Childhood Obesity Prevention
Programmes in Auckland

“It is not adequate to focus on the individual, especially the child, and expect them to exercise self-control against a stream of socially endorsed stimuli designed to encourage the consumption of excess calories” (1)

“We don’t need another diet. We need a way to make healthy eating (and exercise) unavoidable” (2)

Dr Denise Barnfather
A study completed for the Auckland Regional Public Health Service
July 2004
**Executive Summary**

This report was undertaken for Auckland Regional Public Health’s Nutrition Service. Its objectives were as follows:

- Present an overall picture of overweight and obesity in New Zealand children.
- Provide a summary of the proven causes for childhood overweight and obesity.
- Review the literature on the effectiveness of interventions to prevent childhood overweight and obesity.
- Review Auckland programmes that may help prevent childhood obesity, including identifying any gaps in, or barriers to, service.
- Based on the above review, recommend national and local actions that may help prevent childhood obesity.

**The Burden of Overweight and Obesity in New Zealand Children**

Results from the National Children’s Nutrition Survey showed that 21.3% of NZ school children aged between 5 and <15 years of age were overweight and 9.8% were obese. Overweight and obesity levels were highest for Pacific males (33.9%; 26.1%) and females (32.9%; 31%), followed by Maori males (19.6%; 15.7%) and females (30.6%; 16.7%), with the lowest levels in NZ European males (18.4%; 4.7%) and females (18.8%; 6%). Results were based on the International Obesity Task Force reference and may have limited suitability for the NZ population given that NZ Maori and Pacific children have a lower percentage of body fat than Europeans for any given BMI.

Few other NZ studies of childhood BMI have been done, with only one study examining longitudinal trends in BMI. This study of Hawkes Bay children aged 11-12 years showed a doubling in percentage of overweight children and a quadrupling of obese children between 1989 and 2000. International statistics also show trends of rapid increases in prevalence of overweight and obesity with time, with the prevalence of obesity increasing more quickly than the prevalence of overweight.

Obesity carries a significant associated burden of morbidity, mortality, and financial cost. It is the main modifiable driver of the Type 2 diabetes epidemic which is predicted to increase 2.3-fold between 1996 and 2011. Paediatric obesity is also associated with an increased risk of cardiovascular risk
factors, psychological morbidity, asthma, Type 1 diabetes, and early mortality. The direct cost alone of obesity was calculated at $247.1 million in 2001. This equated to 2.5% of total health expenditure, in line with the global WHO estimate that obesity consumes 2-7% of developed countries’ annual health budgets.

Causes of Overweight and Obesity
A persistent imbalance between the amount of energy consumed and the amount expended, in favour of consumption, causes weight gain. However the causes of energy imbalance are more complex and are due to a combination of biological, behavioural, and environmental factors, with environmental factors being responsible for the rapidly evolving obesity epidemic. Environmental factors significantly associated with the obesity epidemic include: inactivity and sedentary lifestyles, high intakes of energy-dense food and drinks (especially non-diet soft drinks), marketing of energy-dense food and drink to children (especially via TV advertising), and low socioeconomic status.

Effectiveness of Interventions to Prevent Childhood Overweight and Obesity
Current research lacks the power to set clear directions for obesity prevention activity at a time when obesity prevention is a public health priority, as noted in the recent Cochrane Review of controlled trials for childhood obesity prevention. Controlled trials of dietary education and/or physical activity are few in number and have methodological and other limitations, with studies examining combined dietary education and physical activity interventions showing no significant impact on BMI. However, dietary education delivered by multimedia strategies to primary and kindergarten children, and education designed to reduce soft drink consumption in primary school children, were significantly associated with reductions in obesity prevalence. Physical activity interventions and interventions aimed at reducing sedentary activity were also associated with significant reductions in BMI in two studies and a trend towards significant reductions in BMI in two remaining studies. Evidence also suggests that breastfeeding is protective, with the largest two studies showing a 20-37% reduction in risk of childhood obesity. However, despite the paucity of evidence for interventions to prevent childhood obesity, the seriousness of trends in childhood obesity suggests we must act now, using the best available evidence, and “guard against nihilists and procrastinators who require top-level evidence from randomised controlled trials before action is taken” (John Catford).
Obesity Prevention Programmes Operating in Auckland

Interviews were conducted with 40 providers of children’s physical activity or nutrition programmes in the Auckland region. Most of the physical activity and nutrition programmes currently operating in the Auckland region do not have obesity prevention as a goal and do not measure weight-related outcomes, although they might be expected to help prevent childhood obesity by increasing physical activity and reducing the energy-density of food and snacks eaten. Programmes that had collected weight-related measures i.e. Food With Attitude, Well Child, Kids In Action, and the Pacific Islands Heartbeat Church project, had significant data collection/recording problems, with the possible exception of Kids In Action where the 2003 evaluation showed that 70% of children had maintained or lost weight and 42% had lost weight. In addition, Food With Attitude and Kids In Action, are both aimed at treatment of obesity rather than prevention, the PI Church project targeted families rather than children, and the Well Child programme had not reported any weight-related findings.

All of the remaining programmes had either increasing physical activity or improving nutrition as goals, with one exception (the Adolescent Obesity & Diabetes Prevention Programme) having obesity and Type 2 diabetes prevention as a specific goal. The Children and Young People’s Diabetes Prevention & Management Project and two large planned obesity prevention trials (the Pacific Obesity Prevention in Communities Trial in Auckland, and Activ8 in Waikato) have obesity prevention as a goal and will measure weight-related outcomes.

Programmes currently reaching the greatest number of children and youth are as follows:

- School-based programmes such as those coordinated by Health Promoting Schools, National Heart Foundation’s School Food and Jump Rope For Heart programmes, and 5+ A Day.
- Pre-school programmes such as the National Heart Foundation’s Healthy Heart Award, the Well Child programme, and other services provided by Auckland District Health Board.
- Family programmes such as Food With Attitude and Young & Active.
- Community programmes provided by city councils particularly Walking School Buses and Waitakere City Council’s youth programmes.

Currently, primary care has only a small role in childhood obesity prevention with no programmes yet developed by PHOs, although Procare has the Modified Green Prescription Project for adults that it may develop to target children and youth in the future, and TaPasifika helps provide the Kids in Action programme. However, both of these programmes involve targeting and treatment of overweight and obese people, rather than prevention in the general population or at-risk groups. Various outstanding service needs were identified by providers and from the literature, and these served to inform recommendations for action.

National and Local Recommendations for Action

Recommendations focus particularly on environmental strategies relating to the physical and policy environments, with lessons from other epidemics suggesting that environmental strategies are the most powerful and sustainable. Vector-based strategies that increase the availability of low-energy, high-nutrient foods while reducing the availability of high-energy snacks and drinks, and host-based strategies that enable the development of lifeskills and individual competence to influence factors determining health, are also needed.

National Recommendations

National recommendations focus on the areas of policy, research, and schools.

