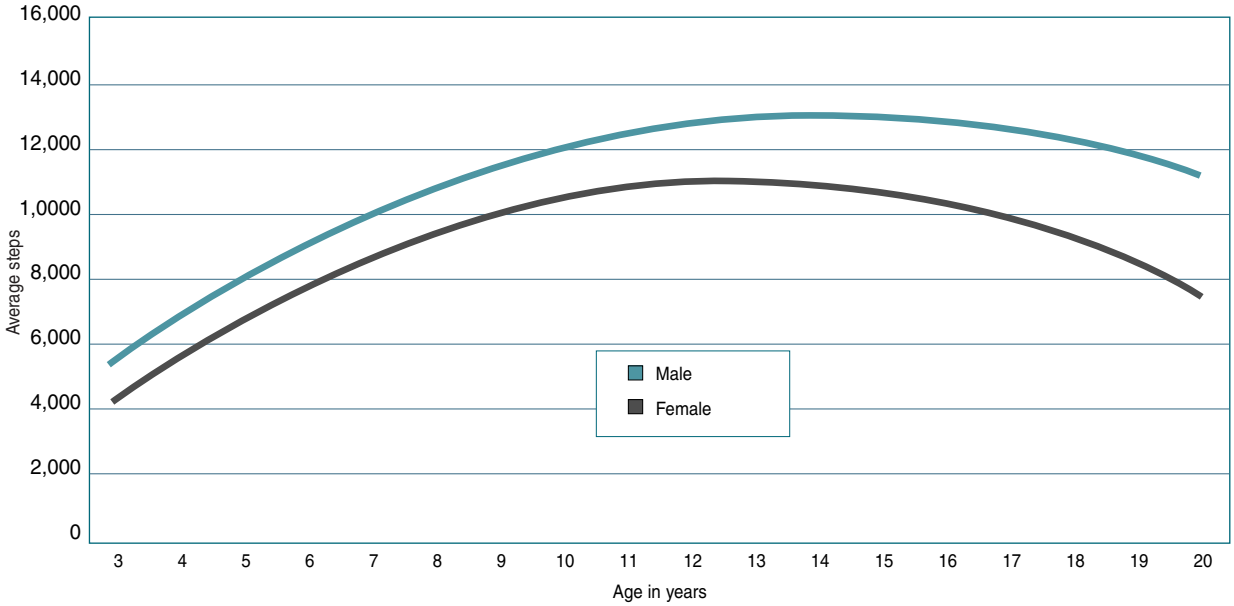
6.1 Pedometer Counts by Age and Gender

General linear modelling was utilised to determine the relationship between age and physical activity levels. The results are presented graphically in Figure 19 and have important implications for the delivery of physical activity programs in schools.

Of particular importance to note is the age at which physical activity levels peak:

- Males had higher activity levels than females throughout the age range, peaking at 14.3 years of age and then gradually reducing; and
- Physical activity levels for females peaked at 12.8 years of age before dropping away at a greater rate than for males.

FIGURE 19: RELATIONSHIP BETWEEN AGE AND PEDOMETER COUNT



6.2 Predictors of Physical Activity

Multi-level modelling is a statistical method that takes into account the hierarchical structure of the data set. In this case there were two levels in the hierarchy: school and the individual. This form of multilevel modelling accounts for the influence of the school attended on individual children. As in the General Linear Modelling, the analyses were performed separately for each gender and the outcome variable was the average pedometer count.

Included in the model were age, gender, BMI, electronic usage (i.e. TV, video, DVDs, playing computer games), total sedentary behaviour, location of school (metropolitan/non-metropolitan) and school. Findings showed that:

- For both males and females, age and low BMI were independent predictors of the pedometer count; and
- While location of the school (metropolitan compared to non-metropolitan) did not predict pedometer counts, the school itself did have a significant effect, as there were significant differences in pedometer counts between schools.

7. ATTITUDES TOWARDS PHYSICAL ACTIVITY

Students in years 5 to 11 were asked whether they agreed or disagreed with a series of statements relating to physical activity. One set of 11 questions asked about motivators to be active, such as *being physically active over the next year might: help me make new friends* or *help me lose or help me to control my weight*. A second set of 14 questions asked about barriers to participation in physical activities, such as, *I look funny when I am physically active* or *I am scared that I might get hurt if I played sport*. The detailed results can be seen in the CAPANS Physical Activity Technical Report.

7.1 Motivators

7.1.1 Total Sample

Overall, a high percentage of students agreed or strongly agreed with the statements across most items. Gender differences were seen in several items. These included:

- More secondary school females than males agreed with the importance of physical activity in *weight loss* or *weight control*;
- A greater percentage of males rated the role of physical activity in *providing fun* higher than females, although the level of agreement among females reduced with age;
- The link between physical activity and *social benefits* was rated higher by males than females, although both males and females were less likely to agree with these benefits with increasing age; and
- The only other item that indicated age differences was *make my parents/carer happy*. Although there were no gender differences, younger students were more likely to agree with this item.

The attitudes of metropolitan and non-metropolitan students are tabulated in detail in the CAPANS Physical Activity Technical Report. Main points to be noted include:

- Non-metropolitan and metropolitan primary school males had similar attitudes towards different aspects of physical activity;
- For primary school females more metropolitan than non-metropolitan students agreed physical activity helped them *to study and learn better*, *improved their appearance*, made their *parents/carers happy* and *helped them make new friends;*
- More metropolitan secondary students agreed that physical activity made them *feel good about themselves*, helped them *spend time with their friends* and helped them to *make new friends*;
- More non-metropolitan secondary school female students agreed that physical activity prevented them from *doing other more enjoyable activities*;
- Among secondary school males, more non-metropolitan students agreed that physical activity helped them to *lose or control their weight*, make their *parents/carers happy*, and *spend time with their friends;* and
- More metropolitan secondary school males agreed physical activity *kept them healthy*.

7.1.2 High and Low Activity Levels

The percentages of high and low active students who agreed with motivations towards physical activity are detailed in the CAPANS Physical Activity Technical Report.

- Activity level generally was not related to motivators to participate in physical activity;
- At secondary, level three items showed some relationship with activity level – *makes me feel good about myself*, *help me spend time with my friends* and *help me make new friends;* and
- The high active group of students were more likely to agree with the motivation statements.

7.1.3 Weight Categories

Attitudes to physical activity according to the BMI categories of acceptable weight and combined overweight and obese ('overweight') are shown in Figures 20 and 21.

- Overall, both male and female primary students showed similar levels of agreement; and
- Regardless of BMI classification, a similar high percentage of each group agreed that activity *keeps me healthy*, *makes me feel good about myself*, *lets me have a lot of fun* and for females only, *keeps me fit.*

Some items related positively to body weight in both male and female primary students:

- There was agreement with *helps me lose/control weight* by a higher percentage of overweight than acceptable weight students;
- *Helps me spend time with my friends* had a lower agreement level among overweight males compared to females;
- A lower percentage of overweight males agreed that doing physical activity *makes my parents happy* compared to overweight females; and
- A higher percentage of overweight males and females in primary school agreed that physical activity *prevents me from doing other things I like more* compared to their acceptable weight peers.

Secondary students' responses show a picture of relatively high agreement to most of the statements (Figures 20 and 21). However, several items that focused on the social benefits of physical activity revealed clear differences in male and female perceptions:

- The social benefits of physical activity were consistently rated lower by overweight males compared to their acceptable weight peers;
- The inverse was true for females, with social benefits being rated higher for overweight females compared to acceptable weight females. These items were *making new friends*, s*pending time with friends* and *having fun*;
- Although fewer secondary students than primary students rated agreement with *makes my parents happy,* overweight females, in particular, agreed with this statement; and
- Overweight students felt that physical activity *prevents me doing other things I like* more than all the acceptable weight secondary students. This difference was much more prevalent in overweight females than overweight males.

Regardless of weight classification, a very high percentage of male and female students agreed that physical activity *keeps me healthy, makes me feel good about myself,* and *keeps me fit.* The results were similar to those reported by primary school students for these items.

FIGURE 20: PERCENT AGREEMENT WITH PHYSICAL ACTIVITY MOTIVATIONS FOR MALES ACCORDING TO SCHOOL GROUP AND WEIGHT CATEGORY

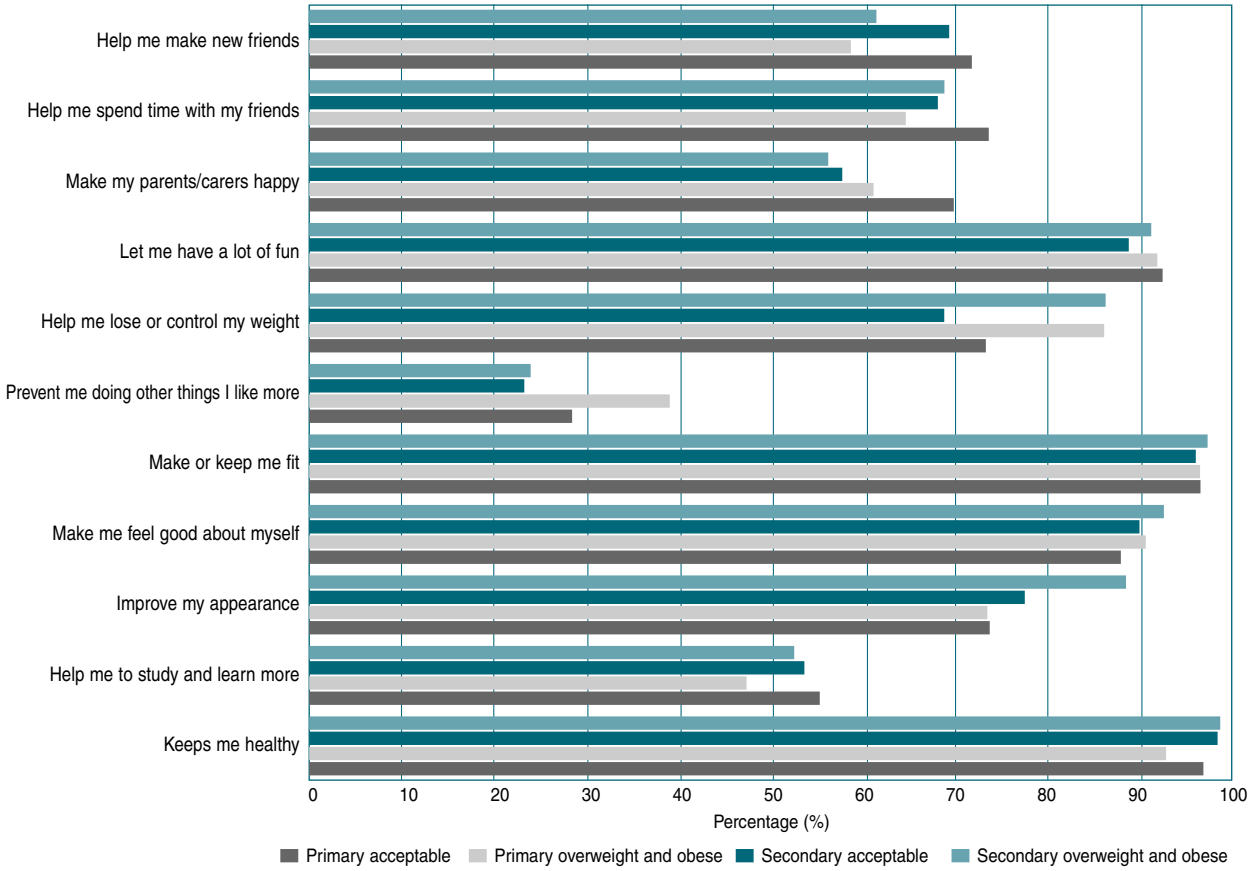
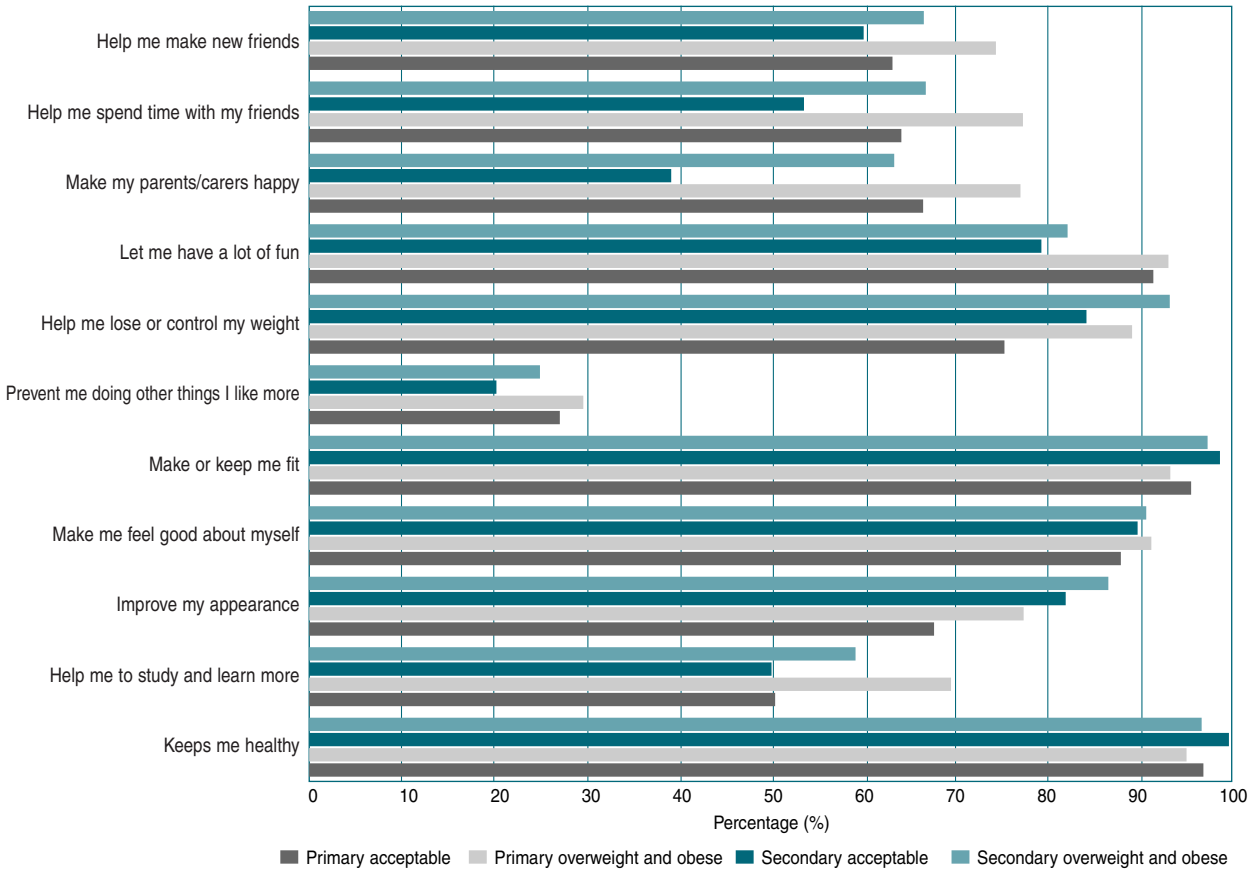


FIGURE 21: PERCENT AGREEMENT WITH PHYSICAL ACTIVITY MOTIVATIONS FOR FEMALES ACCORDING TO SCHOOL GROUP AND WEIGHT CATEGORY



7.2 Barriers to Participation in Physical Activity

7.2.1 Total Sample

Students were asked to indicate whether they agreed or disagreed with a series of fourteen statements relating to reasons for not participating in more physical activity. A higher agreement rating indicated the item was a greater barrier. The percentage of students who expressed agreement to each item according to gender is detailed in the CAPANS Physical Activity Technical Report and summarised in Figures 22 and 23. Overall, less than 25% of students agreed with most of the barriers.

Out of all the statements, *I already do a lot of physical activity* was the only response that was clearly a barrier to most, with over 70% of all students agreeing.

The barriers identified by non-metropolitan and metropolitan students differed:

- A clear barrier for non-metropolitan males was *lack of time,* however non-metropolitan females had a similar level of agreement with their metropolitan peers;
- A*ccess to sports facilities* was relatively unimportant for both male and female non-metropolitan students compared to their metropolitan peers; and
- Compared with males, almost three times as many non-metropolitan and twice as many metropolitan females agreed with the statement *I don't think I am very good at physical activity*.

FIGURE 22: BARRIER TO PARTICIPATION IN MORE PHYSICAL ACTIVITY FOR PRIMARY SCHOOL STUDENTS

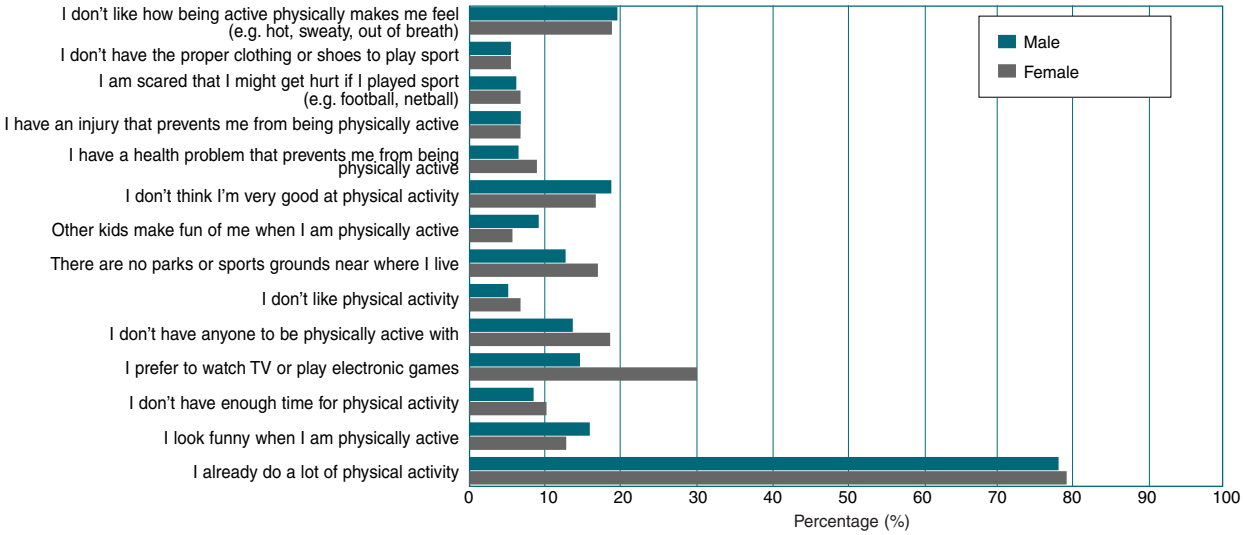
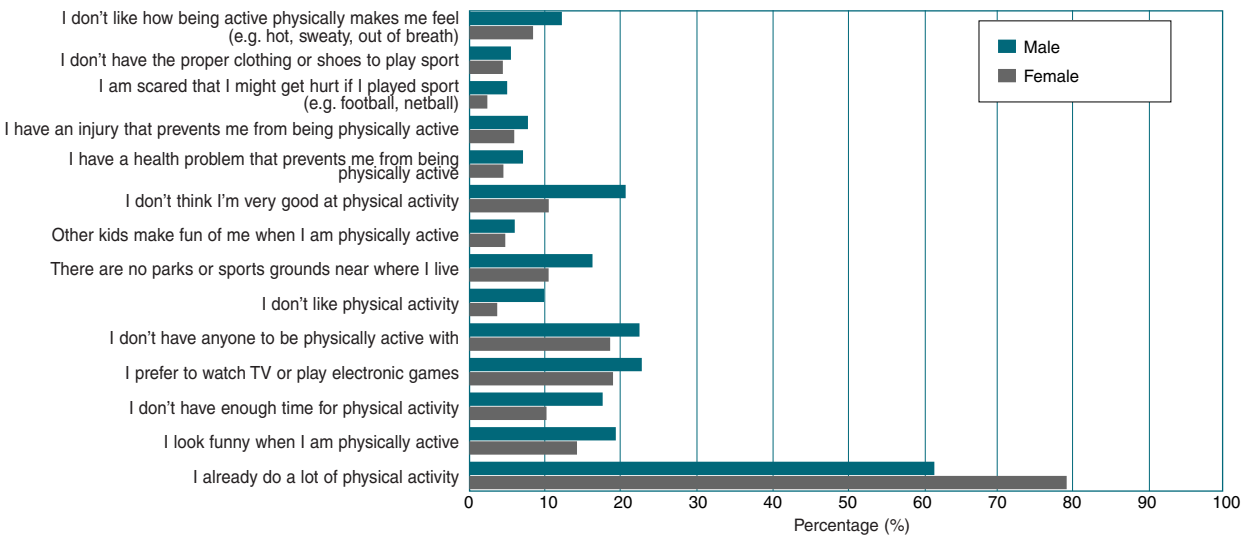


FIGURE 23: BARRIER TO PARTICIPATION IN MORE PHYSICAL ACTIVITY FOR SECONDARY SCHOOL STUDENTS



7.2.2 High and Low Activity Levels

A similar number of students in the high and low activity groups agreed with many of the barriers (see details in the CAPANS Physical Activity Technical Report).