- National policy is recommended to prevent the advertising of high-energy snacks, fast foods and soft drinks to children; control product labelling with health promotion messages; introduce appropriate pricing +/- a fat tax on energy-dense foods of low nutritional value; develop intersectoral policy on obesity control; remove non-diet soft drinks and high-energy snacks/food from vending machines in schools and pre-schools; and ensure that school tuck shops sell food and drink consistent with the National Nutrition Guidelines.

- NZ childhood obesity prevention research is needed that examines the association between environmental factors and individual behaviours affecting energy balance, addresses various methodological constraints, and identifies appropriate Body Mass Index standards according
to ethnicity. In addition, government-supported surveillance and research is needed to evaluate the effect of policy and macroenvironmental changes on nutrition, PA, body weight, and health outcomes.

- It is recommended that the health of the wider school environment discourages access to junk-food outlets, and that active transportation to school is encouraged by the establishment of WSB, safe cycleways and walkways, and other innovations. The schools’ role in physical activity and nutrition/lifestyle education needs to be reassessed and strengthened with a curriculum-based approach being used to influence eating patterns, reduce soft drink consumption, reduce sedentary behaviours (especially TV viewing), promote physical activity, and provide daily structured physical activity.

Local Recommendations

Local recommendations focus on several areas.

- For families, identified barriers to eating fruit and vegetables need to be addressed, and family-based obesity treatment programmes require more resources to help enhance parenting skills.

- More public health dietitians are required in the Auckland region, particularly in the Waitemata and Counties Manukau District Health Board areas.

- Primary Health Organisation plans are needed that target childhood overweight and obesity prevention.

- Health Promoting Schools’ staff could take a more proactive role in monitoring HPS goals and programmes, and providing regional links between programme providers.

- Existing childhood PA/nutrition programmes could include obesity prevention as a goal and weight-related measures as outcomes especially those based in schools or primary care, and possibly some of those run by Regional Sports Trusts.

- Local environmental interventions such as school travel plans, safe walkways and cycleways, school food policies, and school drinking fountains need to be established and supported.

- In addition to its other roles, Auckland Regional Public Health Service could have a lead role in providing nutrition education workshops to tuck shop retailers, and working with the food
industry on nutrition policy and health promotion messages. In addition, ARPHS could have a role in advocating for environmental-level policies.

- There is a need to build collaborative relationships between providers in the area of childhood obesity prevention, nutrition, and PA. This would be aided by maintaining up-to-date lists of providers and programmes, and increasing provider awareness of, and access to relevant programmes and providers. Whilst there is some co-ordination of providers through annual meetings organised by ANA and MoH in conjunction with SPARC, it remains extremely difficult for providers to be aware of all players as funding is widely dispersed.
Acknowledgements

This project was only possible due to the support of the Auckland Regional Public Health Service (ARPHS), the Nutrition Team at ARPHS, Public Health Consultant Supervision, and the Auckland providers of childhood nutrition and physical activity services. Particular thanks are expressed below.

ARPHS

Special thanks to Monica Briggs and Bob Mack for Management support; Nick Sharp for IT assistance; Ruth Moore for document formatting help, Jo Wall for passing on relevant literature, and all other members of the ARPHS team.

Nutrition Team

Grateful thanks to Christine Cook, Kate Sladden and Elizabeth Stewart who managed to convert my nutritional ignorance into a working knowledge of the subject! Christine Cook provided invaluable help and guidance in: designing and writing the proposal for this project, providing an extensive list of provider contacts, accompanying me to initial interviews, keeping me informed of new developments in childhood obesity, providing valuable project feedback, and always being available to provide exceptional help and guidance when needed. Elizabeth Stewart and Kate Sladden were always happy to answer my queries and proved to be wonderfully accurate and intelligent sources of information. Elizabeth provided me with weekly updates of the national and international nutrition news media that proved invaluable.

Supervisor

Dr Nick Jones provided very valuable public health consultant support as co-supervisor of my project with Christine Cook. He was available for help when needed and provided extremely useful feedback during the write-up of my project.

Providers

During the course of this project, I interviewed over 90 people working in the arena of childhood nutrition or physical activity. I can not name each person here but the details for each contributor are available in Appendix Three. I wish to thank the providers for their unique contributions to this project, for spending their valuable time speaking with me, and most of all for continuing to care deeply about the wellbeing of children in their care. I hope that this project will go some way towards allowing their concerns to be heard and acted upon.
# Table of Contents

**EXECUTIVE SUMMARY** ................................................................................................................................. II

**ACKNOWLEDGEMENTS** ................................................................................................................................. VIII

**TABLE OF CONTENTS** ................................................................................................................................. IX

**LIST OF TABLES** .............................................................................................................................................. XI

**LIST OF FIGURES** ............................................................................................................................................. XII

**LIST OF APPENDICES** ..................................................................................................................................... XIII

**LIST OF ABBREVIATIONS** .............................................................................................................................. XIV

**THE BURDEN OF OVERWEIGHT AND OBESITY IN NEW ZEALAND CHILDREN** ................................................................................................................................. 1

- International Standards for Obesity .................................................................................................................. 1
- Ethnic Differences in Obesity in New Zealand Children .................................................................................. 1
- Results from the National Children’s Nutrition Survey ................................................................................... 2
- New Zealand Studies of Childhood Obesity ..................................................................................................... 3
- International Studies of Childhood Obesity .................................................................................................... 4
- Morbidity Associated with Obesity .................................................................................................................. 5
- Mortality Associated with Obesity .................................................................................................................. 7
- Monetary Cost of Obesity .................................................................................................................................. 7

**CAUSES OF OVERWEIGHT AND OBESITY** ..................................................................................................... 9

- Biological ......................................................................................................................................................... 10
- Behavioural .................................................................................................................................................... 10
- Environmental .............................................................................................................................................. 11
- Inactivity ......................................................................................................................................................... 15
- Energy-Dense Food and Drink ....................................................................................................................... 15
- Marketing of Energy-Dense Food and Drink ............................................................................................... 16
- Low Socioeconomic Status ............................................................................................................................. 17
- Possible Causes of Obesity .............................................................................................................................. 17

**EFFECTIVENESS OF INTERVENTIONS TO PREVENT OVERWEIGHT AND OBESITY** ................................................................. 18

- Breastfeeding ............................................................................................................................................... 18
- Controlled Trials of Dietary Education and Physical Activity Interventions ............................................... 19
- Dietary Education vs Control ......................................................................................................................... 23
- Physical Activity/ Reduction in Sedentary Activity vs Control .................................................................. 24
- Dietary Education vs Physical Activity .......................................................................................................... 26
- Combined Effects of Dietary Education and Physical Activity ................................................................... 26
- Summary ......................................................................................................................................................... 32
- Planned Obesity Prevention Trials ............................................................................................................... 33
- Macroeconomic Interventions ....................................................................................................................... 33

**OBESITY PREVENTION PROGRAMMES OPERATING IN AUCKLAND** ......................................................................... 34