- More than 80% of high active primary and secondary students agreed with *I already do a lot of physical activity*;
- Fewer low active primary and secondary students agreed with the above statement;
- More low active students agreed that *I prefer to watch TV or play electronic games* was a barrier compared to the high active students;
- Nearly twice as many low active secondary students agreed with *I don't have anyone to be physically active with* compared to high active students;
- A higher percentage of low active primary and secondary students agreed with the barrier *I don't think I am very good at physical activity* but only 12.5% of high active primary and 11.5% of high active secondary students agreed; and
- Among the least active students, the physical effects of exercise were a barrier to physical activity for 24.1% of primary students and 12.4% of secondary students.

7.2.3 Weight Categories

Overall, only one barrier was agreed with by more than 50% of the sample (see Figures 24 and 25). In general:

- Acceptable weight students reported fewer barriers than their overweight peers;
- Very few overweight students agreed that *not enough time, lack of proper clothing or shoes, lack of facilities nearby, having fun made of them, being scared of getting hurt or injured, health problems* and *I don't like physical activity* were barriers to participation;
- Fewer overweight and obese students stated *I already do a lot of physical activity* as a barrier;
- More overweight males, both primary and secondary, preferred *to watch TV* than acceptable weight males;
- Almost twice as many overweight students agreed with *I don't have anyone to be physically active with* compared to acceptable weight students;
- More primary students classified as overweight agreed that they *don't like how being active physically makes them feel* compared to secondary student groups; and
- Finally, overweight primary students and overweight secondary females agreed that *not being good at physical activity* was a barrier. This was not the case for secondary males with both weight groups reporting similar levels of agreement.

FIGURE 24: PERCENTAGE OF AGREEMENT WITH PHYSICAL ACTIVITY BARRIERS FOR PRIMARY SCHOOL STUDENTS BY GENDER AND WEIGHT CATEGORY

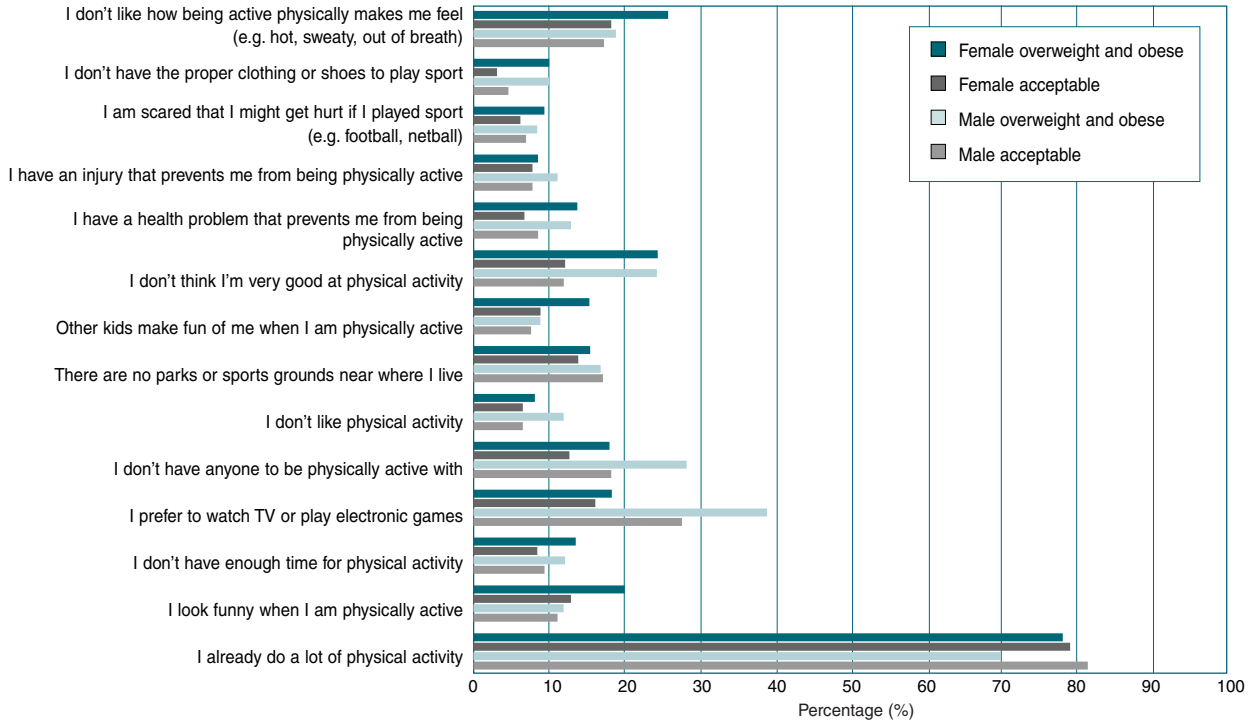
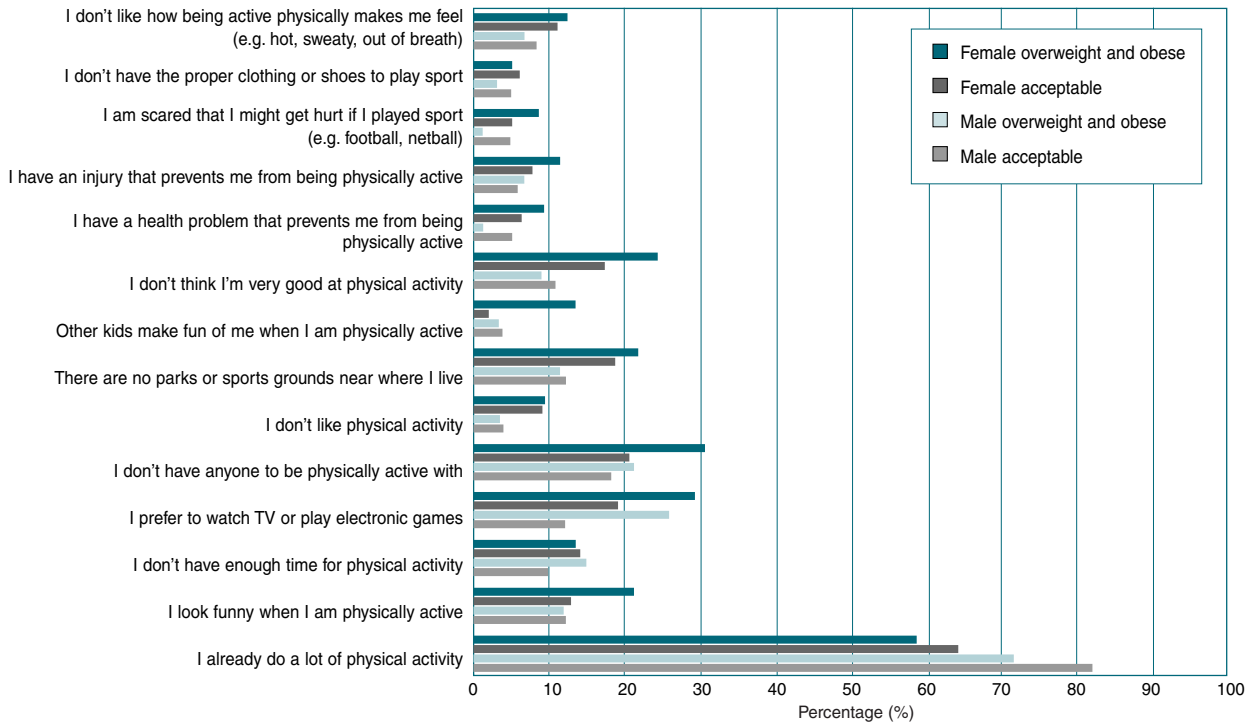


FIGURE 25: PERCENTAGE OF AGREEMENT WITH PHYSICAL ACTIVITY BARRIERS FOR SECONDARY SCHOOL STUDENTS BY GENDER AND WEIGHT CATEGORY



8. NUTRITION

8.1 Sample

8.1.1 24-Hour Food Record

A 24-hour food record was completed by 82.6% of the sample (1,878 students) participating in the combined survey. Of these, 209 food records were excluded due to poor quality and 175 were excluded from this report because the students were outside the age range of 8 to 15 years. The distribution of age and gender of students included in the food record data can be seen in the CAPANS Nutrition Technical Report. Data were adjusted to represent the age and gender distribution of the WA population in this age range.

8.1.2 Food Frequency Questionnaire

The food frequency questionnaire was completed by 84.5% of the sample (1,922 students) participating in the combined survey. Of these, 1,177 were in primary school and 745 were in secondary school. A total of 205 students were excluded from this report because their ages were outside the range of 8 to 15 years (See the CAPANS Nutrition Technical Report).

8.2 Nutrient Intake

Nutrient intakes, nutrient densities and food sources of nutrients were calculated from the 24-hour food record for the following nutrients: energy; water; macronutrients (protein, total fat, saturated fat, poly-unsaturated fat and mono-unsaturated fat, cholesterol, total carbohydrate, sugar and starch, moisture, dietary fibre and alcohol); vitamins (thiamin, riboflavin, niacin, vitamin C, folate, vitamin A (retinol equivalent), retinol (pre-formed vitamin A), beta-carotene (provitamin A); and minerals (potassium, magnesium, calcium, phosphorus, iron and zinc). For this report, the data were aggregated in age groups 8 to 11 years and 12 to 15 years consistent with the 1995 National Nutrition Survey (Australian Bureau of Statistics, 1998b). Mean and median intakes of nutrients for these age groups and gender are summarised in Table 20. Tables of data for individual years, nutrient density and food sources of nutrients are reported in the CAPANS Nutrition Technical Report.

8.2.1 Energy

Energy is derived from protein, fat, carbohydrate and alcohol. Across the age groups, males had higher energy intakes than females. Energy intake increased steadily with age for both males and females, except for 16-year-old females among which there were decreases.

The main food sources of energy were cereal and cereal-based products and cereal based products and dishes. Regular breads and rolls provided almost 10% of energy intake. Other significant sources of energy were milk and milk products; and meat, poultry and game products and dishes; vegetable products and dishes (in particular potatoes), fruit and non-alcoholic beverages.

TABLE 20: MEAN AND MEDIAN NUTRIENT INTAKES OF STUDENTS SEPARATED FOR GENDER AND AGE GROUP

	MALES				FEMALES			
	8–11 YEARS OLD		12–15 YEARS OLD		8–11 YEARS OLD		12–15 YEARS OLD	
	Median	Mean	Median	Mean	Median	Mean	Median	Mean
Nutrient								
Energy (kJ)	8,945	9,359	9,949	10,705	7,719	8,219	8,444	8,742
Macronutrients								
Protein (g)	79.5	89.7	89.8	104.0	70.0	79.3	73.1	76.8
Fat (g)	72.5	82.9	89.3	94.6	68.7	73.3	73.2	78.9
Saturated fat (g)	31.9	37.2	38.9	42.0	29.5	33.1	32.6	35.0
Polyunsaturated fat (g)	8.4	9.8	9.9	11.4	7.3	9.1	8.9	10.3
Monounsaturated fat (g)	26.0	29.8	30.7	33.8	23.7	26.0	25.8	28.7
Cholesterol (mg)	215	250	267	319	192	234	215	243
Total Carbohydrates (g)	261	275	296	315	235	240	249	262
Sugar (g)	120	121	129	145	105	110	116	124
Starch (g)	135	153	147	165	118	128	128	136
Moisture (g)	1,564	1,603	1,883	2,033	1,387	1,453	1,584	1,728
Alcohol (g)	0	0	0	0	0	0	0	0
Dietary fibre (g)	18.7	21.0	19.6	22.3	17.8	18.9	17.6	19.4
Vitamins								
Vitamin A Retinol equivalents (ug)	762	926	782	1141	707	847	652	816
Thiamin (mg)	1.8	2.0	1.8	2.1	1.4	1.7	1.4	1.7
Riboflavin (mg)	2.3	2.6	2.4	2.9	1.9	2.1	1.8	2.0
Niacin equivalents (mg)	35.9	39.8	38.9	45.7	30.9	35.1	32.7	34.5
Vitamin C (mg)	70.1	102.5	72.9	111.1	70.7	99.1	79.9	120.8
Folate (ug)	284	309	299	334	226	249	228	255
Minerals								
Calcium (mg)	920	1020	990	1117	796	854	747	821
Magnesium (mg)	269	293	295	319	237	249	244	257
Iron (mg)	12.4	13.9	14.1	15.9	10.5	11.8	10.5	11.2
Zinc (mg)	10.5	12.4	12.4	14.3	9.1	10.6	9.4	10.1

8.2.2 Macronutrients

Macronutrients include protein, total fat, saturated fat, polyunsaturated fat and monounsaturated fat, cholesterol, total carbohydrate, sugar and starch, dietary fibre and alcohol.

In all age groups, males consumed greater amounts than females of all of the macronutrients. The amount of macronutrients consumed increased with age.

Carbohydrates contributed the largest proportion of energy intake, slightly less than 50 percent of the total energy intake for all age groups. Sugars contributed almost half of the carbohydrate intake and approximately 21 percent of energy intake. Intakes of sugar include both sugar that is found as a part of foods (for example lactose in milk), and added refined sugars such as white and brown sugars. Added sugars accounted for 44 percent of sugar intake.

Total fat contributed approximately 32 percent of energy intake, with saturated fat providing approximately 14 percent of the total energy intake. Protein contributed approximately 16 percent of total energy intake for all age groups. Alcohol intakes were negligible across all age groups. Refer to Figures 26 and 27.

FIGURE 26: MALE MEDIAN INTAKE OF PROTEIN, FAT, SUGARS AND STARCH

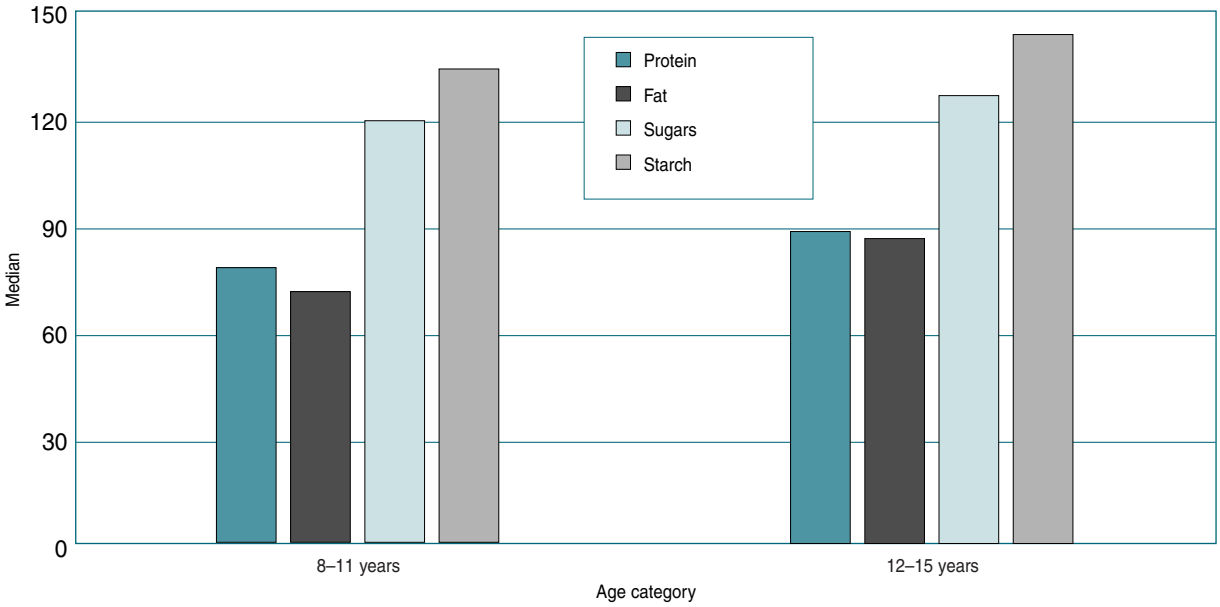
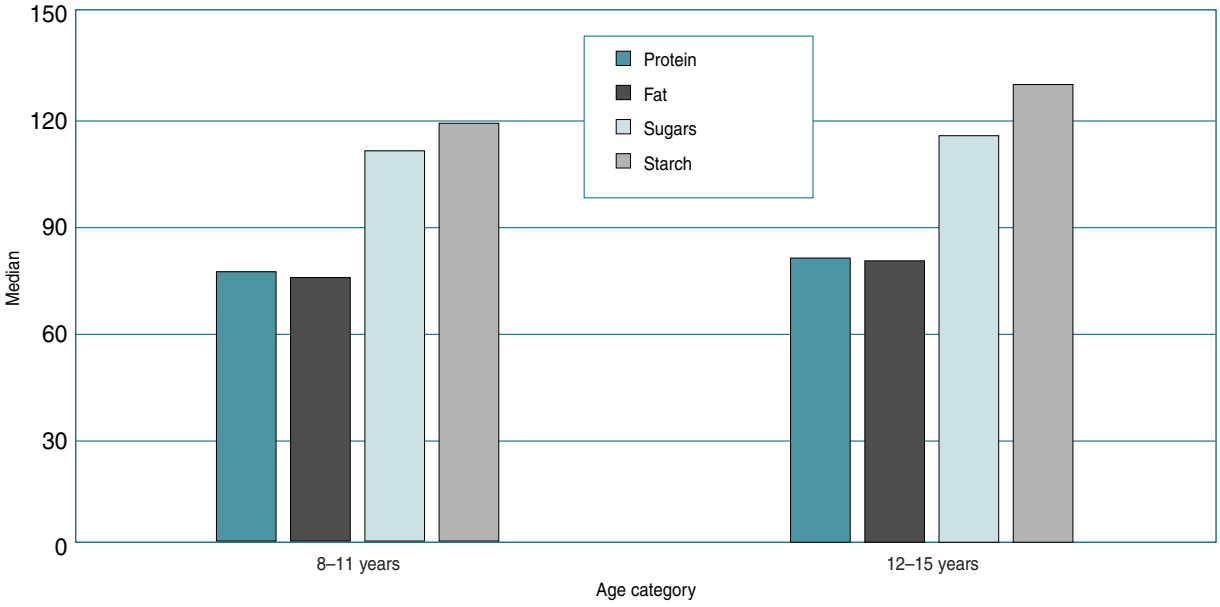


FIGURE 27: FEMALE MEDIAN INTAKE OF PROTEIN, FAT, SUGARS AND STARCH



8.2.3 Vitamins and Minerals

Males in both age categories consumed larger quantities of vitamins and minerals than females. Vitamin and mineral intake generally increased as age increased. Some exceptions to this were, vitamin A, riboflavin, calcium, iron and zinc, which were lower for 12 to 15-year-old females compared to 8 to 11-year-old females. Much of the decrease in intake for 12 to 15-year-old females can be explained by lower intakes of milk and milk products, particularly dairy milk, and lower intakes of meat and alternatives including poultry than the younger age group.