- Schools’ Setting: Multi-component Interventions .......................................................................................... 35
  - Adolescent obesity & diabetes prevention programme .............................................................................. 35
  - Health Promoting Schools ............................................................................................................................ 37
  - The Pacific Obesity Prevention in Communities (OPIC) Project ................................................................ 40
  - Waitemata DHB Wellbeing Schools’ Project ............................................................................................. 41
- Schools’ Setting: Nutrition Interventions ........................................................................................................ 42
  - The School Food Programme ..................................................................................................................... 42
  - 5+ A Day ....................................................................................................................................................... 43
  - Breakfast in Schools ................................................................................................................................. 45
  - Nutrition Education in Schools and Home Economics .............................................................................. 47
List of Tables

Table 1: Relative risk of health problems associated with obesity (56) .................................................. 7
Table 2: International estimates of the direct costs of obesity ................................................................. 8
Table 3: Environmental influences on food intake and physical activity (69) ...................................... 14
Table 4: Summary of strength of evidence on factors that might promote or protect against weight gain and obesity.................................................................................................................... 15
Table 5: Controlled trials evaluating childhood obesity prevention programmes. .............................. 20
List of Figures

Figure 1: Overweight using international cut-off values (12) .................................................................2
Figure 2: Obesity using international cut-off values (12) ............................................................................3
Figure 3: Obesity rates by BMI (>95%) and Body Fat Percentage (>35%) in Auckland School Children (9) ............................................................................................................................... .......4
Figure 4: The ecological model of the causes of obesity .........................................................................9
Figure 5: Epidemiological triad as it applies to obesity. The circles refer to the predominant strategies to address each corner of the triad. Source: (188), .................................................................34
Figure 6: Walking School Buses - schools by decile and TLA (Territorial Local Authority) (329), .... 73
List of Appendices

Appendix 1: Auckland component of the Australasian school-based obesity prevention study for children in Years 9 to 12 ............................................................. 116
Appendix 2: Key informant structured questionnaire ........................................................................ 119
Appendix 3: List of Auckland providers interviewed (ordered by organisation) ................................ 121
Appendix 4: List of programmes in Auckland having a role, or potential role, in childhood obesity prevention ........................................................................................................ 123
## List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC</td>
<td>Auckland City Council</td>
</tr>
<tr>
<td>ADHB</td>
<td>Auckland District Health Board</td>
</tr>
<tr>
<td>AIMHI</td>
<td>Achievement in Multicultural High Schools</td>
</tr>
<tr>
<td>AMN</td>
<td>Aotearoa Maori Netball Oranga Healthy Lifestyles Trust Inc</td>
</tr>
<tr>
<td>ANA</td>
<td>Agencies for Nutrition Action</td>
</tr>
<tr>
<td>ARC</td>
<td>Auckland Regional Council</td>
</tr>
<tr>
<td>ARPHS</td>
<td>Auckland Regional Public Health Service</td>
</tr>
<tr>
<td>AUT</td>
<td>Auckland University of Technology</td>
</tr>
<tr>
<td>BF</td>
<td>Body Fat</td>
</tr>
<tr>
<td>BMI</td>
<td>Body Mass Index ( \frac{\text{weight(kg)}}{\text{height(m}^2\text{)}} )</td>
</tr>
<tr>
<td>C</td>
<td>Control group</td>
</tr>
<tr>
<td>CCHD</td>
<td>Community Child Health and Disability Service</td>
</tr>
<tr>
<td>CFYH</td>
<td>Centre for Youth Health</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence Interval</td>
</tr>
<tr>
<td>CMDHB</td>
<td>Counties Manukau District Health Board</td>
</tr>
<tr>
<td>CYPDPMP</td>
<td>Children and Young Persons Diabetes Prevention and Management Project</td>
</tr>
<tr>
<td>DPT</td>
<td>Diabetes Projects Trust</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization</td>
</tr>
<tr>
<td>FIS</td>
<td>Food In Schools</td>
</tr>
<tr>
<td>FOE</td>
<td>Fight against the Obesity Epidemic</td>
</tr>
<tr>
<td>FTE</td>
<td>Full Time Equivalent</td>
</tr>
<tr>
<td>GEMS</td>
<td>Girls’ health Enrichment Multisite Studies</td>
</tr>
<tr>
<td>HEHA</td>
<td>Healthy Eating Healthy Action</td>
</tr>
<tr>
<td>HHA</td>
<td>Healthy Heart Award</td>
</tr>
<tr>
<td>HPS</td>
<td>Health Promoting Schools</td>
</tr>
<tr>
<td>NSCC</td>
<td>North Shore City Council</td>
</tr>
<tr>
<td>HTHT</td>
<td>Hapai Te Hauora Tapui Ltd</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------------------------</td>
</tr>
<tr>
<td>I</td>
<td>Intervention group</td>
</tr>
<tr>
<td>IOTF</td>
<td>International Obesity TaskForce</td>
</tr>
<tr>
<td>JRFH</td>
<td>Jump Rope For Heart</td>
</tr>
<tr>
<td>KIA</td>
<td>Kids in Action</td>
</tr>
<tr>
<td>LINZ</td>
<td>Life in New Zealand</td>
</tr>
<tr>
<td>MCC</td>
<td>Manukau City Council</td>
</tr>
<tr>
<td>MHK</td>
<td>Mangere Healthy Kai</td>
</tr>
<tr>
<td>MK</td>
<td>More Kids More Active More Often</td>
</tr>
<tr>
<td>MoE</td>
<td>Ministry of Education</td>
</tr>
<tr>
<td>MoH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>MTC</td>
<td>Mangere Town Centre</td>
</tr>
<tr>
<td>n</td>
<td>number of people in a defined group</td>
</tr>
<tr>
<td>NA</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>NEW</td>
<td>Nutrition, Exercise and Weight working party</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
</tr>
<tr>
<td>NHF</td>
<td>National Heart Foundation</td>
</tr>
<tr>
<td>NSCC</td>
<td>North Shore City Council</td>
</tr>
<tr>
<td>NZ</td>
<td>New Zealand</td>
</tr>
<tr>
<td>NZNF</td>
<td>New Zealand Nutrition Foundation</td>
</tr>
<tr>
<td>OAC</td>
<td>Obesity Action Coalition</td>
</tr>
<tr>
<td>OSCAR</td>
<td>Out of School Care and Recreation</td>
</tr>
<tr>
<td>PA</td>
<td>Physical Activity</td>
</tr>
<tr>
<td>PAC</td>
<td>Physical Activity Coordinator</td>
</tr>
<tr>
<td>PE</td>
<td>Physical Education</td>
</tr>
<tr>
<td>PHD</td>
<td>Public Health Dietitian</td>
</tr>
<tr>
<td>PHO</td>
<td>Primary Health Organisation</td>
</tr>
<tr>
<td>PI</td>
<td>Pacific Island</td>
</tr>
<tr>
<td>PIH</td>
<td>Pacific Islands Heartbeat</td>
</tr>
<tr>
<td>RH</td>
<td>Raukura Hauora</td>
</tr>
<tr>
<td>RST</td>
<td>Regional Sports Trusts</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>SD</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>SFP</td>
<td>School Food Programme</td>
</tr>
<tr>
<td>SPARC</td>
<td>Sport and Recreation New Zealand</td>
</tr>
<tr>
<td>TH</td>
<td>Tuakau Homebuilders</td>
</tr>
<tr>
<td>THMM</td>
<td>Te Hotu Manawa Maori</td>
</tr>
<tr>
<td>TLA</td>
<td>Territorial Local Authority</td>
</tr>
<tr>
<td>WCC</td>
<td>Waitakere City Council</td>
</tr>
<tr>
<td>WDHB</td>
<td>Waitemata District Health Board</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organisation</td>
</tr>
<tr>
<td>WSB</td>
<td>Walking School Buses</td>
</tr>
<tr>
<td>YAA</td>
<td>Young &amp; Active</td>
</tr>
<tr>
<td>YMCA</td>
<td>Young Men’s Christian Association</td>
</tr>
</tbody>
</table>
The Burden of Overweight and Obesity in New Zealand Children