8.2.4 Nutrient Density

Nutrient density refers to the amount of nutrients consumed per 1,000 kJ of energy. It is a measure of the nutritional quality of the diet relative to the amount of energy consumed.

Females in the 12 to 15 year age group had lower nutrient densities compared to the 8 to 11 year age group. Nutrient densities were lower for fibre, riboflavin, zinc, vitamin A, calcium, niacin equivalents and iron. Nutrient densities for males aged 12 to 15 years were similar to males aged 8 to 11 years with the exception of thiamin, vitamin C and magnesium, which were lower in the older age group.

For the 8 to 11 year age group, males had higher nutrient densities for thiamin, riboflavin, folate, magnesium and iron than females. Females had a slightly higher nutrient density for fibre.

For the 12 to 15 year age group, males had higher nutrient densities for riboflavin, niacin equivalents, retinol, calcium, iron and zinc. Females had a higher nutrient density for vitamin C.

8.2.5 Geographic Region

Energy intakes were higher in non-metropolitan areas compared to metropolitan areas. Overall, fat intakes were higher in non-metropolitan areas.

Although overall intakes of nutrients were slightly higher in non-metropolitan areas compared to metropolitan areas, there were no clear differences in nutrient densities between the two, except for iron, which was higher in metropolitan areas.

8.3 Foods Eaten

This section presents information on consumption of different types of foods and food groups during the 24-hour food record period. Food groups were those used in the 1995 NNS and are defined in the CAPANS Nutrition Technical Report. All outputs were adjusted for age.

The Australian Guide to Healthy Eating (Department of Health and Family Services, 1998) provides guidelines on the types and amounts of foods that can be eaten to ensure a healthy diet. This guide was based on the Australian Core Food Groups for different age groups (Cashel & Jeffreson, 1995). The Core Food Groups are: cereals; fruit; vegetables; meat and alternatives including poultry, fish, eggs, legumes, nuts; and milk products. (Assignment of study food groups to Core and non-Core Food Groups is reported in the CAPANS Nutrition Technical Report).

8.3.1 Types of Foods Eaten

The proportions of gender and age groups who reported consuming foods from each of the food groups during the 24-hour reporting period are shown in Table 21.

Considering intake of foods from the Core Food Groups, approximately:

- 95 percent of students ate cereals and cereal products;
- 90 percent of students consumed milk and milk products;
- 75 percent of students ate meat, poultry and game products and dishes;
- 70 percent of students ate vegetables;
- 55 percent of students ate fruit;
- 15 percent of students ate nuts and seeds; and
- 10 percent or less of students ate fish or eggs.

Considering intake of the most common Non-Core Foods:

- 70 percent of students ate cereal-based products (e.g. cakes, biscuits, pizza, pastries);
- 50 percent of students ate fats and oils;
- 45 percent of students ate confectionery (e.g. lollies, chocolates, snack bars);
- 45 percent of students ate other sugar products and dishes (e.g. sweet spreads, jelly, icy poles);
- 35 percent of students ate savoury sauces and condiments (e.g. tomato sauce, mayonnaise); and
- 30 percent of students ate snack foods (e.g. crisps, popcorn).

TABLE 21: PROPORTION CONSUMING MAJOR SELECTED FOOD GROUPS ACROSS GENDER AND AGE GROUP (PERCENT)

	MALES		FEMALES		METRO	NON-METRO
	8–11 YEARS OLD	12–15 YEARS OLD	8–11 YEARS OLD	12–15 YEARS OLD	8–15 YEARS OLD	
Food Group						
Cereal and cereal products	98	95	98	90	95	95
Cereal-based products and dishes	75	69	79	73	73	77
Fruit products and dishes	53	48	67	59	54	62
Vegetable products and dishes	74	72	72	80	76	72
Milk products and dishes	94	91	94	90	92	91
Meat, poultry, game products and dishes	77	82	77	74	79	74
Fish and seafood products and dishes	8	5	10	13	10	6
Egg products	6	9	6	9	9	5
Fats and oils	53	46	50	50	47	55
Non-alcoholic beverages	95	96	97	97	95	99
Snack foods	29	33	35	27	34	24
Confectionery	44	45	51	50	45	52
Sugar products and dishes	44	42	42	53	46	45
Soups	6	3	4	5	3	7
Savoury sauces and condiments	36	42	30	44	40	35
Seed and nut products and dishes	18	12	12	13	14	13
Miscellaneous	37	30	41	39	34	43

Reported patterns of food group consumption for age and gender groups were similar but with the following exceptions:

- Younger children (8 to 11-year-old), particularly females, were more likely than adolescents to eat cereal and cereal-based products (mainly sweet biscuits);

- Adolescents were more likely to eat sauces and condiments;
- Females in both age groups were more likely than males to eat foods from the fruit, confectionery and miscellaneous foods groups;
- Younger females were more likely than the younger males to eat cereal-based products (cakes, biscuits) and snack foods; and
- Adolescent females were more likely than adolescent males to eat sugar products but less likely to eat foods from the meat, poultry and game and cereal products food groups.

Reported patterns of food intake were similar for children and adolescents living in metropolitan and non-metropolitan areas, with the following exceptions.

- Those living in non-metropolitan areas were more likely to eat fruit products and dishes, cereal-based products and dishes, fats and oils and miscellaneous foods (particularly savoury spreads);
- Those living in the metropolitan area were more likely to eat meat, poultry and game products and dishes, eggs and snack foods; and
- The largest differences were seen for fruit and snack foods.

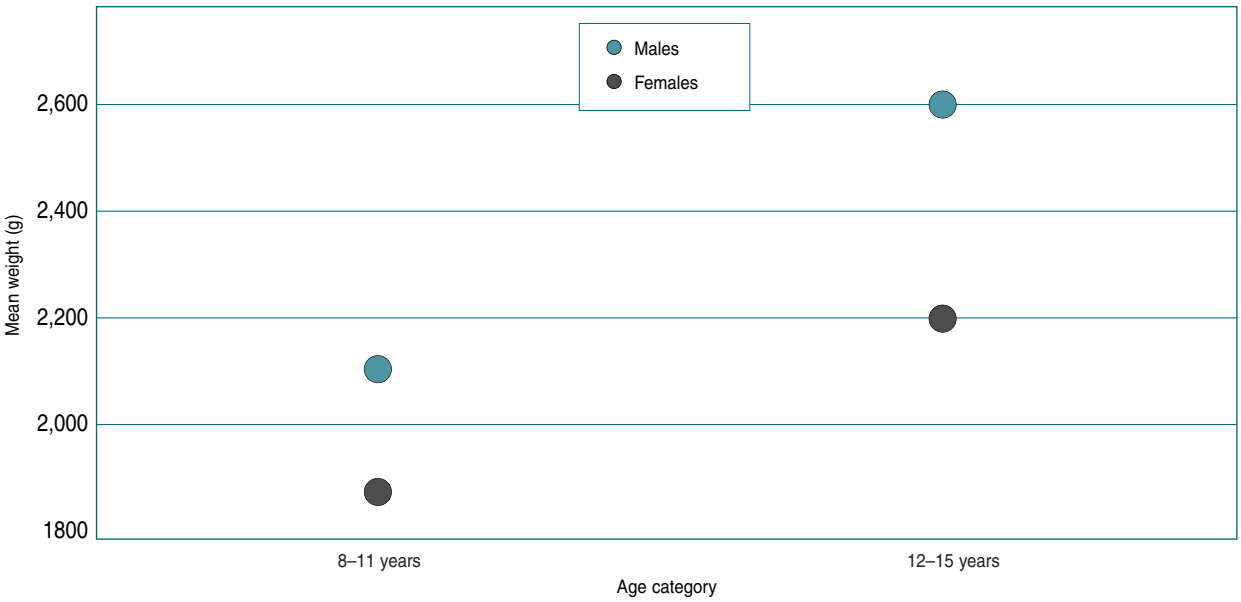
8.3.2 Quantity of Intake

- The average weight of most foods consumed (excluding non-alcoholic beverages) was derived from Core Foods (Table 22);
- Mean daily intake was highest for fluid-based food groups-milk and milk products and non-alcoholic beverages, followed by cereal and cereal products and meat, game and poultry;
- Significant amounts of cereal-based products and fruit and vegetables were also consumed;
- For most food groups, the mean quantities of foods and beverages were higher for males than females in each age group; and
- Males aged 12 to 15 years had the highest mean daily intake of food and beverages (see Figure 28).

TABLE 22: MEAN DAILY INTAKE OF MAJOR SELECTED FOOD GROUPS ACROSS GENDER AND AGE GROUP (AVERAGE GRAMS PER PERSON)

	MALES		FEMALES	
	8–11 YEARS OLD	12–15 YEARS OLD	8–11 YEARS OLD	12–15 YEARS OLD
Food Group				
Cereal and cereal products	213	240	166	166
Cereal-based products and dishes	163	179	144	158
Fruit products and dishes	109	123	141	139
Vegetable products and dishes	154	163	136	167
Milk products and dishes	467	510	363	305
Meat, poultry and game products and dishes	148	193	134	123
Fish and seafood products and dishes	14	7	20	20
Egg products	3	8	4	5
Fats and oils	6	6	5	6
Non-alcoholic beverages	703	1,055	680	1,003
Snack foods	18	17	12	14
Confectionery	19	25	16	25
Sugar products and dishes	21	14	18	15
Soups	22	15	16	13
Savoury sauces and condiments	28	22	13	21
Seed and nut products and dishes	3	3	2	3
Miscellaneous	4	4	4	4

FIGURE 28: MEAN DAILY FOOD AND BEVERAGE INTAKE BY GENDER AND AGE GROUP



8.4 Food Intakes Compared to Recommended Intakes

Mean daily intakes of foods for age and gender groups were compared to recommended intakes of Core Food Groups for children (8–11 years) and adolescents (12–15 years) (Cashel & Jeffreson, 1995).

- Reported intakes of fruit and vegetables fell well short of minimum recommended amounts for both age groups (see Figures 29 and 30);
- Milk intakes fell short of minimum recommended amounts for females in the 12 to 15 year age group; and
- In contrast, mean intakes of meat and alternatives including poultry were substantially greater than the minimum recommended, particularly for the younger age group.

FIGURE 29: PROPORTION OF RECOMMENDED AMOUNTS OF CORE FOOD GROUPS CONSUMED BY MALES

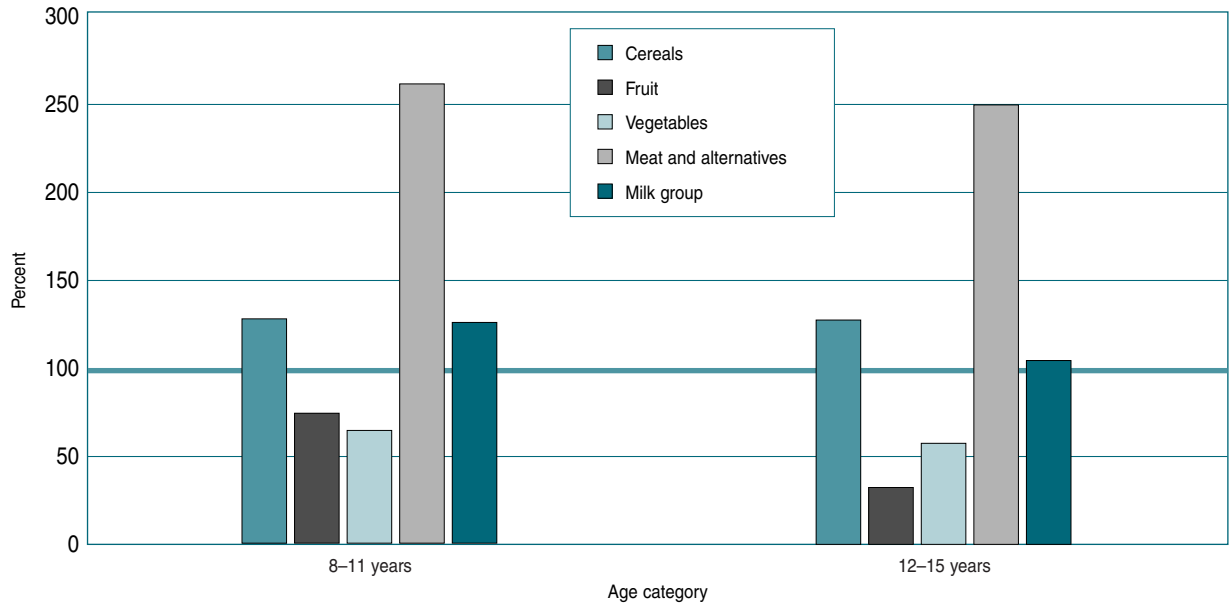
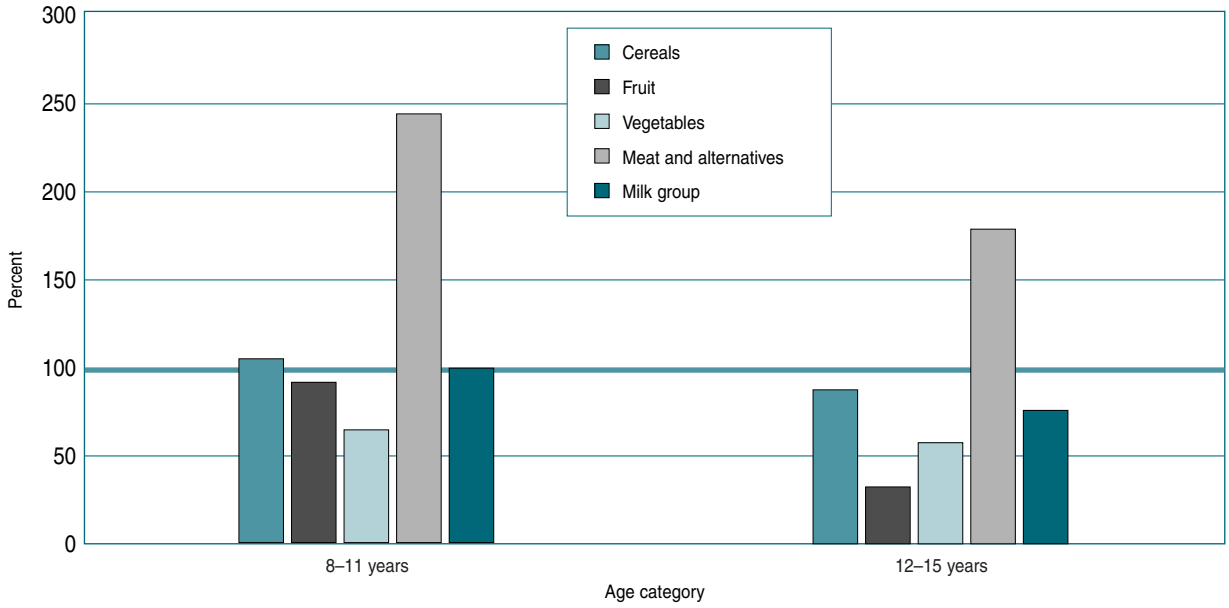


FIGURE 30: PROPORTION OF RECOMMENDED AMOUNTS OF CORE FOOD GROUPS CONSUMED BY FEMALES



8.5 Highlights for Food Sub-groups

Detailed tables of proportions consuming food subgroups; and amounts consumed by age, gender and metropolitan or non-metropolitan residence are available in the CAPANS Nutrition Technical Report. The key findings are summarised below and describe the intake with respect to food sub-groups during the 24-hour recording period.

8.5.1 Cereals and Cereal Products

This group of foods includes regular bread and rolls, pasta and rice and breakfast cereals.

- Regular breads and rolls and breakfast cereals were the main food subgroups contributing to the students' cereal and cereal product intake;
- At least 70 percent of students consumed regular breads or rolls in the 24-hour survey period;
- More than 50 percent of students consumed breakfast cereals, including muesli and porridge;
- At least 15 percent of students consumed pasta products and 10 percent consumed rice and rice products; and
- More children (8–11 years) than adolescents (12–15 years) consumed cereal and cereal products.

8.5.2 Cereal-based Products and Dishes

This food grouping contains sweet and savoury biscuits, cakes, buns, muffins, pastries and mixed dishes where cereal was the major ingredient, such as pizza.

- Sweet biscuits, cake-type products and mixed dishes with cereal as the main ingredient were the main contributors to intake;
- At least 22 percent of students consumed sweet biscuits in the 24-hour survey period;
- At least 24 percent of students consumed cakes, buns, muffins, scones and cake-type desserts;
- At least 21 percent of students consumed mixed dishes where cereal was the major ingredient;
- Slightly more females consumed sweet and savoury biscuits; and
- Slightly more children and adolescents living in non-metropolitan areas ate foods from the cereal-based products and dishes category.