International Standards for Obesity
Results from the 2002 National Children’s Nutrition Survey for overweight and obesity in NZ school children aged between 5 and <15 years of age were based on international cut-offs. The reference cut-off values used for determining the prevalence of overweight and obesity in children were as determined by the International Obesity Task Force (IOTF) (Cole et al, 2000 (3)). The IOTF reference is one of the two most widely used international BMI-for-age reference charts developed, the other being the World Health Organisation (WHO)/US National Centre for Health Statistics reference (4). The IOTF reference is used to classify overweight and obesity in young people of 2-18 years of age, and is a series of age- and sex- specific BMI cut-off points based on population data collected from Brazil, UK, Hong Kong, Singapore, the Netherlands, and the USA. The BMI cut-offs were derived from sex-specific BMI age curves that pass through a BMI of 25 and 30 kg/m² (the cut-off points used in adults to define overweight and obesity, respectively) at 18 years of age.

Ethnic Differences in Obesity in New Zealand Children
The suitability of using the IOTF BMI reference for NZ children is unknown. However, researchers have compared ethnic differences in BMI and % BF (body fat) among Maori, Pacific, and European populations, with several studies finding that Maori and Pacific adults tend to be leaner (i.e. have a lower %BF and a higher fat-free mass) than NZ Europeans of the same body size (5-7). Similar results have been observed in children, with one study finding that Maori and Pacific girls have 3.7% less BF than European girls of the same body size (8). A similar finding, although small, was found in a study of schoolchildren aged between 5-10 years (9). However, one small NZ study (n=79) of children aged 5-14 years found no difference in percentage BF between Maori Pacific, and European (10). A study of NZ adults showed that when higher BMI thresholds were applied to Maori and Pacific people to counteract their higher lean-to-fat mass ratio (26 and 32 kg/m² for overweight and obesity, respectively), these two groups remained twice as likely to be obese than the ‘European and Other’ group (11).

Asian ethnic groups have been largely neglected by NZ health and research policies. Despite the fact that Asian adults comprise 12.5% of the Auckland population (Census 2001), in the 2002 National
Children’s Nutrition Survey Asian children were not over-sampled as were Maori and Pacific children, and were not analysed separately but were grouped in with NZ Europeans (12). Overseas studies of Asian children (13) and adolescents (14) have shown that they have a greater central fat mass compared with Europeans and other ethnic groups, while studies of adult Asians have shown that they also have higher levels of BF than Europeans for a given BMI (15, 16), thus putting them at greater risk of obesity-related disease at relatively low BMI scores. One NZ study has shown that Asian Indian children tended to have a higher %BF at a given BMI compared with NZ Europeans (9), and an overseas study suggested that Chinese adolescents matured later than the IOTF reference populations (17), thus providing another cause for misclassification in Asian children.

**Results from the National Children’s Nutrition Survey**

Using the IOTF cut-off points, results from the National Children’s Nutrition Survey showed that 21.3% of NZ school children aged between 5 and <15 years of age were overweight and 9.8% were obese (12). The proportion of overweight females remained constant throughout the three age groups while the proportion of overweight males increased from 16.4% (5-6 years) to 23.7% (11-14 years) (Figure 1).

![Figure 1: Proportion of overweight NZ children using international cut-off values (12)](image)

The proportion of obese males was similar in the three age groups while the proportion of obese females increased from 6.7% (5-6 years) to 11.6% (7-10 years) (Figure 2).
Overweight and obesity levels were highest for Pacific males (33.9%; 26.1%) and females (32.9%; 31%), followed by Maori males (19.6%; 15.7%) and females (30.6%; 16.7%), with the lowest levels in NZ European males (18.4%; 4.7%) and females (18.8%; 6%) (3).

New Zealand Studies of Childhood Obesity
A study of 2273 Auckland school children aged 5-10.9y showed that 14.3% of all children were obese, with obesity rates higher in Pacific people (24.1%) and Maori (15.8%) than in European children (8.6%) (9). Using a definition of obesity based on percentage body fat >30%, obesity rates were higher in all ethnic groups (Figure 3). Youth2000, a national study of 12,934 Year 9 to 13 students, discovered that a high proportion of female students had tried to lose weight in the previous year (63.2%, 95% CI 61.3-65.2%) with the proportion increasing with age from Year 9 (52.2%, 95% CI 48.3-56.0%) to Year 13 (73.6%, 95% CI 70.6-76.5%) (18). This correlated with the finding that the proportion of females participating in at least 20 minutes of moderate to vigorous physical activity on at least three occasions in a week decreased with age from Year 9 (60.8%, 95% CI 57.3-64.3%) to Year 13 (51.4%, 95% CI 47.3-55.5%). BMI was not measured for the Youth2000 survey.

A recent study of Year 9 students at nine schools (eight of which were in South Auckland), conducted as part of the AIMHI (Achievement in Multicultural High Schools) Healthy Community Schools Initiative, revealed that 30% of children were obese (J Woolston, personal communication). One recent NZ study of approximately 900 children aged 11-12 years in Hawkes Bay, examined changes in BMI between 1989 and 2000, using the IOTF standard (19). The percentage of overweight children
increased from 11.0% in 1989 to 20.9% in 2000, and the percentage of obese children increased from 2.4% in 1989 to 9.1% in 2000. The absolute percentages in 2000 were higher for Maori (overweight 24.7%, obese 15.3%) and Pacific people (overweight 35.0%, obese 15.0%) than European (overweight 18.2%, obese 5.7%). However, the risk of being overweight or obese in 2000 compared to 1989 was greatest among European children (RR overweight=3.0, 95% CI 2.2-4.0; RR obese = 8.3, 95% CI 3.0-23.3).