8.5.3 Fruit Products and Dishes

This group contains all types of fruit including mixed and dried fruits and mixed dishes where fruit was the major component.

- Pome fruit were the main type eaten, with more than 30 percent of students consuming in the 24-hour study period;
- More children from the older age group ate pome and citrus fruit, but fewer ate tropical fruit including bananas; and
- More children and adolescents living in non-metropolitan areas ate foods from the fruit products and dishes group, including pome fruit, citrus fruit, tropical fruit, other fruit and dried and preserved fruit.

8.5.4 Vegetable Products and Dishes

The main contributing subgroups to vegetable intake were potatoes, carrots and similar root vegetables, and leaf and stalk vegetables.

- 40 percent of students consumed potatoes in the 24 hours;
- 20 percent of students (50 percent of those consuming potatoes) ate chips, wedges, hash browns or similar types of potatoes cooked in substantial amounts of fat;
- More than 19 percent of students ate carrots and similar root vegetables;
- More than 21 percent of students ate leaf and stalk vegetables;
- Overall, slightly more adolescents (12–15 years) reported consumption of foods from the vegetable group;
- Slightly more children and adolescents living in non-metropolitan areas reported eating vegetables from the peas and beans and other fruiting vegetable categories; and
- Metropolitan children and adolescents reported eating more potatoes.

8.5.5 Milk Products and Dishes

Most children and adolescents consumed milk products and dishes. The main contributing subgroups were dairy milk, cheese and frozen milk products like ice cream.

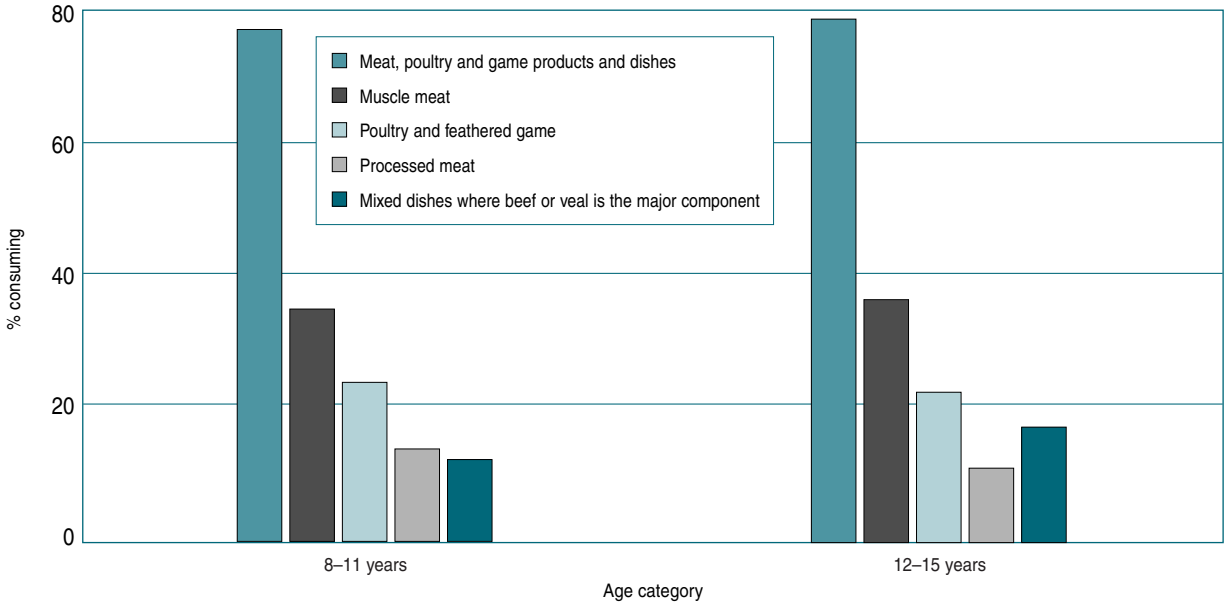
- More than 65 percent of students consumed dairy milk in the 24 hours;
- More than 37 percent of students consumed cheese;
- More than 23 percent of students consumed frozen milk products;
- More children (8–11 years) than adolescents (12–15 years) consumed; milk and milk products overall, dairy milk, yoghurt and frozen milk products;
- Fewer females than males ate yoghurt;
- Fewer adolescent females than males consumed dairy milk and flavoured milks;
- Fewer adolescent males consumed cheese; and
- Fewer children and adolescents in non-metropolitan areas consumed dairy milk.

8.5.6 Meat, Poultry and Game Products and Dishes

The main contributing subgroups to the proportion consuming meat, poultry and game products and dishes were muscle meat, poultry and other feathered game, and mixed dishes with beef or veal as the major component (see Figure 31).

- More than 35 percent of students consumed muscle meats;
- More than 20 percent of students consumed poultry and other feathered game;
- More than 10 percent of students consumed mixed dishes with beef or veal as the major component;
- Fewer adolescent females than males consumed meat, poultry and game products and dishes; and
- Slightly less children and adolescents living in non-metropolitan areas reported eating foods from the meat, poultry and game products and dishes group.

FIGURE 31: PERCENT CONSUMPTION OF MEAT, POULTRY AND GAME PRODUCTS AND DISHES ACROSS AGE CATEGORY



8.5.7 Fish and Seafood Products and Dishes

The main contributing subgroups to consumption of fish and seafood products and dishes were finfish, and fish and seafood products.

- Approximately 2 percent of students consumed finfish;
- Approximately 5 percent of students consumed fish and seafood products; and
- More children and adolescents in metropolitan than non-metropolitan areas ate fish and seafood products and dishes.

8.5.8 Fats and Oils

This food group contains butter, margarine, vegetable oils and other fats. The main contributing subgroups to consumption of fats and oils were margarine and butter.

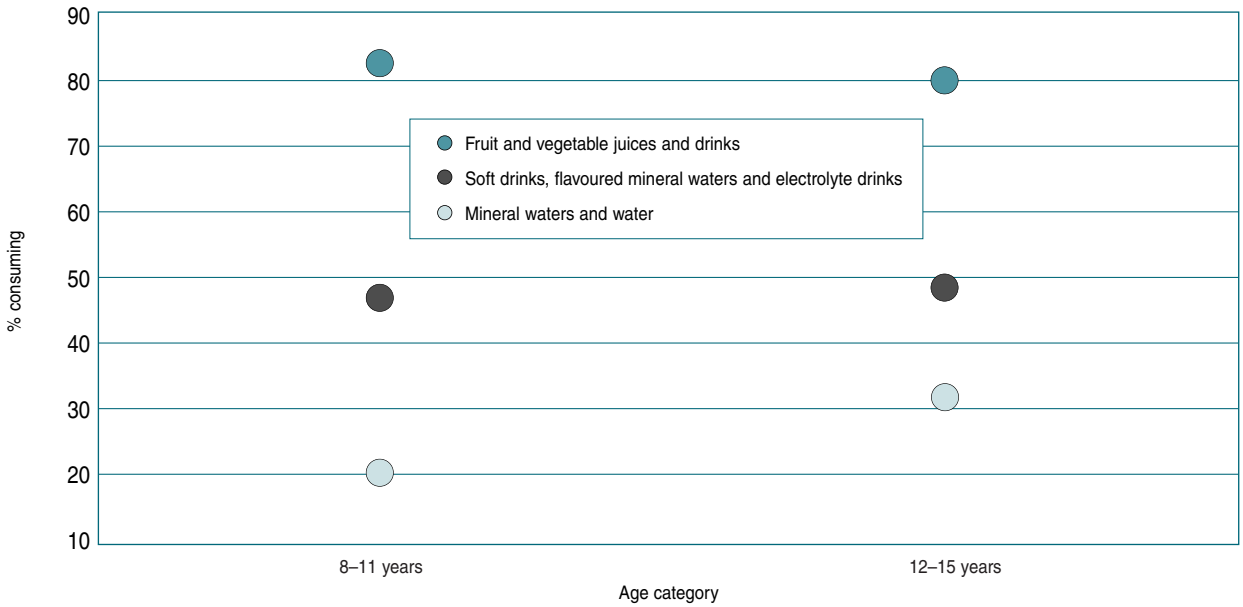
- Approximately 30 percent of students consumed margarine;
- Less than 20 percent of students consumed butter; and
- More children (8–11 years) ate butter than did adolescents (12–15 years).

8.5.9 Non-alcoholic Beverages (excluding milk)

This group includes tea, coffee, coffee substitutes, fruit and vegetable juices and drinks, soft drinks, flavoured mineral waters, electrolyte drinks, mineral waters and water (see Figure 32).

- At least 80 percent of students reported drinking water over the 24-hour study period;
- Almost 50 percent of students reported drinking fruit and vegetable juices and drinks;
- About 20 percent children and at least 30 percent of adolescents reported drinking soft drinks, flavoured mineral waters and electrolyte drinks; and
- More children and adolescents living in non-metropolitan areas reported drinking water and fewer reported drinking soft drinks, flavoured mineral waters and electrolyte drinks than did children and adolescents in metropolitan areas.

FIGURE 32: PERCENT CONSUMPTION OF NON-ALCOHOLIC BEVERAGES ACROSS AGE CATEGORY



8.5.10 Snack Foods

Snack foods include potato snacks, corn snacks, extruded snacks and pretzels.

- The main contributing subgroup to consumption of snack foods was potato snacks (approximately 18 percent consuming); and
- More children and adolescents living in metropolitan areas consumed snack foods during the 24-hour reporting period.

8.5.11 Confectionery

This food group includes chocolate and chocolate-based confectionery, cereal, fruit, nut and seed bars, and other confectionery.

- At least 15 percent of students consumed foods from each subgroup in this food group; and
- More females in the 12-15 year age group consumed chocolate and chocolate-based confectionery, than the males in the same age group.

8.5.12 Sugar Products and Dishes

This food group includes (i) sugar, honey and syrups; (ii) jam, lemon spreads, chocolate spreads; and (iii) dishes and products other than confectionery where sugar was the main component. The main subgroups contributing to consumption were sugar, honey and syrups and jam and spreads.

- At least 25 percent of students consumed sugar, honey or syrups over the 24-hour survey;
- About 15 percent of students consumed jams or other sweet spreads;
- More children than adolescents reported consuming jam, lemon and chocolate spreads; and
- More adolescent females than males consumed sugar products and dishes, particularly sugar, honey and syrups.

8.6 Trends in Dietary Intake

8.6.1 Comparison to Previous Studies

There were two previous children's dietary surveys using 24-hour dietary record or recall data to which this study may be compared to determine trends in food and nutrient intake; the National Dietary Survey of School Children (aged 10–15 years): 1985 (Department of Community Services and Health, 1989) and the 1995 National Nutrition Survey (Australian Bureau of Statistics, 1998b). The comparable sample was limited to 10 to 15 year old children and there were many design, methodological, data collection and data processing differences between the surveys. In an attempt to define a comparable data set for the 1985 and 1995 data sets, Cook et al. (2001) described key points of difference.

There were several main differences to be considered when comparing these surveys.

- Different seasons of the year. The 2003 survey was more representative of colder months. This may affect intake of certain foods, particularly seasonal foods such as fruit, vegetables and drinks. Therefore it may also affect the types and amounts of nutrients consumed (Australian Bureau of Statistics, 1998a);
- The day of the week. The 2003 survey was more representative of school days than weekends. This may affect the intake of certain foods, particularly soft drinks, snack foods, take-away and party foods and the quantity of foods eaten;
- Different method of data collection. A 24-hour dietary recall with the information provided by a parent or guardian (1995) may produce a different estimate of intake than a 24-hour record completed by the child and reviewed at the end of 24 hours (1985 and 2003);
- Different standard quantities of foods used in the coding process. For example the amount of margarine used for a 'thin scrape' on a slice of bread may have been interpreted differently in previous surveys; and
- The use of different nutrient databases, food classification criteria and food categories. These differences arise primarily because databases may not keep pace with the ever-growing list of new foods in the marketplace, or as a result of the reformulation of existing foods.

Overall, the 2003 study was more similar in its methods to the 1985 than the 1995 study.

8.6.2 Trends in Energy and Nutrient Intakes

Energy and nutrient intakes for 1985, 1995 and 2003 are shown in Table 23. Key findings are summarised below.

For macronutrients (see Table 23):

- mean and median energy, protein, carbohydrate intakes show an increasing trend;
- total fat has not changed significantly;
- increase in carbohydrate was predominantly from starches; and
- fibre intake increased slightly.

TABLE 23: COMPARISON OF ESTIMATED 24-HOUR ENERGY AND NUTRIENT INTAKES FOR CHILDREN AGED 10-15 YEARS: 1985, 1995 (COOK, RUTISHAUSER & ALLSOPP, 2001) AND 2003

	Year	Sample Size	Mean intake	Standard deviation	95% CI mean Lower	95% CI mean Upper	Median intake
Energy (kJ)							
Males	1985	2,619	9,670	3,615	9,532	9,808	9,154
	1995	544	11,088	3,975	10,754	11,422	10,644
	2003	598	10,391	4,260	10,049	10,734	9,524
Females	1985	2,591	7,586	2,400	7,494	7,678	7,378
	1995	488	8,488	2,740	8,244	8,731	8,045
	2003	592	8,691	3,388	8,417	8965	8,372
Protein (g)							
Males	1985	2,619	83.8	34.6	82.4	85.1	78.7
	1995	544	95.8	38.8	92.5	99.0	88.0
	2003	598	100.9	52.1	96.7	105.1	87.7
Females	1985	2,591	64.5	23.6	63.6	65.4	61.2
	1995	488	72.8	29.5	70.2	75.4	67.8
	2003	592	79.5	50.1	75.4	83.5	73.2
Carbohydrate (g)							
Males	1985	2,619	283	112	279	287	269
	1995	544	345	134	334	356	322
	2003	598	303	133	293	314	284
Females	1985	2,591	224	76	221	227	215
	1995	488	264	89	256	272	258
	2003	592	256	98	248	264	246
Total fat (g)							
Males	1985	2,619	96	43	94	97	88
	1995	544	101	45	97	105	94
	2003	598	93	46	89	96	86
Females	1985	2,591	75	31	74	76	72
	1995	488	77	33	74	80	72
	2003	592	80	42	76	82	72
Fibre (g)							
Males	1985	2,619	20.6	10.6	20.2	21.1	18.9
	1995	544	23.2	11.7	22.2	24.1	20.5
	2003	598	22.1	12.1	21.1	23.0	19.4
Females	1985	2,591	16.8	8.00	16.5	17.1	15.5
	1995	488	18.2	7.81	17.5	18.9	16.8
	2003	592	19.3	9.5	18.5	20.1	18.1

For vitamins (see Table 24):

- vitamin C intake decreased;
- thiamin intake showed an increasing trend; and
- riboflavin and niacin intakes increased to 1995 but stabilised in 2003.

TABLE 24: COMPARISON OF ESTIMATED 24-HOUR INTAKE OF VITAMINS FOR CHILDREN AGED 10-15 YEARS: 1985, 1995 (COOK, RUTISHAUSER & ALLSOPP, 2001) AND 2003

	Year	Sample Size	Mean intake	Standard deviation	95% CI mean Lower	95% CI mean Upper	Median intake
Vitamin A (ug)							
Males	1985	2,619	1,103	3,473	970	1,236	797
	1995	544	1,199	2,474	991	1,407	904
	2003	598	1,057	2,432	861	1,252	776
Females	1985	2,591	861	1,740	794	928	664
	1995	488	1,074	2,651	838	1,309	734
	2003	592	848	600	800	897	689
Thiamin (mg)							
Males	1985	2,619	1.75	1.09	1.71	1.79	1.52
	1995	544	2.26	1.47	2.13	2.38	1.91
	2003	598	2.06	1.35	1.95	2.17	1.78
Females	1985	2,591	1.40	0.91	1.36	1.43	1.21
	1995	488	1.56	0.92	1.48	1.65	1.34
	2003	592	1.71	1.40	1.60	1.82	1.43
Riboflavin (mg)							
Males	1985	2,619	2.47	1.54	2.41	2.53	2.17
	1995	544	2.88	2.01	2.71	3.05	2.47
	2003	598	2.79	1.80	2.65	2.94	2.36
Females	1985	2,591	1.86	1.16	1.82	1.91	1.64
	1995	488	2.01	1.31	1.90	2.13	1.72
	2003	592	2.10	1.28	2.00	2.20	1.85
Niacin equivalents (mg)							
Males	1985	2,619	34.2	14.9	33.7	34.8	31.7
	1995	544	43.6	19.0	42.0	45.2	40.3
	2003	598	44.4	24.1	42.4	46.3	38.8
Females	1985	2,591	26.9	11.0	26.5	27.3	25.3
	1995	488	32.8	13.6	31.6	34.0	30.8
	2003	592	35.4	21.2	33.7	37.1	32.4
Vitamin C							
Males	1985	2,619	136	126	131	141	98
	1995	544	121	128	110	132	91
	2003	598	110	112	101	119	74
Females	1985	2,591	129	113	125	134	96
	1995	488	116	107	106	125	84
	2003	592	113	109	104	122	78

For minerals (see Table 25):

- iron intake increased up until 1995 but has since stabilised; and
- calcium and zinc intakes show an increasing trend.

TABLE 25: COMPARISON OF ESTIMATED 24-HOUR INTAKE OF MINERALS FOR CHILDREN AGED 10-15 YEARS: 1985, 1995 (COOK, RUTISHAUSER & ALLSOPP, 2001) AND 2003

	Year	Sample Size	Mean intake	Standard deviation	95% CI mean Lower	95% CI mean Upper	Median intake
Iron (mg)							
Males	1985	2,619	13.3	6.0	13.1	13.5	12.2
	1995	544	15.4	8.0	14.7	16.1	14.2
	2003	598	15.3	7.9	14.6	16.0	13.7
Females	1985	2,591	9.9	4.0	9.8	10.1	9.5
	1995	488	11.0	5.1	10.5	11.4	10.2
	2003	592	11.5	6.7	11.0	12.1	10.6
Calcium (mg)							
Males	1985	2,619	1,007	597	984	1,030	888
	1995	544	1,054	620	1,002	1,106	934
	2003	598	1,102	677	1,048	1,157	971
Females	1985	2,591	753	407	737	768	690
	1995	488	794	471	752	836	722
	2003	592	847	498	807	888	788
Zinc (mg)							
Males	1985	2,619	11.0	5.8	10.8	11.2	9.9
	1995	544	12.1	5.8	11.6	12.6	10.8
	2003	598	13.8	7.8	13.2	14.5	11.9
Females	1985	2,591	8.4	4.0	8.3	8.6	7.8
	1995	488	9.2	4.2	8.7	9.4	8.3
	2003	592	10.4	8.5	9.7	11.1	9.4

8.6.3 Trends in Food Group Intake

Data tables of food group intakes for 1985, 1995 and 2003 are provided in the CAPANS Nutrition Technical Report. Key findings are shown in Table 26 and summarised below.

In 2003, compared to 1985 and 1995, the most significant changes are summarised.