**Figure 3: Obesity rates by BMI (>95th percentile) and body fat percentage (>35%) in Auckland school children (9)**

![Bar chart showing obesity rates by BMI and body fat percentage for European, Maori, Pacific, and Other children.]

---

**International Studies of Childhood Obesity**

The WHO estimated that world-wide there were 200 million obese adults in 1995 and 18 million children aged under five classified as overweight; by 2000 the number of obese adults had increased to over 300 million (20). Internationally there is evidence that the prevalence of overweight and obesity amongst children of all ages is also increasing rapidly (21-31). One study of English and Scottish primary school children showed substantial increases in overweight and obesity between 1984 and 1994 (22). From 1984 to 1994 overweight increased from 5% to 9% and 9% to 13% in English boys and girls, respectively, and from 6% to 10% and 10% to 16% in Scottish boys and girls, respectively. The prevalence of obesity increased correspondingly, reaching 1.7% (English boys), 2.1% (Scottish boys), 2.6% (English girls), and 3.2% (Scottish girls). An English study of pre-school children showed a rise in prevalence of overweight (14.7% to 23.6%) and obesity (5.4% to 9.2%) between 1989 and 1998 (21). The 2002 Health Survey for England also noted deterioration in overall childhood statistics with 21.8% of boys and 27.5% of girls being either overweight or obese (32). By projection of these
statistics, it has been estimated that by 2020 the prevalence of childhood obesity will be >50% in the
UK (33).

In the USA, obesity in children and adolescents increased from 11 to 15% between the National Health
and Nutrition Examination Surveys conducted in 1988-94 and 1999-2000, and at the later date
approximately 30% of children were overweight, a figure that has doubled in 30 years (34, 35). In
Australia, figures published in 2001 show that 16.1-16.9% of boys (and 17.4-20.4% of girls) were
overweight, and 5.1-6.9% of boys (5.7-7.0% of girls) were obese (36). Spanish, Australian and
American data have shown that children’s BMI appears to be increasing most in the heavier BMI group
(23-26, 30). A comprehensive listing of the prevalence of child and adolescent overweight and obesity
in most countries, along with reference to how overweight and obesity were classified in each instance,
was recently published by the International Association for the Study of Obesity (37).

**Morbidity Associated with Obesity**

Obesity in childhood predicts adult obesity (38). In addition, increasing age of obesity in childhood
more strongly predicts obesity in adulthood, with an odds ratio for adult obesity of 1.3 at 1-2 years of
age rising to 17.5 at 15-17 years of age (38). In 2002, the Ministry of Health published a model
forecasting the prevalence and severity of adult obesity in 2011 (39) based on adult BMI\(^1\) measurements from three prior national surveys (11, 40, 41). The model estimated total population
mean BMI would increase from 25.5 in 1997 to 26.4 in 2011, while the prevalence of obesity would
increase from 17% in 1996 to 29% in 2011(39).

Obesity is the main modifiable driver of the Type 2 diabetes epidemic, although other factors such as
diminishing levels of physical activity have a smaller, independent effect (42). Globally, obesity and
Type II diabetes have reached epidemic proportions, with 120 million people affected by Type II
diabetes in 1997, and the number predicted to reach 216 million by 2010 (43). In New Zealand, the
number of adults with diagnosed (mainly Type 2) diabetes is predicted to increase 78% (1.8-fold) while
the annual number of new diagnoses will rise approximately 2.3-fold from 4700 in 1996 to about
11,100 in 2011 (39). One third of this forecast growth in the diabetes epidemic from 1996 to 2011 has
been attributed to obesity (39).

\(^1\) Adult BMI: obesity is defined as a BMI \(\geq 30\) kg/m\(^2\); overweight is defined as 25 < BMI < 30 kg/m\(^2\).
Obesity is also a risk factor for other chronic diseases including heart disease, hypertension, stroke, gallstones, some cancers (endometrial, colon, and breast), osteoarthritis, obstructive sleep apnoea, and psychological problems such as depression, low self-esteem, and social stigmatisation (Table 1). In children, as mentioned above, the later the weight gain in childhood and adolescence, the greater the persistence of overweight and obesity into adulthood with its attendant risks for chronic disease (38, 44, 45). In fact, more than 60% of overweight children also have at least one additional risk factor for cardiovascular disease such as raised blood pressure, hyperlipidaemia or hyperinsulinaemia, and more than 20% have two or more risk factors (46). Many studies have observed significant clustering of cardiovascular risk factors with paediatric obesity and, as with adults, the extent of asymptomatic atherosclerotic lesions in childhood and adolescence is predicted by the number of cardiovascular risk factors present (47).

In addition to cardiovascular risk factors, a recent international review of the health consequences of childhood obesity showed that obese children are more likely to experience psychological or psychiatric problems than non-obese children, that girls are at greater risk than boys, and that risk of psychological morbidity increases with age (48). Paediatric obesity has also been significantly associated with risk of asthma and severity of asthma (49-52), a more than two-fold risk of developing Type 1 diabetes (53), and a marker of chronic inflammation (54).

Studies have also shown that obesity in adolescence/young adulthood has adverse effects on social and economic outcomes in young adulthood such as income and educational attainment, and there is some evidence that these effects are more marked in women than in men (55).
Table 1: Relative risk of health problems associated with obesity (56)

<table>
<thead>
<tr>
<th>Greatly increased (relative risk greater than 3)*</th>
<th>Moderately increased (relative risk 2-3)*</th>
<th>Slightly increased (relative risk 1-2)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Type 2 diabetes</td>
<td>• Coronary heart disease</td>
<td>• Cancer (breast cancer in postmenopausal women, endometrial cancer, colon cancer)</td>
</tr>
<tr>
<td>• Gallbladder disease</td>
<td>• Hypertension</td>
<td>• Reproductive hormone abnormalities</td>
</tr>
<tr>
<td>• Dyslipidaemia</td>
<td>• Osteoarthritis</td>
<td>• Polycystic ovary syndrome</td>
</tr>
<tr>
<td>• Insulin resistance</td>
<td>• Hyperuricaemia</td>
<td>• Impaired fertility</td>
</tr>
<tr>
<td>• Breathlessness</td>
<td></td>
<td>• Low back pain due to obesity</td>
</tr>
<tr>
<td>• Sleep apnoea</td>
<td></td>
<td>• Increased anaesthetic risk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Foetal defects associated with maternal obesity</td>
</tr>
</tbody>
</table>

*All relative risk estimates are approximate

**Mortality Associated with Obesity**

Every year, 1,000 New Zealanders die of obesity-related diseases, which is double the annual road toll (57). Evidence, although scant, indicates that obese youth are at increased risk of early mortality independent of the risk conferred by adult obesity (58, 59). A Dutch cohort study found that a BMI of >25kg/m² at 18 years of age was associated with a significantly increased risk of mortality within 20 years of follow-up (58). At 32 years of follow-up the relative risk of mortality was 1.95 compared with those who had had a BMI of 19kg/m² at 18 years of age. Similarly, Must and colleagues found that adolescent overweight had adverse effects on long-term morbidity and mortality (59). Among men, the RR of all-cause mortality was 1.8 (95% CI 1.2 to 2.7) and coronary heart disease mortality was 2.3 (95% CI 1.4 to 4.1).