Decreases in the percentage of children and adolescents consuming:

- meat, poultry and game products and dishes, but an increase in mean amount consumed;
- eggs and egg products;
- vegetable products and dishes;
- fruit (particularly among males);
- milk and milk products;
- fats and oils; and
- sugar and sugar products.

Increases in the percentage consuming:

- confectionery (mean amount consumed by both males and females also increased);
- fish and fish products, but only for females; and
- snack foods, for males only. (Amount of snack foods consumed also increased for males and females).

No change in percentage consuming:

- cereal-based products and dishes, although mean amount increased significantly for both males and females.

TABLE 26: COMPARISON OF ESTIMATED 24-HOUR INTAKE OF SELECTED FOOD GROUPS FOR CHILDREN AGED 10-15 YEARS: 1985, 1995 (COOK, RUTISHAUSER & ALLSOPP, 2001) AND 2003

	Year	Sample Size	Mean intake (g)	Standard deviation	95% CI mean Lower	95% CI mean Upper	Median intake (g)	% Consuming
Meat, poultry, game products and dishes								
Males	1985	2,619	138	149	132	144	104	85.1
	1995	544	139	141	127	150	111	79.5
	2003	598	183	214	166	200	133	79.5
Females	1985	2,591	106	108	102	110	80	82.8
	1995	488	107	113	97	117	78	78.5
	2003	592	133	207	117	150	77	76.2
Vegetable products and dishes								
Males	1985	2,619	194	179	187	201	165	82.4
	1995	544	203	205	186	221	157	78.7
	2003	598	158	178	143	172	106	72.5
Females	1985	2,591	161	135	156	166	145	84.1
	1995	488	181	171	166	196	150	83.7
	2003	592	159	160	146	172	122	77.8
Fruit products and dishes								
Males	1985	2,619	126	163	120	133	85	60.2
	1995	544	125	186	109	141	43	52.0
	2003	598	119	184	104	134	0	49.3
Females	1985	2,591	123	136	118	128	86	69.2
	1995	488	128	156	115	142	97	58.9
	2003	592	139	193	123	154	101	61.9
Milk products and dishes								
Males	1985	2,619	542	431	525	558	455	95.3
	1995	544	484	399	451	518	392	91.5
	2003	598	505	417	471	538	390	91.5
Females	1985	2,591	372	291	360	383	312	94.9
	1995	488	349	333	319	378	281	91.1
	2003	592	339	285	316	362	266	91.7
Cereal-based products and dishes								
Males	1985	2,619	110	145	104	115	60	75.0
	1995	544	161	198	144	178	84	75.6
	2003	598	186	258	165	206	100	72.2
Females	1985	2,591	85	106	81	89	46	75.1
	1995	488	124	158	110	138	74	72.72

(continued)

TABLE 26 (CONTINUED): COMPARISON OF ESTIMATED 24-HOUR INTAKE OF SELECTED FOOD GROUPS FOR CHILDREN AGED 10-15 YEARS: 1985, 1995 (COOK, RUTISHAUSER & ALLSOPP, 2001)

	Year	Sample Size	Mean intake (g)	Standard deviation	95% CI mean Lower	95% CI mean Upper	Median intake (g)	% Consuming
Eggs and egg products								
Males	1985	2,619	13	38	11	14	0	18.9
	1995	544	11	39	7	14	0	12.8
	2003	598	7	33	4	9	0	8.2
Females	1985	2,591	11	37	9	12	0	17.5
	1995	488	8	28	5	10	0	10.0
	2003	592	5	19	3	6	0	7.6
Fish and fish products								
Males	1985	2,619	9	35	8	10	0	9.7
	1995	544	17	55	13	22	0	12.2
	2003	598	8	46	4	12	0	5.8
Females	1985	2,591	8	28	7	9	0	11.2
	1995	488	15	54	10	20	0	10.9
	2003	592	24	94	16	31	0	12.6
Fats and oils								
Males	1985	2,619	19	18	18	20	14	82.2
	1995	544	12	14	11	13	10	77.5
	2003	598	6	9	5	6	0	45.8
Females	1985	2,591	15	14	15	16	14	83.2
	1995	488	9	10	8	10	6	74.8
	2003	592	6	11	5	7	2	51.2
Snack foods								
Males	1985	2,619	12	28	11	13	0	26.5
	1995	544	12	26	9	14	0	28.6
	2003	598	20	62	15	25	0	33.5
Females	1985	2,591	12	26	11	13	0	33.4
	1995	488	12	22	10	14	0	36.3
	2003	592	14	39	11	17	0	31.8
Confectionery								
Males	1985	2,619	16	N/A	15	18	0	34
	1995	544	25	N/A	21	28	0	50
	2003	598	23	43	20	27	0	45
Females	1985	2,591	15	N/A	14	17	0	42
	1995	488	21	N/A	18	25	2	50
	2003	592	22	42	19	26	2	50
Sugar products and dishes								
Males	1985	2,619	17	28	16	18	9	74.6
	1995	544	27	85	20	34	6	61.5
	2003	598	14	41	11	18	0	43.1
Females	1985	2,591	11	16	11	12	6	67.9
	1995	488	26	62	21	31	3	55.2
	2003	592	17	52	13	21	1	50.3

9. ANTHROPOMETRIC MEASURES

The sample size for these measures was lower than for other measures, as 15.3% of the males and 23.3% of females did not consent to participate in this section of the survey (for details see CAPANS Nutrition Technical Report).

Height, weight and umbilicus waist girth measures were compared with the 1985 Australian Health and Fitness Survey (Pyke, 1987). For that study each student's age was calculated as of 30th June 1985 regardless of the time of testing. Data were not available for 16-year-old students.

9.1 Height

Height is reported in percentiles in Tables 27 (males) and 28 (females) from 7 to 16 years of age. Males in 2003 were taller by an average of 3.2 centimetres (Figure 33) and females were taller by 2.8 centimetres (Figure 32) than their 1985 counterparts.

TABLE 27: HEIGHT (CM) FOR MALES BY AGE IN 2003

Percentile	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15	Age 16
10	122.6	123.7	129.3	134.5	138.6	144.2	149.4	155.0	163.8	167.5
20	123.7	125.9	133.3	137.6	144.0	147.2	153.1	163.4	167.7	170.5
30	128.5	128.3	135.6	139.7	145.7	149.6	155.5	166.6	169.5	172.3
40	129.2	130.1	137.1	141.3	148.0	151.7	157.5	168.9	172.1	174.6
Median	130.8	131.0	138.6	143.0	148.9	155.0	159.9	170.7	173.1	176.9
60	131.6	132.4	139.9	144.8	150.9	156.7	162.8	174.4	174.7	178.2
70	132.5	134.0	143.1	146.0	152.4	158.6	166.6	178.9	176.4	180.7
80	137.2	136.1	144.8	148.2	156.6	161.0	169.2	180.6	179.0	183.9
90	137.7	138.6	146.6	150.1	159.5	166.5	172.1	182.2	180.7	187.4
Mean	130.6	131.1	138.7	142.8	149.2	154.5	160.8	170.8	172.9	177.1
sd	5.7	6.4	6.3	6.0	7.8	7.9	8.7	9.9	6.2	7.7
n	20	162	35	190	38	190	135	25	91	73

FIGURE 33: MALE MEDIAN HEIGHT 1985 AND 2003

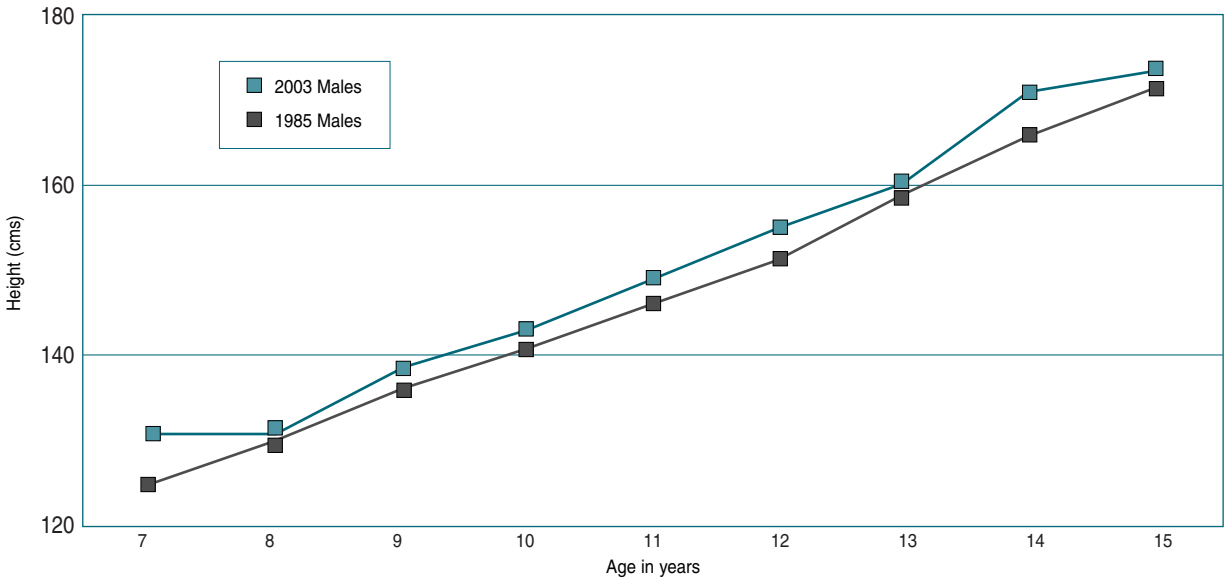
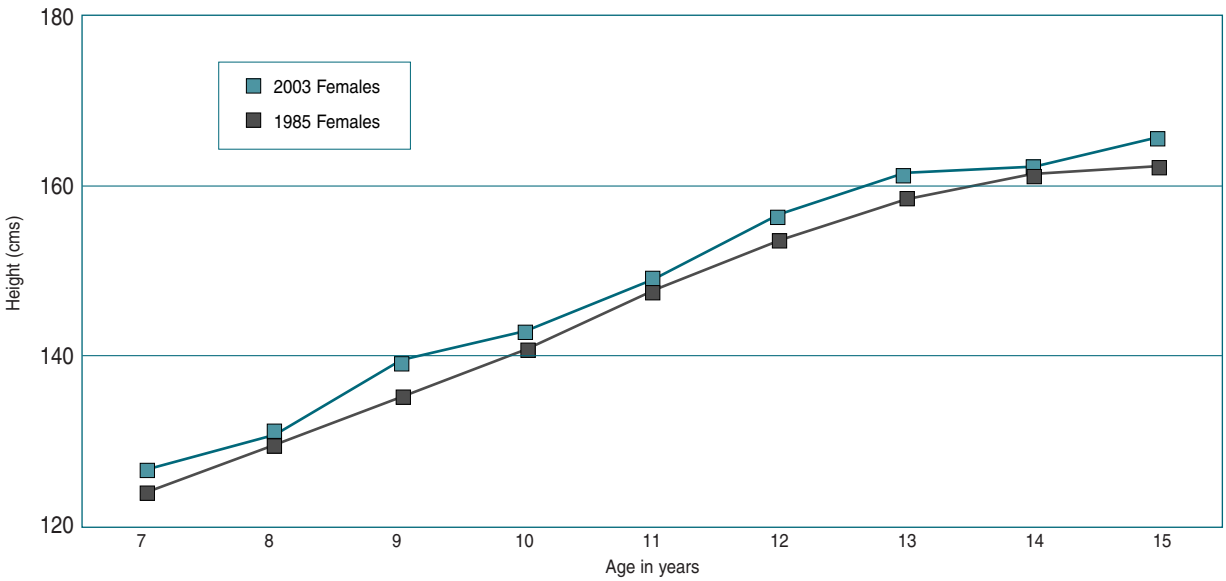


TABLE 28: HEIGHT (CM) FOR FEMALES BY AGE 2003

Percentile	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15	Age 16
10	118.2	123.3	128.7	134.1	143.0	146.6	150.7	155.3	156.4	155.4
20	122.0	126.4	133.0	137.0	143.6	149.8	155.8	157.9	159.1	159.0
30	123.4	127.8	135.4	139.0	145.5	152.8	157.5	159.5	161.2	160.7
40	125.8	128.9	136.5	140.3	147.3	154.6	159.2	160.5	162.2	163.3
Median	126.2	130.6	138.9	142.3	148.5	156.2	161.1	161.4	165.2	164.8
60	128.7	131.7	141.0	144.3	151.0	158.0	162.6	163.7	166.0	166.1
70	132.9	134.0	142.0	146.2	153.2	161.0	164.5	166.0	167.9	167.0
80	134.5	135.5	144.5	148.3	156.1	163.3	167.0	167.7	169.5	170.7
90	135.5	137.3	150.2	152.2	160.4	165.3	170.6	172.1	174.5	175.1
Mean	127.3	130.6	139.2	142.8	150.1	156.4	161.0	162.6	165.0	164.7
sd	6.6	5.3	7.4	6.8	6.7	7.2	7.1	6.5	7.1	7.3
n	23	151	41	180	27	170	92	36	96	60

FIGURE 34: FEMALE MEDIAN HEIGHT 1985 AND 2003



9.2 Weight

Male mean weight increased by as much as 12kg from 1985 (Pyke, 1987) whereas female mean weight increased by up to 6.6kg. Mean increases were 5.1kg for both males and females. Refer to Tables 29 and 30, and Figures 35 and 36 for males and females respectively.

TABLE 29: WEIGHT (KG) FOR MALES BY AGE IN 2003

Percentile	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15	Age 16
10	24.6	23.4	27.0	29.4	34.7	35.8	39.2	47.4	53.2	55.5
20	26.2	25.4	30.1	31.3	36.3	38.2	41.5	50.6	57.6	58.5
30	26.5	26.8	31.1	33.5	38.6	40.1	45.5	54.5	59.0	62.2
40	27.1	27.9	33.0	35.2	40.2	42.4	48.3	56.6	61.3	65.9
Median	28.3	28.7	34.0	36.8	42.5	46.0	49.9	61.5	63.5	69.3
60	29.5	30.2	35.6	38.8	44.5	47.5	54.1	65.1	68.0	71.3
70	30.4	32.4	37.0	40.8	46.4	49.7	57.1	67.7	70.3	74.5
80	31.4	34.7	40.0	44.5	50.3	53.6	61.4	79.5	74.6	80.3
90	37.6	37.9	43.1	49.0	53.4	58.2	70.7	98.7	79.8	84.7
Mean	29.3	30.2	35.1	36.8	42.8	46.3	52.8	65.1	63.5	70.0
sd	4.5	6.2	6.6	7.7	7.5	9.5	12.1	18.0	11.0	12.4
n	20	162	35	190	38	190	135	25	91	73

FIGURE 35: MALE MEDIAN WEIGHT 1985 AND 2003

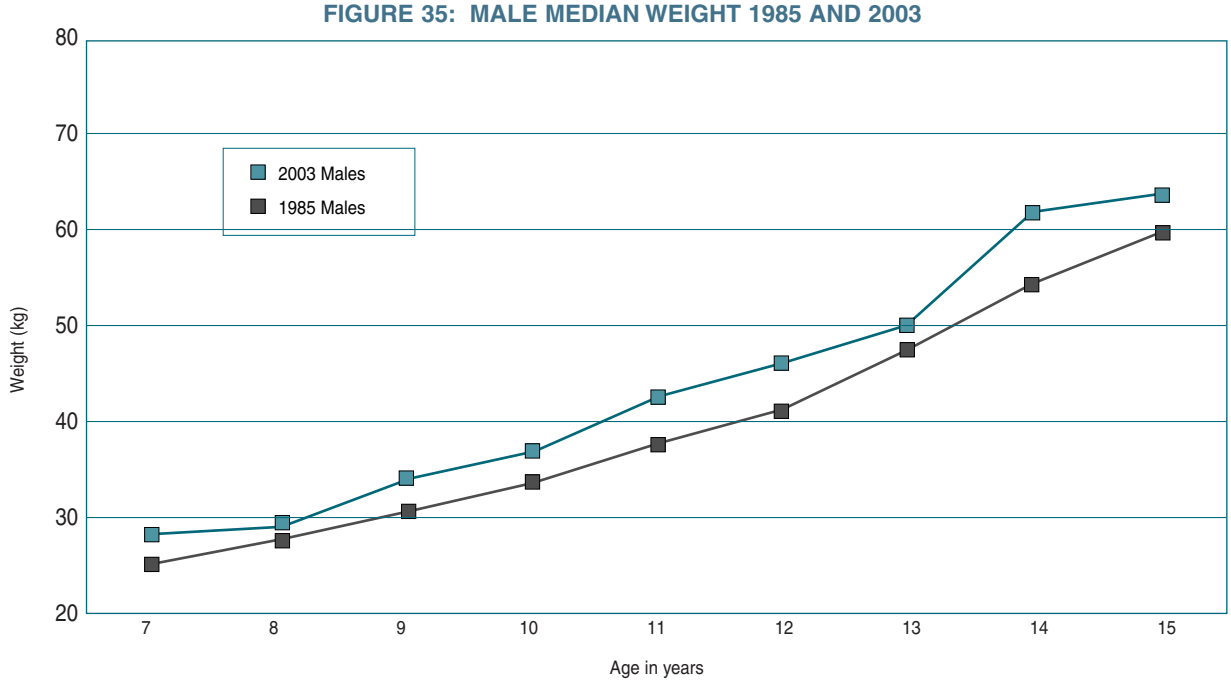
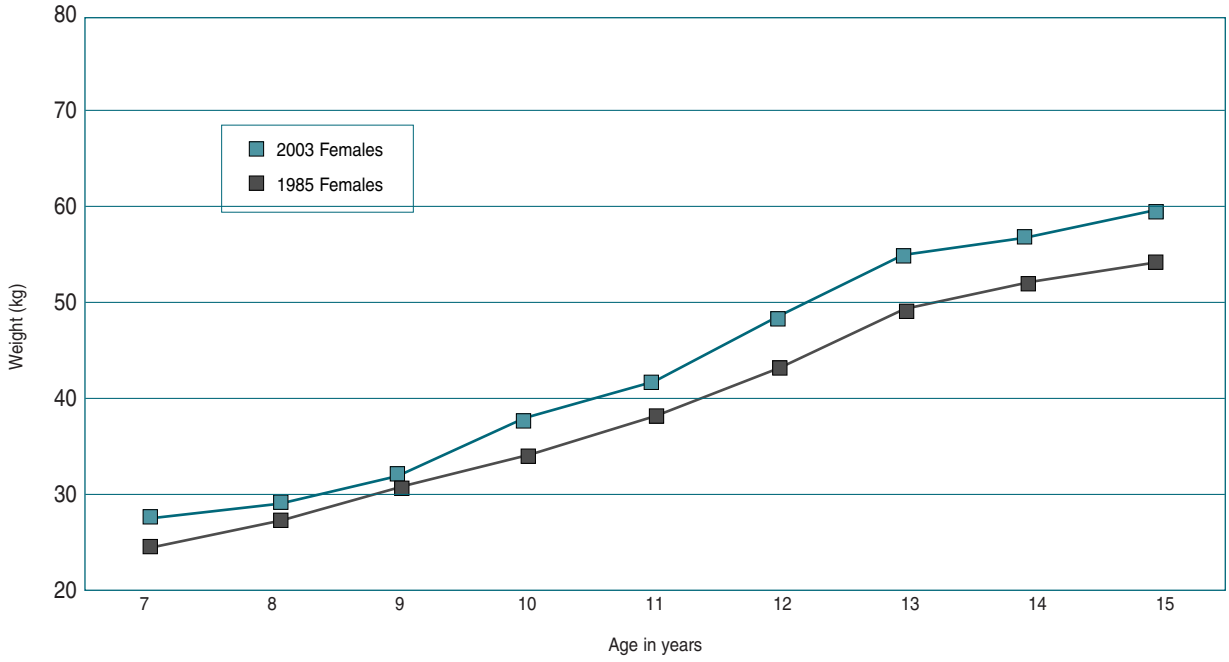


TABLE 30: WEIGHT (KG) FOR FEMALES BY AGE IN 2003

Percentile	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15	Age 16
10	23.2	23.4	27.2	30.0	32.9	37.5	43.5	48.0	49.2	47.3
20	24.6	25.6	28.1	31.6	35.8	40.9	46.9	51.1	52.2	51.2
30	25.5	26.6	29.2	33.3	37.3	43.4	50.5	52.0	53.6	54.0
40	26.4	27.5	30.2	35.2	40.2	45.6	53.3	54.5	56.2	55.5
Median	27.2	28.6	31.9	37.7	41.4	48.3	54.7	56.6	59.5	58.3
60	28.2	29.5	36.1	39.6	45.3	50.3	56.8	60.1	61.4	61.0
70	33.0	31.8	39.0	42.2	47.3	52.2	59.1	64.8	64.3	63.3
80	39.8	34.1	42.3	44.7	54.7	57.1	66.1	66.9	69.4	65.9
90	43.0	37.6	46.1	50.1	58.2	62.2	68.1	71.8	75.4	71.1
Mean	30.2	29.9	34.9	38.7	43.9	49.0	55.9	58.6	59.5	58.9
sd	7.6	6.1	7.6	8.0	9.0	9.4	11.1	9.6	11.0	8.8
n	23	151	41	180	27	170	92	36	96	60

FIGURE 36: FEMALE MEDIAN WEIGHT 1985 AND 2003



9.3 Waist Girth

Waist girth measures were taken following two methodologies, referred to as Iliac Crest and Umbilicus.

9.3.1 Waist Girth – Iliac Crest Measure

This measure will be used in the main discussion, as it is now the preferred protocol for research studies (World Health Organization, 1995). Refer to Tables 31 and 32 for males and females respectively.

TABLE 31: WAIST GIRTH (CM) (ILIAC CREST) FOR MALES BY AGE

Percentile	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15	Age 16
10	52.7	52.6	55.5	56.6	59.1	59.8	61.9	63.1	66.9	67.2
20	55.2	54.1	57.5	57.9	61.6	61.3	63.0	65.8	78.8	70.5
30	55.7	55.1	59.3	59.5	63.0	62.6	65.1	68.7	70.5	72.0
40	56.1	56.7	59.8	61.1	64.9	64.1	66.2	70.2	71.6	74.2
Median	57.1	57.8	60.6	62.6	66.0	65.5	67.8	72.4	73.9	75.0
60	57.9	59.5	62.3	64.1	66.9	67.2	69.2	74.0	74.9	78.3
70	58.5	61.1	65.1	66.3	70.5	69.0	72.3	77.9	77.0	80.0
80	61.2	63.2	66.4	70.8	73.8	71.5	77.3	80.6	78.7	81.8
90	68.9	68.8	70.4	75.8	77.2	77.6	82.7	95.9	85.7	86.1
Mean	58.2	59.4	62.1	64.4	66.8	67.2	70.2	75.2	75.0	76.9
sd	4.9	6.8	5.7	7.9	6.7	7.7	8.6	11.4	9.1	8.6
n	21	164	35	190	38	189	135	25	90	73

TABLE 32: WAIST GIRTH (CM) (ILIAC CREST) OF FEMALES BY AGE

Percentile	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15	Age 16
10	51.9	52.3	53.1	55.0	57.7	59.1	61.1	63.6	64.6	63.8
20	53.1	53.8	53.9	57.2	58.9	61.0	63.4	66.4	67.2	65.6
30	54.0	55.0	55.2	58.9	60.8	61.8	66.2	68.6	68.2	66.7
40	55.8	56.2	57.2	60.1	61.7	63.4	67.6	69.2	69.5	68.1
Median	56.2	57.3	60.0	61.8	63.6	65.7	68.9	71.7	71.5	69.7
60	57.8	58.5	61.8	63.6	66.0	68.1	70.5	74.2	72.7	71.7
70	61.3	59.6	63.2	65.9	66.7	69.9	73.8	76.4	74.5	74.0
80	66.8	61.1	65.4	68.9	73.3	73.4	76.5	79.3	78.4	76.9
90	74.4	65.7	69.9	74.6	80.9	77.9	81.9	82.1	87.3	78.9
Mean	59.4	58.3	60.9	63.4	65.7	67.1	70.6	72.8	72.5	71.2
sd	8.4	6.1	8.1	7.4	7.7	7.5	8.3	7.5	11.1	6.8
n	23	153	40	180	27	172	92	36	97	60

9.3.2 Waist Girth – Umbilicus Measure

The umbilicus method of measuring waist girth allows direct comparison to the 1985 Australian Health and Fitness Survey result (Pyke, 1987) (refer to Figures 37 and 38 for males and females respectively). Waist girths were larger in 2003 at all ages compared to 1985. Male students' average waist girths increased over 19 years by as much as 5.8 centimetres, and females' girths increased by up to 11 centimetres. This increase was particularly apparent for females aged 13 years and above. On average male waist girths increased by 5.6 cm and female waist girths increased by 7.4 cm.

FIGURE 37: MALE MEDIAN WAIST GIRTH 1985 AND 2003

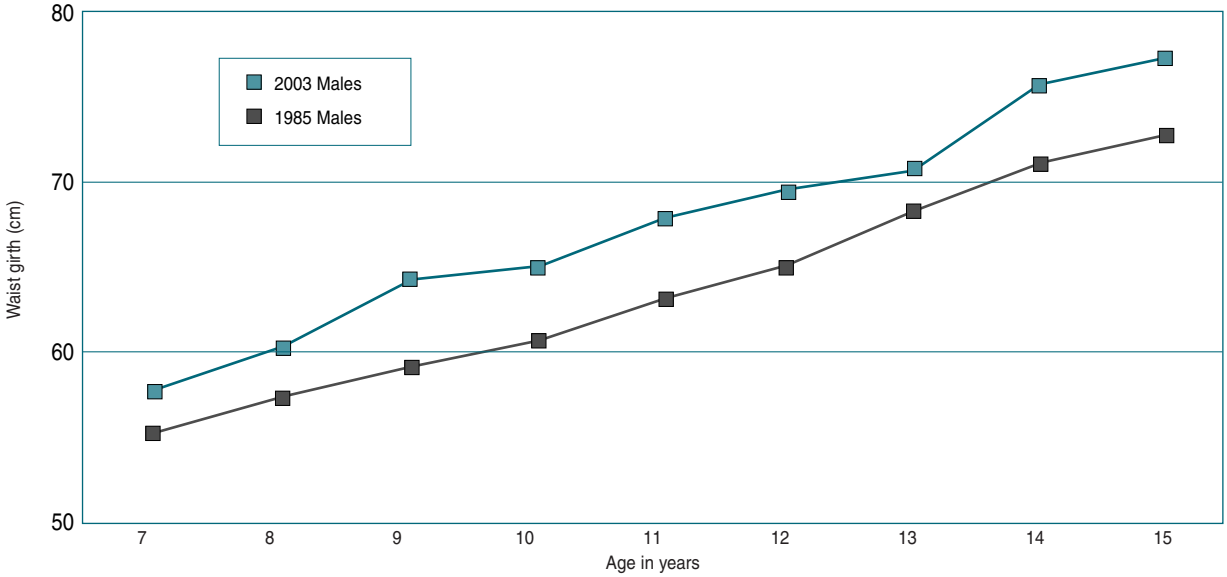
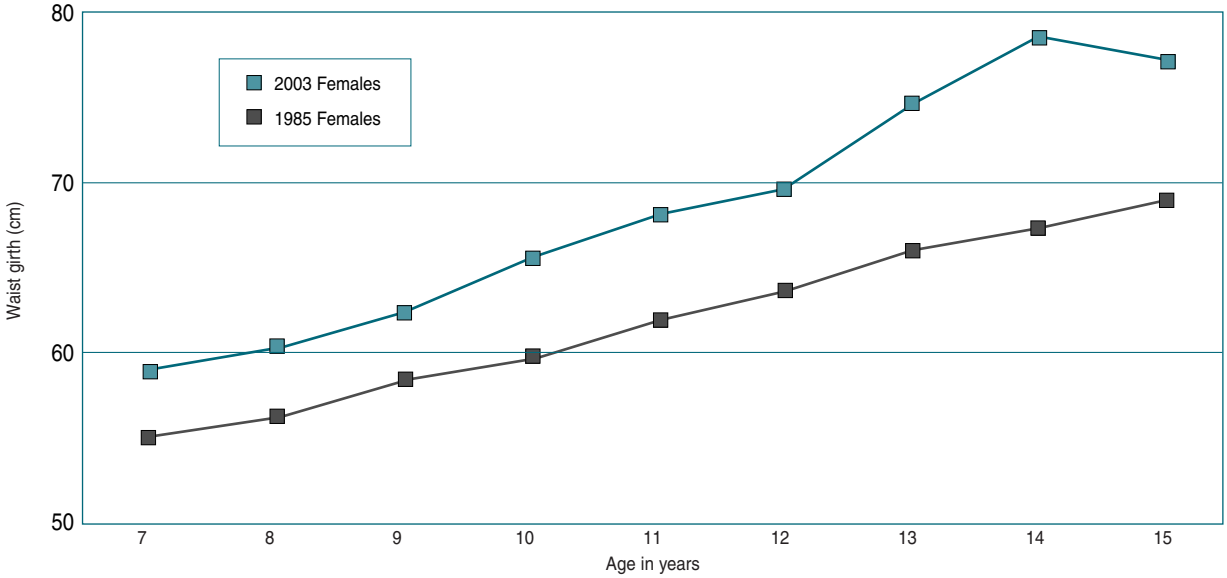
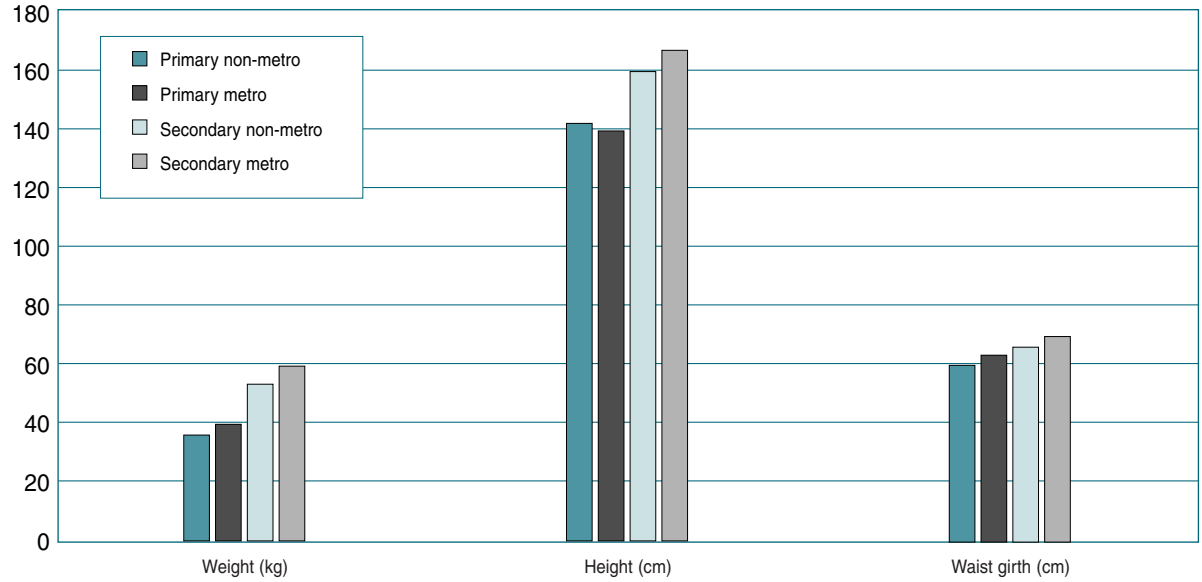


FIGURE 38: FEMALE MEDIAN WAIST GIRTH 1985 AND 2003



When the location of school was considered, non-metropolitan primary school students on average were taller, weighed less, and had smaller waist girths than their metropolitan counterparts (see Figure 39). These differences were similar for the older students, however the secondary metropolitan students were also taller. Differences between non-metropolitan and metropolitan living locations with respect to physical measures of health had disappeared by secondary level of schooling.

FIGURE 39: HEIGHT, WEIGHT, AND WAIST GIRTH FOR METROPOLITAN AND NON-METROPOLITAN STUDENTS



10. BODY MASS INDEX

Body Mass Index (BMI) is reported in kg/m^2 and was calculated for each student from height and weight measures. (BMI percentiles are reported for gender by age in the CAPANS Physical Activity Technical Report). As expected, BMI in children increased with age.

Based on height and weight measures, each student was classified as acceptable weight, overweight or obese based on Cole et al, (2000) BMI categories (details provided in the CAPANS Physical Activity Technical Report).

Results for males and females are shown in Tables 33 and 34, respectively. By dichotomising the sample into acceptable and overweight (overweight plus obese), the proportion of overweight males across age ranged from a minimum of 15% at 7 years to a high 36% at 14 years of age. Female students prevalence of overweight, ranged between 39.1% at 7 years of age and 15% at 16 years of age. The prevalence of overweight and obesity in 7 to 15-year-old students increased from 9.3% of males and 10.6% of females in 1985 to 21.7% of males and 27.8% of females in 2003.

TABLE 33: PERCENTAGE OF MALES CATEGORISED AS ACCEPTABLE WEIGHT, OVERWEIGHT OR OBESE

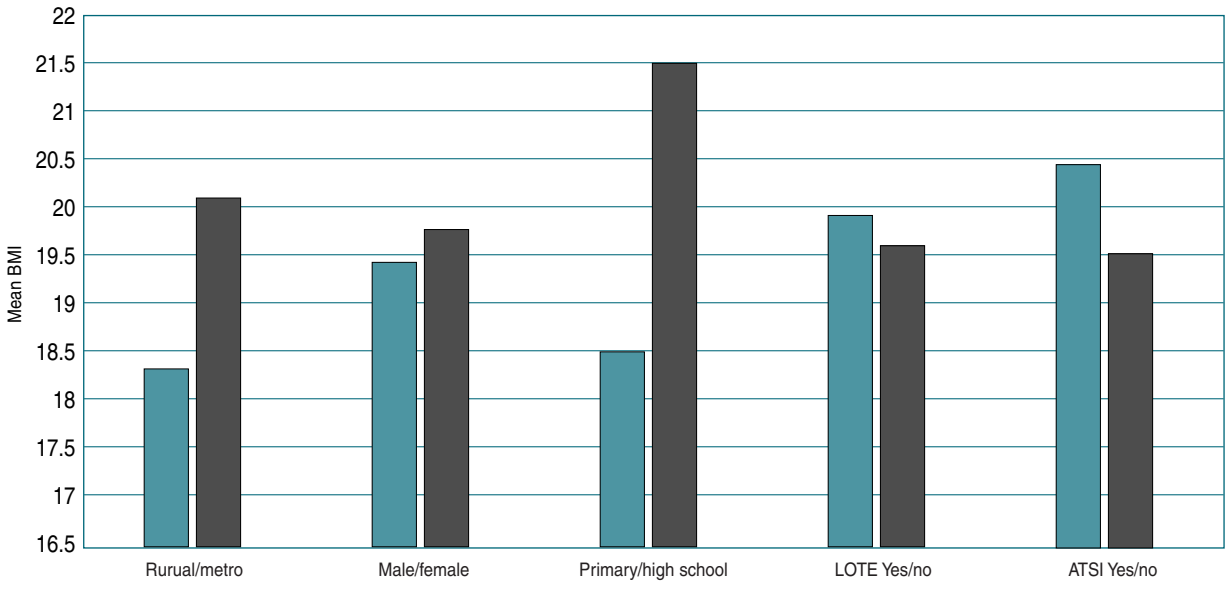
	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15	Age 16
n	*20*	*162*	*35*	*190*	*38*	*190*	*135*	*25*	*91*	*73*
Normal	85.0	78.4	80.0	75.8	73.7	83.2	80.0	64.0	74.7	80.8
Overweight	10.0	14.8	14.3	18.9	26.3	14.7	15.6	20.0	18.7	15.1
Obese	5.0	6.8	5.7	5.3	0.0	2.1	4.4	16.0	6.6	4.1

TABLE 34: PERCENTAGE OF FEMALES CATEGORISED AS ACCEPTABLE WEIGHT, OVERWEIGHT OR OBESE

	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15	Age 16
n	*23*	*151*	*41*	*180*	*27*	*170*	*92*	*36*	*96*	*60*
Normal	60.9	76.2	73.2	71.1	74.1	72.9	72.8	69.4	71.9	85.0
Overweight	21.7	17.9	22.0	23.9	22.2	23.5	21.7	25.0	25.0	11.7
Obese	17.4	6.0	4.9	5.0	3.7	3.5	5.4	5.6	3.1	3.3

When the BMI data was stratified for various demographic variables, clear differences emerge (see Figure 40). Metropolitan students had higher BMI's than non-metropolitan students and female students had slightly higher BMI's than males. The large difference in BMI for primary and secondary students reflects expected developmental changes in physique as the body mass increases relative to height with growth. The slightly higher BMI in students who speak languages other than English may reflect cultural differences. Of interest was the higher average BMI for Aboriginal students in the sample, which adds to the concern for greater risk of earlier onset of Type II diabetes in children, which is already endemic in Aboriginal and Torres Straight Islander communities.