**Monetary Cost of Obesity**

As well as causing excess morbidity and mortality, obesity imposes an important financial burden on New Zealand society. In 1991, the direct annual cost of obesity was estimated at $135 million, which was 2.5% of the total 1991 health expenditure (60). This equated to an annual cost attributable to obesity of $247.1 million in 2000/01 (61). This figure excluded the downstream costs from chronic diseases that result from obesity. For example, the annual cost of diabetes alone has been estimated at $280 million and the cost of coronary artery disease was estimated at $306 - $467 million in the early 1990s (57). In the Pacific Islands, the economic consequences of non-communicable diseases, chiefly obesity and type 2 diabetes, have been dramatic, consuming US$1.95 million, almost 60% of the health budget of Tonga, and US$13.6m, 39% of the health budget of Fiji (62).
In the United States, obesity consumed a whopping US $118 billion of the national healthcare budget in the late 1990s, more than double the US $47 billion costs for smoking (63, 64). More recently, the combined direct and indirect costs to the USA have been reassessed at $123 billion in 2001 (65). In 1998, the direct cost of treating obesity in England was estimated at £480 million and indirect costs (loss of earnings due to sickness and premature mortality) amounted to £2.1 billion (66). In Australia, the direct cost of obesity was estimated at $680 - $1239 million in 1995-96 (67). Globally, the WHO has estimated that the cost of obesity for a country is 2-7% of the annual health budget (31). International comparisons of the direct costs of obesity as a proportion of the total healthcare expenditure are presented in Table 2.

Table 2: International estimates of the direct costs of obesity (12, 68-73)

<table>
<thead>
<tr>
<th>Country</th>
<th>Year of estimate</th>
<th>Proportion of total healthcare expenditure due to obesity</th>
<th>Prevalence of obesity (BMI&gt;30kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>At time of estimate</td>
</tr>
<tr>
<td>USA</td>
<td>2000</td>
<td>8.5%</td>
<td>30.5%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1981-89</td>
<td>4%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Canada</td>
<td>1997</td>
<td>2.4%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Portugal</td>
<td>1996</td>
<td>3.5%</td>
<td>11.5%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1991</td>
<td>2.5%&lt;sup&gt;a&lt;/sup&gt;</td>
<td>11.1%&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Australia</td>
<td>1989/90</td>
<td>&gt;2%</td>
<td>10.8%</td>
</tr>
<tr>
<td>England</td>
<td>1998</td>
<td>1.5%</td>
<td>19.0%</td>
</tr>
<tr>
<td>France</td>
<td>1992</td>
<td>1.5%</td>
<td>6.5%</td>
</tr>
</tbody>
</table>

<sup>a</sup>2.5% of the healthcare budget was equal to $135 million
<sup>b</sup>Prevalence of adult obesity from the LINZ Survey, 1989 (70)
<sup>c</sup>Prevalence of adult obesity from the National Nutrition Survey, 1997 (11)
Causes of Overweight and Obesity

At first consideration, the cause of obesity seems simple: too much energy consumed for energy expended. However, the reasons why energy imbalance is common in our society, and indeed in all Western countries, are complex. Greg Critser, renowned author of the recently published book ‘Fat Land: how Americans became the fattest people in the world’ describes some of this complexity well when pondering the socio-economic factors responsible for his success in losing weight by their influence on his environment and behaviour (74):

‘Yet the more I contemplated my success, the more I came to see it not as a triumph of will, but as a triumph of my economic and social class. The weight loss medication Meridia, for example, had been effective not because it is such a good drug; even its purveyors freely admit it is far from effective for most people. What made the drug work for me was the upper-middle-class support system that I had brought to it: a good physician who insisted on seeing me every two weeks, access to a safe park where I could walk and jog, friends who shared the value of becoming slender, healthy home-cooked food consumed with my wife, books about health, and medical journals about the latest nutritional breakthroughs. And money. And time.’

This complexity is captured by Swinburn’s ‘ecological model’ of the causes of obesity (Figure 4) that regards obesity as a normal response to an abnormal environment. It proposes three main influences on level of body fat (biology, behaviour and environment), mediated through energy intake and energy expenditure, and moderated by physiological adjustments during periods of energy imbalance (75). This places obesity in an ecological context that clearly calls for multi-sectorial involvement to impact on the problem.

![Figure 4: The ecological model of the causes of obesity (75)](image-url)
Influences

**Biological:** The main biological influences on weight are genetic through ethnicity, gender, hormonal and other heritable factors, while biological ageing is also often associated with weight gain (75). In addition, several studies have found an association between various measures of abdominal obesity in childhood or adult life and low birth weight, malnutrition during early gestation, or early weight gain (76-83). Obesity in childhood has also been associated with maternal overweight status (38, 84), maternal gestational diabetes (85), and high birth weight (84, 86-88). Research on the foetal origins of disease hypothesis has shown that coronary heart disease (89-96), chronic renal disease (97, 98), Type 2 diabetes (99, 100), and hypertension (101, 102), are all possible outcomes associated with low birth weight or body leanness at birth +/- followed by poor or rapid infant growth. Obesity in childhood or adulthood would exacerbate these poor outcomes.

Most of these biological influences on weight are not modifiable except for the prevention of small birth weight babies and rapid early weight gain. However, small birth weight does not only depend on modifiable factors such as maternal nutrition, smoking, and level of social deprivation, but also on mother’s body composition, size and nutrient stores, which are influenced and established during her own foetal life in addition to her nutritional experiences in childhood and adolescence (103). However, while biological factors explain much of the variance in body fat between individuals within a given environment, they do not explain the large population increases that represent the obesity epidemic itself (75).

**Behavioural:** Behaviours leading to overeating and/or inactivity are the result of a complex mix of psychological, cognitive, biological and environmental influences (75). A number of psychological models have been proposed as possible causes of obesity, although currently, personality and emotional factors are thought to play only a minor role in the aetiology of obesity (104, 105). Binge-eating disorder is linked to obesity with a prevalence of 20-30% in obese patients and 2.5% in the general population (106, 107). Emotional eating is a less severe form of binge eating caused by disinhibition of restraint resulting from emotional arousal. A recent study of 153 girls from the USA, showed that girls at risk for overweight (>85th percentile BMI) at 5 years of age had higher levels of dietary restraint2.