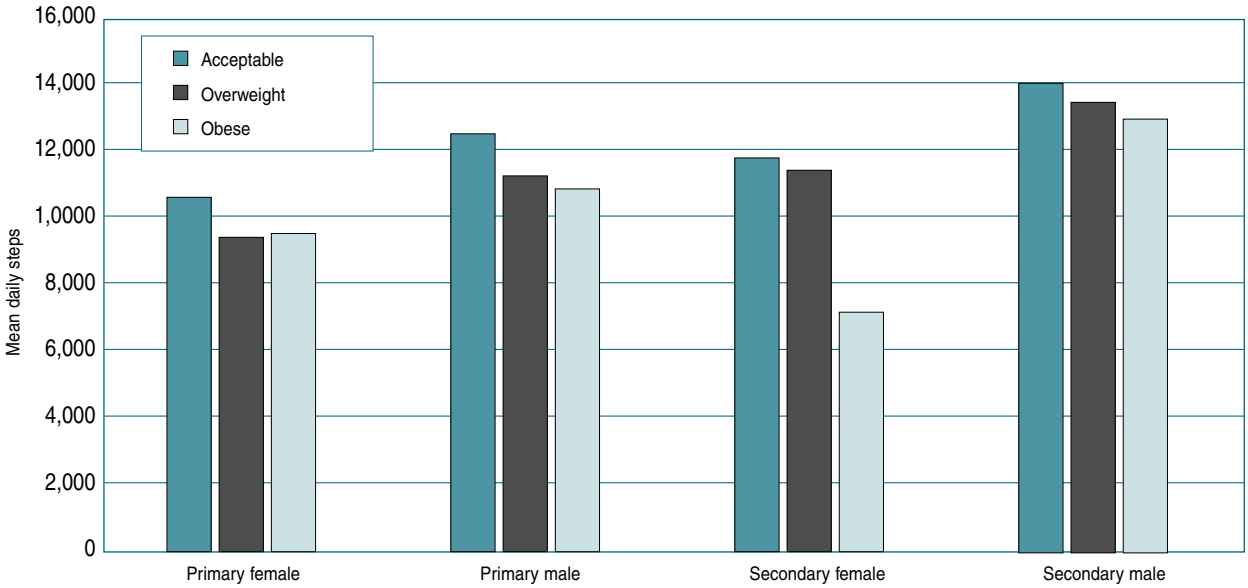
FIGURE 40: MEAN BMI FOR DEMOGRAPHIC VARIABLES



10.1 Physical Activity Levels

The average daily step counts of students were compared according to BMI categories and reported for primary or secondary school and gender in Figure 41. For both primary and secondary school groups, those students at an acceptable weight reported higher average step counts than their overweight or obese counterparts. Of particular concern was that the lowest step count was recorded for obese secondary school females, whereas for all other groups the step counts increased from primary to secondary years.

FIGURE 41: MEAN STEP COUNTS ACROSS BMI CATEGORIES, GENDER AND SCHOOL GROUP



10.2 Nutrient Intakes

Mean and median EI/BMR ratios for both male and female overweight and obese children and adolescents were significantly lower than for acceptable weight children (refer to CAPANS Nutrition Technical Report for detailed tables).

Since there was little difference in the proportions reporting being on a weight controlled diet (0% of 8 to 11-year-olds, 0% of acceptable weight adolescent males, 1% of overweight or obese adolescent males; 2% of acceptable weight and 3% of overweight or obese adolescent females) the differences in EI/BMR ratios were most likely due to under-reporting of food intake or low food intake as a result of very low levels of physical activity (Goldberg et al., 1991; Black, 2000).

With the removal of data from the students most likely to be under-reporting (EI/BMR ratio less than 0.9, refer to explanatory notes), the mean and median intakes of energy and macronutrients were not significantly different for the acceptable weight and overweight/obese students for both age categories and genders. The only exception was fat intake in 10 to 11-year-old females, which was lower in the overweight/obese children.

The mean and median intakes of vitamins and minerals showed some significant but variable differences between BMI, age and gender categories. Most of these differences were retained when nutrient density (nutrient intake/energy intake (kJ)) was considered (refer to CAPANS Nutrition Technical Report for detailed tables).

To allow examination of the effects of physical activity on food intake, energy and nutrient intakes were considered in relation to step counts as well as BMI and gender. Age groups were combined and activity level was defined as *more active* when step count was equal to or above the median and *less active* when step count was below the median.

Median EI/BMR remained higher for those of acceptable weight than those overweight or obese in both the more active and less active groups of males and females.

With consideration of activity level, more significant differences in energy and nutrient intakes were seen between BMI and gender categories, but these were not consistent across categories (Tables 35 to 38).

In the more active group of males:

- Those of acceptable weight consumed more sugars, riboflavin, vitamin A and calcium than the overweight or obese; and
- Riboflavin, vitamin A and calcium densities showed similar differences.

In the more active group of females:

- Median energy, macronutrient, vitamin and mineral intakes were no different in acceptable weight and overweight or obese.

In the less active group of females:

- Those of acceptable weight consumed more starch, fibre, vitamin A, beta-carotene, riboflavin and magnesium than the overweight or obese; and
- These differences remained similar for vitamin A, beta-carotene and magnesium nutrient density.

In the less active group of males:

- Those of acceptable weight had higher folate intake and higher nutrient densities for folate and iron than those overweight or obese.

Macronutrient intake was no different in those of acceptable weight and those overweight or obese.

TABLE 35: MEDIAN DAILY INTAKE OF ENERGY, MOISTURE AND MACRONUTRIENTS FOR MALES 10-15 YEARS BY BMI CATEGORY AND ACTIVITY CATEGORY (EI/BMR ≥ 0.09)

	MORE ACTIVE		LESS ACTIVE		
	Acceptable weight	Overweight / Obese	Acceptable weight	Overweight / Obese	Total
n	*164*	*32*	*155*	*42*	*393*
Energy (kJ)	10,387	9,926	9,658	9,981	10,075
Protein (g)	99.5	102.9	88.4	89.8	92.3
Fat (g)	94.8	98.3	84.5	86.0	92.3
Saturated fat (g)	42.4	45.9	37.7	35.9	40.9
Polyunsaturated fat (g)	10.0	11.3	10.0	9.3	10.0
Monounsaturated fat (g)	31.8	36.3	30.4	29.6	31.3
Cholesterol (mg)	284	318	273	263	278
Carbohydrate (g)	321	283	279	293	298
Sugars (g)	138	121	115	123	130
Starch (g)	156	163	148	151	152
Water (g)	1,923	2,141	1,777	1,666	1,869
Alcohol (g)	0	0	0	0	0
Fibre (g)	20.0	21.1	20.2	18.8	20.1
EI/BMR[(a)]	1.7	1.4	1.5	1.3	1.6

(a) Only calculated for participants over 10 years of age where weight was measured. See Nutrition Technical Report for more details.

TABLE 36: MEDIAN DAILY INTAKE OF ENERGY, MOISTURE AND MACRONUTRIENTS FOR FEMALES 10-15 YEARS BY BMI CATEGORY AND ACTIVITY CATEGORY (EI/BMR ≥ 0.09)

	MORE ACTIVE		LESS ACTIVE		
	Acceptable weight	Overweight / Obese	Acceptable weight	Overweight / Obese	Total
n	*158*	*39*	*140*	*58*	*395*
Energy (kJ)	8,419	9,551	9,062	8,367	8,882
Protein (g)	75.9	90.6	82.3	73.1	78.2
Fat (g)	76.1	80.1	80.7	76.4	78.1
Saturated fat (g)	33.9	37.3	34.2	34.2	34.5
Polyunsaturated fat (g)	9.8	8.2	9.3	10.1	9.3
Monounsaturated fat (g)	26.4	28.8	29.3	24.3	27.1
Cholesterol (mg)	224	230	260	221	229
Carbohydrate (g)	250	247	273	263	260
Sugars (g)	121	112	122	111	120
Starch (g)	131	125	148	128	134
Water (g)	1,714	1,499	1,687	1,464	,1,609
Alcohol (g)	0	0	0	0	0
Fibre (g)	19.6	19.5	20.8	16.1	20.1
EI/BMR	1.6	1.4	1.7	1.3	1.5

TABLE 37: MEDIAN DAILY INTAKE OF VITAMINS AND MINERALS FOR MALES 10-15 YEARS BY BMI CATEGORY AND ACTIVITY CATEGORY (EI/BMR ≥ 0.09)

	MORE ACTIVE		LESS ACTIVE		
	Acceptable weight	Overweight / Obese	Acceptable weight	Overweight / Obese	Total
n	*164*	*32*	*155*	*42*	*393*
Thiamin (mg)	1.9	1.8	2.0	1.6	1.9
Riboflavin (mg)	2.7	2.2	2.6	2.2	2.6
Niacin (mg)	22.8	21.2	21.7	18.5	21.8
Niacin equivalents (mg)	43.1	42.8	40.8	36.9	41.5
Vitamin C (mg)	90	101	66	74	79
Folate (ug)	327	285	332	235	307
Vitamin A (ug)	903	754	778	1,030	841
Retinol (ug)	524	413	421	432	467
Beta carotene (ug)	1,211	807	1,190	1,096	1,172
Potassium (mg)	3,185	3,480	3,135	2,756	3,129
Magnesium (mg)	312	314	295	289	302
Calcium (mg)	1,100	1,100	934	1,169	1,060
Phosphorus (mg)	1,797	1,659	1,506	1,784	1,678
Iron (mg)	14.9	14.6	14.9	12.2	14.7
Zinc (mg)	12.8	12.1	11.4	13.1	12.3

TABLE 38: MEDIAN DAILY INTAKE OF VITAMINS AND MINERALS FOR FEMALES 10-15 YEARS BY BMI CATEGORY AND ACTIVITY CATEGORY (EI/BMR ≥ 0.09)

	MORE ACTIVE		LESS ACTIVE		
	Acceptable weight	Overweight / Obese	Acceptable weight	Overweight / Obese	Total
n	*158*	*39*	*140*	*58*	*395*
Thiamin (mg)	1.4	1.9	1.6	1.3	1.5
Riboflavin (mg)	2.0	2.1	2.2	1.7	2.0
Niacin (mg)	18.6	21.8	19.7	16.0	18.4
Niacin equivalents (mg)	34.4	41.8	35.8	30.9	35.1
Vitamin C (mg)	96	93	73	73	83
Folate (ug)	227	250	261	237	245
Vitamin A (ug)	804	756	839	588	788
Retinol (ug)	388	410	428	339	388
Beta carotene (ug)	1,369	1,967	1,575	1,098	1,411
Potassium (mg)	2,773	2,645	2,577	2,416	2,613
Magnesium (mg)	260	258	267	227	264
Calcium (mg)	808	811	884	849	852
Phosphorus (mg)	1,387	1,556	1,458	1,314	1,435
Iron (mg)	11.4	10.9	11.7	10.8	11.4
Zinc (mg)	10.1	10.3	10.8	10.7	10.3

10.2.1 Food Choice and Eating Habits

Data from the food frequency questionnaire highlighted a number of factors linked to higher rates of overweight and obesity (see Table 39).

The only factor that differentiated acceptable weight and overweight 8 to 11-year-olds was the mother's education, with the mothers of overweight children less likely to complete year 10 and the higher percentage of acceptable weight children eating breakfast cereals with added sugar. The length of time the student was breastfed as a baby was higher for acceptable weight 8 to 11-year-olds. This was also a differentiating factor for adolescents. The length of time the student was breastfed as a baby was slightly higher for acceptable weight 8 to 11-year-olds.

Compared to acceptable weight adolescents, overweight and obese adolescents were also:

- more likely to skip breakfast on three days per week or more;
- more likely to eat breakfast cereal less than 5 times per week;
- more likely to eat breakfast cereals with added sugar or flavourings; and
- more likely to have mothers who completed year 10 education or less.

TABLE 39: PERCENTAGE OF STUDENT RESPONSES TO PATTERNS OF EATING OVER THE LAST 12 MONTHS ACCORDING TO BMI

	8 TO 11 YEARS			12 TO 15 YEARS		
Item	Acceptable	Overweight/ Obese	P	Acceptable	Overweight/ Obese	P
Less than 2 serves of fruit per day	44.0	37.4	NS	44.0	45.7	NS
Less than 3 serves of vegetables per day	65.7	63.6	NS	54.8	50.2	NS
Times per week eating breakfast cereal (5 days per week or more)	57.5	53.3	NS	50.3	43.3	P<0.05
Eat dinner watching TV 5–7 days/wk	20.7	25.7	NS	28.6	24.5	NS
Take-away foods once or more a week	32.9	36.0	NS	35.7	37.0	NS
Drink regular soft drinks more than once per week	25.0	25.8	NS	42.2	43.3	NS
Breakfast cereals with added sugar & flavouring	27.1	18.5	P<0.05	18.8	28.4	p<0.01
Potato chips, corn chips or Twisties more than once per week	48.9	45.7	NS	43.4	37.4	NS
Eat breakfast 4 days per week or less	4.7	3.2	NS	21.2	30.5	p<0.01
Breastfed 4-6 months or less	41.9	53.9	P<0.01	-	-	-
Mothers education – completed year 10 or less	25.1	35.8	P< 0.01	25.7	41.0	p<0.001
Parent rating of weight 'about right' or 'too thin'	98.2	73.1	P<0.001	-	-	-
Self rating of weight 'about right' or 'too thin'	-	-	-	93.4	55.9	p<0.001

10.3 Predictors of BMI

The following section provides the results of multi-variate analysis of selected variables to predict BMI.

Aside from age, which for children was expected to be a strong predictor of BMI as a continuous variable, lower levels of physical activity and regularly skipping breakfast were the main predictors of BMI amongst the variables considered. Mother's education limited to year 10 or below, and eating fast food more than once a week were also important. There was no significant difference in BMI across schools.

11. RECOMMENDATIONS

With consideration of the results of the CAPANS study and existing policies, programs and infrastructure in Western Australia, the Premier's Physical Activity Taskforce recommends:

1. Enhancing the policy and curriculum emphasis on the physical activity and healthy lifestyles program that is delivered in schools, with monitoring and evaluation of the educational outcomes in line with other literacy and numeracy outcomes.
2. Implementing a professional learning program and resources for teachers in the K-10 years of schooling, to support the delivery of quality physical activity and healthy eating programs. This will include expanded Fundamental Movement Skills training for K-3 teachers so that all schools have access to trained staff.
3. Initiating communication and mass media campaigns promoting the National Child and Youth Physical Activity Recommendations to parents and children, with an emphasis on decreasing sedentary behaviour.
4. Providing ongoing funding for the monitoring of child and adolescent physical activity levels, nutrition and growth status.
5. Focusing on nutrition at school and ensuring adequate accreditation in all school canteens, and sustained funding of the WA School Canteen Association to administer the accreditation and professional development of canteen staff.
6. Developing a set of resources and a professional development program for teachers around healthy eating habits for life and a corresponding mass media campaign linked to the above physical activity campaign.
7. Implementing professional development of the health work-force to promote physical activity and healthy eating.
8. Increasing the skills and capacity of community sport and recreation service providers to target children's participation needs.
9. Promoting physical activity opportunities both in and outside of school hours with an emphasis on programs that encourage the participation of female secondary students.
10. Continuing to support and expand programs which inform and encourage active transport, such as walking and cycling, among school-aged children, their parents and their teachers.

GLOSSARY

Active play includes any non-organised activity of moderate or vigorous intensity.

Active transport includes any method of transport that requires expenditure of energy e.g. walking, cycling, skateboarding, scootering.

Basal Metabolic Rate (BMR) is the amount of energy expended by the body at rest over a 24-hour period, to maintain vital processes such as respiration, circulation and digestion.

Bipedal motion is motion involving two feet

Body Mass Index (BMI) is an indicator of fatness. It is calculated by dividing a person's weight in kilograms by their height in metres squared.

Duration refers to the length of time (hours/minutes) spent participating in an activity.

EI/BMR is an Energy Intake to BMR ratio, which expresses a person's energy intake as a multiple of their basal metabolic rate over the same time period. It is calculated as energy intake divided by BMR.

Energy Expenditure in relation to physical activity is an estimate of energy costs. It is usually derived from observation, indirect or direct assessment or reports of people's activity level.

Energy Intake is the amount of energy supplied by foods and drinks consumed over the 24-hour period measured in kilojoules (kJ).

Exercise is a subset of physical activity and is defined as planned, structured and repetitive bodily movement done to improve or maintain one or more components of fitness, such as muscle strength, endurance, flexibility or cardio-respiratory endurance.

Extruded snacks have undergone a cooking-extrusion process with the aim of producing a voluminous, expanded, texturised and crispy product, for example Twisties. Primary ingredients in extruded products include starch, protein, fat, sugar and fibre (cellulose).

Fin fish is any aquatic vertebrate of the superclass Pisces. Examples flathead, swordfish, barramundi, salmon

Frankfort Plane is an imaginary line passing through the external ear canal and across the top of the lower bone of the eye socket, immediately under the eye.

Frequency refers to the number of times a person performs an activity within a given period.

Fundamental Movement Skills Are *movement patterns that involve different body parts such as legs, arms, trunk and head, and include running, hopping, catching, throwing, striking and balance. They are the foundation movements or precursor patterns to the more specialised, complex skills used in games, sports, dance, gymnastics, outdoor education and physical recreation activities.* Department of Education and Training (2001). Fundamental Movement Skills Teacher Resource, Government of Western Australia, Perth, WA.

Height is a measure (in centimetres or metres) of how tall a person is.

High Active refers to a group of participants whose mean daily step counts were in the highest tertile (third).

Inactivity is used to when a participant reports that they did not participate in given activity(s).

Intensity is the perceived or self-reported intensity at which an activity is performed e.g. vigorous, moderate, light.

Low Active refers to a group of participants whose mean daily step counts were in the lowest tertile (third).

Macronutrients include protein, fat (total saturated, monounsaturated and polyunsaturated), cholesterol, carbohydrate (total, starches and sugars), dietary fibre and alcohol.

Metropolitan describes a region defined by postcode. For this survey, all postcodes including 6215 and below, other than 6041-6044, were included. These represented Perth, Western Australia.

Moderate intensity physical activity requires 3 to 6 METs (3 to 6 times as much energy as at rest), it generally causes some increase in breathing and heart rate.

Non-metropolitan describes a region defined by postcode. For this survey, all postcodes above 6215, other than 6566 and 6588, were included. These represented any region other than Perth in Western Australia

Nutrition in this report refers to dietary habits and food, beverage and nutrient intake.

Nutrient Density refers to the amount of a nutrient consumed per 1,000kJ of energy intake. It is an indicator of the quality of the diet relative to energy intake.

Obesity is a term ascribed to a person whose BMI is above a certain cut off point. For this study the cut-points were based on the Cole et al., (2000) international cut off points for different ages and sex.

Optical mark recognition is a process of inputting data by detecting marks on a form. Light reflection is used to detect the marks and they are interpreted as data by software.

Overweight is a term ascribed to a person whose BMI is above a certain cut off point. For this study the cut-points were based on the Cole et al., (2000) international cut off points for different ages and sex.

Pedometer is a small motion sensor device, which counts and records the number of steps performed by the wearer while performing activities using bipedal motion.

Physical Activity is any bodily movement produced by skeletal muscles that results in energy expenditure.

Physical Education/School Sport is used to describe physical activity sessions performed as part of the school curriculum.

Pome fruit is a fleshy fruit, such as an apple, pear, or quince, having several seed chambers and an outer fleshy part largely derived from the hypanthium.

Secular trend refers to the relatively consistent movement of a variable over a long period

Sedentary is used to describe activities that require minimal energy expenditure such as watching television or reading.

Sport is a physical activity that generally is competitive and involves an accepted set of rules.

Stadiometer is a device used for measuring height.

Vigorous activity is physical activity requiring 6+ METs (over 6 times as much energy as at rest); it usually causes some 'huffing and puffing'.

Waist girth is a measure in centimetres of the circumference of a person's waist.

Weight is a measure in kilograms of how much a person weighs.

ABBREVIATIONS

%	Percentage
AAHMS	Australian Adolescent Health Monitoring Service
ABS	Australian Bureau of Statistics
ACER	Australian Centre for Education Research
BMI	Body Mass Index
BMR	Basal Metabolic Rate
CAPANS	Child and Adolescent Physical Activity and Nutrition Survey
cm	centimetre
df	degrees of freedom
EI	Energy Intake
K-3	kindergarten to year 3
K-10	kindergarten to year 10
kg	kilogram
kg/m^2	kilograms divided by (metres squared)
metro	metropolitan
METs	Metabolic equivalent (MET) is a unit of energy or level of oxygen used at rest (1 MET = VO2 of 3.5 mL/kg/min).
Mins	minutes
n	number in the sample size
NNS	national nutrition survey
non-metro	non-metropolitan
ns	not significant
PA	Physical Activity
PAQ	Physical Activity Questionnaire
PE	Physical Education
P	Probability
r	correlation coefficient
sd	standard deviation
SHS	senior high school
TV	Television
wk	week

REFERENCES

Ainsworth, B. E., Haskell, W. J., Leon, A. S., Jacobs, D. R., Montoye, H. J., Sallis, J. F., & Paffenbarger, R.S. (1993). Compendium of physical activities: classification of energy costs of human physical activities. *Medicine and Science in Sports and Exercise,* 25(1), 71-80.

Australian Bureau of Statistics. (2004): 4901.0. *Children's Participation in Cultural and Leisure Activities*. Canberra: ABS.

Australian Bureau of Statistics and Department of Health and Aged Care (1999). *National Nutrition Survey Foods Eaten Australia 1995*, ABS cat. no. 4804.0, Canberra: ABS.

Australian Bureau of Statistics. (1998a). *National Nutrition Survey: Nutrient Intakes and Physical Measurements*, 1995. Cat. No. 4805.0, Canberra: ABS.

Australian Bureau of Statistics. (1998b). *National Nutrition Survey: User's Guide, 1995*. Cat. No. 4801.0, Canberra: ABS.

Australian Institute of Health and Welfare. (2003). *Australia's Young People: Their Health and Wellbeing 2003.* AIHW Cat. No: PHE 50. Retrieved April 8, 2004 from http://www.aihw.gov.au/publications/index.cfm?type=detail&id=9569.

Ballard-Barbash, R., Graubard, I., Krebs-Smith, S. M., Schatzkin, A., & Thompson, F. E. (1996). Contribution of dieting to the inverse association between energy intake and body mass index. *European Journal Clinical Nutrition*, 50(2):98-106.

Bandini, L. G., Cyr, H., Must, A., & Dietz, W. H. (1997). Validity of reported energy intake in pre-adolescent girls. *American Journal Clinical Nutrition*, 65:1138S-41S.

Baranowski, T. (1988). Validity and reliability of self-report measures of physical activity: An information processing perspective. *Research Quarterly for Exercise and Sport,* 59, 314-327.

Bassett, D. R., Ainsworth, B. E., Swartz, A. M., Stratch, S. J., O'Brien, W. L., & King, G. A. (2000). Validity of four motion sensors in measuring moderate intensity physical activity. *Medicine and Science in Sports and Exercise,* 32, 5417-s5418.

Bassett, D. R. J., Ainsworth, B. E., Leggett, S. R., Mathien, C. A., Main, J. A., Hunter, D. C., & Duncan, G. E. (1996). Accuracy of five electronic pedometers for measuring distance walked. *Medicine and Science in Sports and Exercise,* 28(8), 1071-1077.

Black, A. E. (2000). Critical evaluation of energy intake using the Goldberg cut-off for energy intake: basal metabolic rate. A practical guide to its calculation, use and limitations. *International Journal of Obesity Related Metabolic Disorders,* 24(9), 1119-30.

Black, A. E., & Cole, T. J. (2001). Biased over- or under-reporting is characteristic of individuals whether over time or by different assessment methods. *Journal of American Dieticians Association.* 101(1), 70-80.

Blanksby, B., Barrett, P., Freedman, L., Bloomfield, J., Stewart, A., & Turnbull, J. (1974). *An anthropometric survey of Western Australian primary school children*. Perth, WA: Education Department of Western Australia.

Blanksby, B., Scott, C., & Foster, D. (1986). *Anthropometric Survey of Western Australian Secondary School students*. Department of Human Movement and Recreation Studies, UWA: ACHPER Publications.

Booth, M. L., Macaskill, P., McLellan, L., Phongsavan, P., Okely, T., Patterson, J., Wright, J., Bauman, A., & Baur, L. (1997). *NSW schools fitness and physical activity survey*. Sydney: NSW Department of Education and Training.

Booth, M., Chey, T., Wake, M., Norton, K., Hesketh, K., Dollman, J., & Robertson, I. (2003). Change in the prevalence of overweight and obesity among young Australians, 1969-1997. *The American Journal of Clinical Nutrition*, 77, 29-36.

Briefel, R. R., Sempos, C. T., McDowell, M. A., Chien, S., & Alaimo, K. (1997). Dietary methods research in the third National Health and Nutrition Examination Survey: underreporting of energy intake. *American Journal Clinical Nutrition*, 65(4 Suppl):1203S-1209S.

Bull, F., Milligan, R., Rosenberg, M., & MacGowan, H. (2000). *Physical activity levels of Western Australian adults 1999*. Perth, WA: Health Department of Western Australia and Sport and Recreation Way2Go.

Cashel, K. & Jeffreson, F. (1995). *The core food groups*. Canberra: National Health and Medical Research Council.

Casperson, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports,* 100, 126-131.

Cavill, N., Biddles, S., & Sallis, J. F. (2001). Health enhancing physical activity for young people: Statement of the United Kingdom expert consensus conference. *Pediatric Exercise Science,* 13, 13-25.

Cole, T. J., Bellizzi, M. C., Flegal, K. M., & Dietz, W. H. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. *British Medical Journal,* 320, 1240-1243.

Cook, T., Rutishauser, I. H. E., & Alsopp, R. (2001). *The Bridging Study - comparing results from the 1983, 1985 and 1995 Australian national nutrition surveys*. Canberra, ACT: Commonwealth Department of Health and Aged Care.

Corbin, C. B., & Pangrazi, R. P. (2003). *Physical activity for children: A statement of guidelines*. Reston, VA: NASPE.

Department of Community Services and Health. (1989). *National Dietary Survey of School Children*. Canberra: Australian Government Publishing Service.

Department of Health and Ageing (2004). *Australia's Physical Activity recommendations for Children and Youth*. Canberra: Australian Governemnt Publishing Service.

Department of Health and Family Services. (1998). *The Australian Guide to Healthy Eating.* Canberra: Department of Health and Family Services.

Dietz, W., & Gortmaker, S. L. (1985). Do we fatten our children at the television set? Obesity and television viewing in children and adolescents. *Pediatrics,* 75(5), 807-811.

Dollman, J., Olds, T., Norton, K., & Stuart, D. (1999). The evolution of fitness and fatness in 10-11-year-old Australian schoolchildren: changes in distributional characteristics between 1985 and 1997. *Pediatric Exercise Science,* 11, 108-121.

Epstein, L., Smith, J. A., Vara, L. S., & Rodefer, J. S. (1991). Behavioral economic analysis of activity choice in obese children. *Health Psychology,* 10, 311-316.

Eston, R. G., Rowlands, A. V., & Ingledew, D. K. (1998). Validity of heart rate, pedometry, and accelerometry for predicting the energy cost of children's activities. *Journal of Applied Physiology,* 84(1), 362-371.

Ferguson, M. A., Gutin, B., Le, N., Karp, W., Litaker, M., Humphries, M., Okuyama, T., Riggs, S., & Owens, S. (1999). Effects of exercise training and its cessation on components of the insulin resistance syndrome in obese children. *International Journal of Obesity Related Metabolic Disorders,* 23, 889-895.

Food Standards Australia. (1999). AUSNUT (1999). *Australian food and nutrient database for estimation of dietary intake.* Retrieved June 27, 2004 from http://www.foodstandards.gov.au/recallssurveillance/foodcompositionprogram/ausnut1999/index.cfm.

Glasson, C., Hands, B., Parker, H., Brinkman, S. & Read, H. (2004). Western Australian Children and Adolescent Physical Activity and Nutrition Survey 2003. *Food Coding Manual*. Perth, WA: University of Notre Dame Australia.

Goldberg, G.R., Black, A.E., Jebb, S.A., Cole, T.J., Murgatroyd, P.R., Coward, W.A. & Prentice, A.M. (1991). Critical evaluation of energy intake data using fundamental principles of energy physiology: 1. Derivation of cut-off limits to identify under-reporting. *European Journal of Clinical Nutrition,* 45(12), 569-81

Goodes, H. J. (1942). *Report to the Honourable Minister of Public Health on the Survey of the Measurements of Height and Weight of School Children*. Perth: Government Printer.

Gretebeck, R. J., & Montoye, H. J. (1992). Variability of some objective measures of physical activity. *Medicine and Science in Sports and Exercise,* 24(10), 1167-1172.

Hands, B., Parker, H. E., Blanksby, B., & Larkin, D. (2001). *Western Australian Children's Body Mass Index 1940, 1974 and 2000*. Perth, WA: University of Notre Dame Australia.

Hill, J. O., Wyatt, H. R., Reed, G. W., & Peters, J. C. (2003). Obesity and the Environment: Where do we go from here? *Science*. 299(5608), 853-855.

Janz, K. F., Paulos, R., Burns, T. L., & Levy, S. M. (1999). *Measuring physical activity in pre-school children: The Iowa Bone Growth Study.* Paper presented at the Measurement of Physical Activity Conference, Dallas TX.

Jenner, D. A., Vandongen, R., & Beilin, L. J. (1992). Relationships between blood pressure and measures of dietary energy intake, physical fitness, and physical activity in Australian children aged 11-12 years. *Journal of Epidemiology and Community Health,* 46, 108-113.

Kilanowski, C. K., Consalvi, A. R., & Epstein, L. H. (1999). Validation of an electronic pedometer for measurement of physical activity in children. *Pediatric Exercise Science,* 11, 63-68.

Kohl, H. W., Fulton, J. E., & Casperson, C. J. (2000). Assessment of physical activity among children and adolescents: a review and synthesis. *Preventive Medicine,* 31, S54-S76.

Kowalski, K. C., Crocker, R. E., & Faulkner, R. A. (1997). Validation of the Physical Activity Questionnaire for Older Children. *Pediatric Exercise Science,* 9, 174-186.

Lemura, L. M., & Maziekas, M. T. (2002). Factors that alter body fat, body mass, and fat free mass in pediatric obesity. *Medicine and Science in Sports and Exercise,* 34, 487-496.

Livingstone, M. B., Prentice, A. M., Coward, W. A., Strain, J. J., Black, A. E., Davies, P. S., Stewart, C. M., McKenna, P. G., & Whitehead, R. G. (1992). Validation of estimates of energy intake by weighed dietary record and diet history in children and adolescents. *American Journal Clinical Nutrition*, 56:*29-35.*

Mathers, C, Vos, T., & Stevenson, C. (1999). *Burden of disease and injury in Australia*. AIHW catalogue PHE 17. Canberra: Australian Institute of Health and Welfare.

McCarthy, H.D., Ellis, S.M., & Cole, T.J. (2003). Central overweight and obesity in British youth aged 11-16 years: cross sectional surveys of waist circumference. *BMJ, 326(7390*), 624. Retrieved March 21, 2003 from http://bmj.com/cgi/content/full/326/7390/624.

McCormack, G., & Giles-Corti, B. (2002). *Report to the Physical Activity Taskforce, Evaluation and Monitoring Group: An assessment of self report questionnaires and motion sensors for measuring physical activity in children*. Perth: Department of Public Health, The University of Western Australia.

McCormack, G., Milligan, R., Giles-Corti, B., & Clarkson, J. (2003). *Physical Activity levels of Western Australian Adults 2002: results from the adult physical activity survey and pedometer study*. Perth, Western Australia: Western Australian Government.

McMahon, S., Haynes, A., Ratnam, N., Grant, M., Carne, C., Jones, T., & Davis, E. (2004). Increase in type 2 diabetes in children and adolescents in Western Australia. *Medical Journal of Australia*, 180(9) 459 – 461.

National Health and Medical Research Council. (2003). *Dietary Guidelines for Children and Adolescents in Australia Incorporating the Infant Feeding Guidelines for Health Workers*. Canberra: National Health and Medical Research Council.

National Heart Foundation of Australia and the Cardiac Society of Australia and New Zealand. (2001). *Lipid management guidelines 2001 – Summary Paper*. Retrieved June 27, 2004 from http://www.heartfoundation.com.au/downloads/lipid_prof_paper.pdf.

Olds, T., Dollman, J., Norton, K., & Harten, N. (2001). A century of growth in Australian children. In T. Jurimae & A. P. Hills (Eds.), *Body Composition Assessment in Children and Adolescents* (Vol. 44, pp. 85-103). Basel: Karger.

Pate, R. R., Baranowski, T., Dowda, M., & Trost, S. G. (1996). Tracking of physical activity in young children. *Medicine and Science in Sports and Exercise,* 28(1), 92-96.

Pikosky, M., Faigenbaum, W., Westcott, W., & Rodriguez, N. (2002). Effects of resistance training on protein utilisation in health children. *Medicine and Science in Sports and Exercise,* 43, 820-827.

Pyke, J. E. (1987). *Australian Health and Fitness Survey 1985*. Parkside, SA: Australian Council for Health, Physical Education and Recreation.

Rowland, T. W. (1990). *Exercise and Children's Health*. Champaign, IL: Human Kinetics.

Rowlands, A. V., Eston, R. G., & Ingledew, D. K. (1997). Measurement of physical activity in children with particular reference to the use of heart rate and pedometry. *Sports Medicine,* 24(4), 258-272.

Rowlands, A. V., Eston, R. G., & Ingledew, D. K. (1999). Relationship between activity levels, aerobic fitness, and body fat in 8- to 10-yr-old children. *Journal of Applied Physiology,* 86, 1428-1435.

Sallis, J. F. (1991). Self-report measures of children's physical activity. *Journal of School Health,* 61(5), 215-219.

Sallis, J. F. (1993). Epidemiology of physical activity and fitness in children and adolescents. *Critical Reviews in Food Science and Nutrition,* 33(4-5), 403-408.

Sallis, J. F. (2000). Age-related decline in physical activity: a synthesis of human and animal studies. *Medicine and Science in Sports and Exercise,* 32(9), 1598-1600.

Saris, W. H. M. (1986). Habitual physical activity in children methodology and findings in health and disease. *Medicine and Science in Sports and Exercise,* 18, 253-263.

Swinburn, B., Egger, G. & Raza, F (1999). Dissecting obesogenic environments: the development and application of a framework for identifying and prioritising environmental interventions for obesity. *Preventive Medicine,* 29(6), 563-70.

Tanner, J. M. (1962). *Growth at Adolescence* (second ed.). Oxford: Blackwell Scientific Publications.

Telford, A., Salmon, J., Jolley, D. & Crawford, D. (2004). Reliability and validity of physical activity questionnaires for children: the Children's Leisure Activities Study Survey (CLASS). *Pediatric Exercise Science*, 16, 64-78.

Trost, S. (2003). Discussion paper for the development of recommendations for childrens and youths participation in health promoting physical activity. Canberra, ACT: Australian Government.

Trost, S. G., & Brown, W. (2000). *Young people's participation in physical activity*. St Lucia: The University of Queensland.

Trost, S. G., Pate, R. R., Freedson, P. S., Sallis, J. F., & Taylor, W. C. (1999). *Using objective physical activity measures with youth: How many days of monitoring are needed?* Paper presented at the Measurement of Physical Activity, Dallas TX.

Tryon, W. W., Pinto, L. P., & Morrison, D. F. (1991). Reliability assessment of pedometer activity measurements. *Journal of Psychopathology and Behavioural Assessment,* 13(1), 27-44.

Tudor-Locke, C. E., & Myers, A. M. (2001). Methodological considerations for researchers and practitioners using pedometers to measure physical (ambulatory) activity. *Research Quarterly for Exercise and Sport,* 72(1), 1-12.

Tudor-Locke, C., Kasse, C., Williams, J. E. and Reis, J. P. (2002). *Pedometer-Assessed Steps Taken in 30 Minutes of Self-Selected Moderate Intensity Walking.* Unpublished report, University of South Carolina, Columbia.

Watts, K., Beye, P., Siafarikas, A., Davis, E., Jones, T., O'Driscoll, G., & Green, D. J. 2004. Exercise training in obese children: Effects on vascular function and body composition. *Journal of Pediatrics*, 144(5), 620-625.

Welk, G. J., Corbin, C. B., & Dale, D. (2000). Measurement issues in the assessment of physical activity. *Research Quarterly for Exercise and Sport,* 71(2 (supp)), 59-73.

World Health Organization. (1985). Energy and protein requirements: Report of a joint FAO/WHO/UNU expert consultation, *WHO Technical report* series 724.

World Health Organization. (2004). *Global Strategy on Diet, Physical Activity and Health.* Retrieved March 25, 2004 from http://www.who.int/hpr/global.strategy.shtml

World Health Organization. (2003a). *How much physical activity needed to improve and maintain health.* Retrieved March 25, 2004 from http://www.who.int/hpr/physactiv/pa.how.much.shtml

World Health Organization. (2003b). *Physical Activity for Various Population Groups: Children and Young People*. Retrieved March 25, 2004 from http://www.who.int/hpr/physactiv/children.youth.shtml

World Health Organization. (2003c). *Physical Activity: Direct and Indirect Health Benefits.* Retrieved March 25, 2004 from http://www.who.int/hpr/physactiv/health.benefits.shtml

World Health Organization. (2003d). *Physical Activity: Sedentary Lifestyle: a global public health problem*. Retrieved March 25, 2004 from http://www.who.int/hpr/physactiv/sedentary.lifestyle1.shtml

Zubrick, S. R., Silburn, S. R., Gurrin, L., Teoh, H., Shepherd, C., Carlton, J., & Lawrence, D. (1997). *Western Australian Child Health Survey*. Perth, WA: Australian Bureau of Statistics and the TVW Telethon Institute for Child Health Research.

Premier's **Physical Activity** Taskforce
Department of **Health**

Healthway