---

2 Dietary restraint is defined as the tendency to restrict intake as a means of maintaining or losing body weight.
disinhibited overeating, weight concern, and body dissatisfaction, and higher weight gain from 5 to 9 years of age (108). This, and similar studies, suggests that children’s attempts to control weight may result in weight gain, and that positive alternatives to dietary restriction may be needed, such as encouraging PA, healthy foods, and appropriate portion sizes (109-111). Body image dissatisfaction is highly correlated with obesity, particularly obese binge eaters (112, 113). In addition, a profile of psychosocial factors has been identified in adolescents and adults that are closely associated with non-participation in organised sport and exercise that may predispose individuals to developing obesity. By late adolescence, physical self-perceptions of fitness and skill strongly predict the degree and type of involvement in sport and exercise (114, 115). Similarly, social physique anxiety (a fear of displaying the body in public settings) presents an additional barrier to attendance at exercise settings (116). Attitudes, beliefs and intentions about exercise also comprises the mental ‘set’ that predicts inactivity (117, 118), and the obese score particularly low on such profiles (119, 120).

Cognitive influences on behaviour include factors such as willpower based on knowledge and are considered to have only a minor effect on behaviour (75). Environmental influences are discussed below.

Environmental: The environmental influences on the amount and type of food eaten and the amount and type of physical activity undertaken are rarely understood and thus vastly underrated. This is understandable given the large and subtly interconnected network of obesogenic environmental influences impacting on the population. However, an attempt must be made to understand environmental influences as they potentially explain the rapidly evolving obesity epidemic. Greg Critser has described this influence well by detailing how changes in the American environment, that were replicated to some degree throughout most of the developed world, led to upsizing of the population (74). The environmental factors identified by Critser are discussed below (italicized section) to aid understanding of the concept that such factors are pervasive and powerful forces driving the obesity epidemic. A similar historical analysis that links the obesity epidemic with environmental factors has not yet been carried out for NZ.
In 1970s America, economic factors that led to changes in agriculture resulted in a surplus of cheap fats (121, 122) and sugars (123, 124) that allowed affordable super-sizing of energy-dense fast foods (125-128). Huge variety in cheap fast-food and energy-dense snacks exploited the human drive for novelty – the same drive that supported our hunter-gatherer forebears in gaining a variety of energy-poor and micronutrient-rich foods to improve survival now supports overconsumption of energy-dense commercial foods that ultimately limit survival (129).

Critser also describes how the roles of society, schools and parents as custodians of caloric intake were eroded in the 1980s. Societal changes led to parenting changes: both parents were now working, parents were left with less time or inclination to supervise their children’s meals, and more meals were being eaten outside the home with loss of control over portion sizes and the nutritional content of meals (130). New ideas about food and children came into vogue in society: research suggested children should eat more frequently than three times a day and that children should be allowed to self-moderate their food intake (131) – this was associated with an increase in snacking on energy-dense micronutrient-poor foods which was most prevalent among the poor (132).

In public schools, the in loco parentis rights of teachers were eroded by legal, economic and cultural changes (133). Moves to limit taxation in the late 1970s (134, 135) left schools competing for money with other public services and led to budget cuts that curtailed physical education, stopped subsidisation of school cafeterias (thus leading to an entrepreneurial rather than a nutritional food environment), and saw public schools’ middle-class parental support disappearing to private schools. Super-sized and fat-laden fast foods and soft drinks entered schools in this new entrepreneurial environment (136-139). Coke purchased ‘pouring rights’ in schools by providing them with monetary remuneration in return for selling and advertising rights (140-142). This led to children drinking Coke and other soft drinks in place of milk and nutrient-rich foods, often without properly compensating for liquid calories consumed by eating less at other meal times (143, 144). In addition, from the 1980s, meat became affordable for most individuals on a daily basis. This combined with a publishing drive for new diet books that could compete with Atkins’ very low carbohydrate diet, resulted in an outpouring of Atkins’-like diets and many “all you can eat diets” that were, however, all missing any mention of the concept of ‘self-control’ (145-147).
Nevertheless, increases in calorie consumption were not matched by compensatory increases in physical activity; instead many of the existing social constructs supporting physical activity were eroded. The decline of physical exercise in schools across the USA was an important societal change. In early twentieth century California, four years of PE were required for graduation along with a daily dose of formal PE (148). However, the future climate of budgetary constraints, declining national productivity and job growth coupled with declining school math and science scores, parents’ collective ‘bad memories’ of failure and humiliation in PE, and a societal change towards individualised rather than group exercise with the advent of private gyms and ‘aerobics’, led to PE teachers being sacrificed in favour of ‘higher’ academic priorities (149). The remaining fitness opportunities for children (children’s sport clubs and safe parks and neighbourhoods) depended greatly on socioeconomic status, as such opportunities were contingent upon parental time, money or residence (150).

Television viewing hours rose in the 1980s and a strong inverse association between duration of TV viewing and weekly exercise was observed (151). TV viewing time was also positively correlated with increasing body fat percentages (152). Between 1966 and 1994, youth obesity jumped from 7 to 22%. Television was being used as a baby-sitter and advertising of fast foods increased rapidly. Children and parents were sitting watching hours of TV full of billion-dollar cues to eat even when one was not hungry. In addition, the socioeconomically disadvantaged were viewing most TV and exercising least, and this was found to be associated with poorer neighbourhoods affording less safe environments for physical activity (152).

Societal attitudes to exercise were also changing – exercise was no longer seen as a way to better one’s performance in everyday life but as a means to reduce the risk of chronic diseases, with only moderate exercise prescribed by the latter, replacing more vigorous exercise prescribed by the former (153). Unfortunately, the moderate exercise prescription of the 1990s coincided with a time of unparalleled opportunity to be both sedentary and consume huge amounts of cheap calories. In addition, given the permissiveness of American culture and the way that information was presented by the media, the moderate prescription was often interpreted as an excuse not to exercise rather than as a ‘doable’ goal. In effect, an exercise prescription to reduce a lazy man’s chance of a heart attack had
turned into a national prescription for fitness. In addition, medical research, some of it flawed, combined with media spin had given rise to the erroneous widespread beliefs that it was okay to gain weight as one aged (154) and that fat people were healthy (155).

As exemplified above and noted by Swinburn (75), environmental influences represent the public health arm of the obesity problem (Table 3) with obesogenic macroenvironments overriding the more limited effect of programmes aimed at individual behaviour. Table 3 lists aspects of the physical, economic, social and cultural environment that affect foods consumed and physical activity undertaken.

Table 3: Environmental influences on food intake and physical activity (75)

<table>
<thead>
<tr>
<th>Type of environment</th>
<th>Physical Environment</th>
<th>Economic environment</th>
<th>Sociocultural environment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Food</td>
<td>Activity</td>
<td>Food</td>
</tr>
<tr>
<td>Macro</td>
<td>Food laws and regulation</td>
<td>Labour saving devices</td>
<td>Food taxes and subsidies</td>
</tr>
<tr>
<td></td>
<td>Food technology</td>
<td>Cycleways and walkways</td>
<td>Cost of food technology</td>
</tr>
<tr>
<td></td>
<td>Low fat foods</td>
<td>Fitness industry policies</td>
<td>Marketing costs</td>
</tr>
<tr>
<td></td>
<td>Food industry policies</td>
<td>Transport system</td>
<td>Food prices</td>
</tr>
<tr>
<td>Micro</td>
<td>Food in house</td>
<td>Local recreation facilities</td>
<td>Family income</td>
</tr>
<tr>
<td></td>
<td>Choices at school cafeterias</td>
<td>Second cars</td>
<td>Other household expenses</td>
</tr>
<tr>
<td></td>
<td>Food in local shops</td>
<td>Safe streets</td>
<td>Subsidised expenses</td>
</tr>
<tr>
<td></td>
<td>Proximity of fast food outlets</td>
<td>Household rules for watching TV and video</td>
<td>Home grown foods</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The WHO recently compiled a list of the environmental factors that research has shown to promote or protect against weight gain and obesity, divided according to the strength of the available evidence (Table 4) (156).
Table 4: Summary of strength of evidence on factors that might promote or protect against weight gain and obesity\(^a\) (156).

<table>
<thead>
<tr>
<th>Evidence</th>
<th>Decreased risk</th>
<th>No relationship</th>
<th>Increased risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convincing</td>
<td>Regular physical activity&lt;br&gt;High intake of dietary fibre(^b)</td>
<td></td>
<td>Sedentary lifestyles&lt;br&gt;High intake of energy-dense micronutrient-poor foods(^c)</td>
</tr>
<tr>
<td>Probable</td>
<td>Home and school environments that support healthy food choices for children(^d) &lt;br&gt;Breastfeeding</td>
<td></td>
<td>Heavy marketing of energy-dense foods and fast-food outlets(^e) &lt;br&gt;High intake of sugars-sweetened soft drinks and fruit juices &lt;br&gt;Adverse socioeconomic conditions (in developed countries, especially for women)(^f)</td>
</tr>
<tr>
<td>Possible</td>
<td>Low glycaemic index foods</td>
<td>Protein content of the diet</td>
<td>Large portion sizes&lt;br&gt;High proportion of food prepared outside the home (developed countries)&lt;br&gt;“Rigid restraint/periodic disinhibition” eating patterns</td>
</tr>
<tr>
<td>Insufficient</td>
<td>Increased eating frequency</td>
<td></td>
<td>Alcohol</td>
</tr>
</tbody>
</table>

\(^a\)Strength of evidence: the totality of the evidence was taken into account. The World Cancer Research Fund schema was taken as the starting point but was modified in the following manner: randomised controlled trials (RCTs) were given prominence as the highest ranking study design (RCTs were not a major source of cancer evidence); associated evidence and expert opinion was also taken into account in relation to environmental determinants (direct trials were not usually available).

\(^b\)Specific amounts will depend on the analytical methodologies used to measure fibre.

\(^c\)Energy-dense and micronutrient-poor foods tend to be processed foods that are high in fat and/or sugars. Low energy-dense (or energy-dilute) foods, such as fruit, legumes, vegetables, and whole grain cereals, are high in dietary fibre and water.

\(^d\)Associated evidence and expert opinion included.

Inactivity

The studies showing increased evidence of risk for overweight and obesity (i.e. potentially causative factors) include sedentary lifestyles, with convincing evidence that the inactivity associated with sedentary occupations and TV watching promotes weight gain (157, 158). A recent longitudinal study of 1000 New Zealanders followed up over 26 years, showed that in 26 year-olds, population-attributable fractions indicated that 17% of overweight and 15% of poor cardiovascular fitness could be attributed to watching TV for more than 2h a day during childhood and adolescence (159).

Energy-Dense Food and Drink

A high intake of energy-dense foods (high in fat and generally low in water, micronutrients and fibre), and consumption of energy-dense drinks (usually high in sugar) are the main candidates for the so-called “passive overconsumption” of calories that occurs when the energy density of the diet is high (144, 158, 160). There is also increasing evidence that the high intake of sugars in beverages promotes weight gain (143, 144, 157, 161-163) and it has been estimated that every additional glass or can of sugar-sweetened drink drunk per day by children increases the risk of becoming obese by 60% (164).
Soft drink intake amongst USA children is increasing with consumption doubling over the last two decades and now adding 188 kcal/day to the energy intake of children who drink them (165, 166). In NZ, 45% of children aged 5-14 years of age drink carbonated drinks at least weekly, with the highest consumption by Maori and Pacific people and those in the lowest NZDep01 (12).

**Marketing of Energy-Dense Food and Drink**

The WHO report on diet and nutrition concluded that there was sufficient indirect evidence that the heavy marketing of fast foods and soft drinks to young children causes obesity (156). Certainly, the consistent strong relationships between TV viewing and obesity in children may relate in part to the advertising to which they are exposed (162, 167-169). Since release of the WHO report on diet and nutrition, the Hastings report, a UK report prepared for the FSA (Food Standards Agency) that reviewed all research on the effect of food promotion to children, was published (170). This report concluded that although results from research into a topic of this nature could not amount to proof of causality, sufficient evidence existed to conclude that an effect exists, with the research showing that:

- There is a lot of food advertising to children.
- The advertised diet is less healthy than the recommended one. A NZ study showed that two-thirds of food advertisements targeted at children were for food high in fat and/or sugar (171).
- Children enjoy and engage with food promotion.
- Food promotion is having an effect, particularly on children’s preferences, purchase behaviour and consumption.
- This effect is independent of other factors and operates at both a brand and category level.

Not surprisingly, the Hastings’ report was quickly followed by an analysis of the report commissioned by the UK Food Advertising Unit (FAU) that concluded, “we do not believe the Hastings Review has the robustness to be used for policy development” (172). Despite the fact that the Hastings Review admitted that current research was unable to demonstrate proof of causality between advertising and children’s food consumption behaviour, the FAU analysis chose to concentrate on this lack of causality, and the results of one study that showed that parental influence affected children’s behaviour more than food advertising (173), rather than the evidence showing that an effect existed. More recently, WHO commissioned a report to review regulations on food marketing to children as part of its global strategy on diet and physical activity (174).
Low Socioeconomic Status
As the obesity epidemic has progressed, lower socioeconomic status has been consistently associated with higher rates of obesity in higher income countries (175). The mechanisms by which socioeconomic status influences food and activity patterns are probably multifactorial and need elucidation. However, the WHO report suggests that people living in circumstances of low socioeconomic status may be most at the mercy of obesogenic environments. This is because their eating and activity behaviours are more likely to be the “default choices” on offer e.g. the cheapest or geographically most available food/activity sources (156). In NZ, rates of overweight and obesity are highest amongst Pacific and Maori children who also have the highest rates of low socioeconomic status (see ‘burden of overweight and obesity in NZ children’). Similarly, data from the Medical Research Council of England has shown that Asian children are four times more likely to be obese than those who are white (176). In the USA, black girls and their mothers are heavier than their white counterparts (177), and the largest concentrations of the obese reside in the poorest sectors of society – the chronically impoverished (from Appalachia to the rural South), working poor (from L.A. barrios to New York’s Little Puerto Rico), and ‘structurally’ poor (from Detroit’s housing projects to reservation-tied Native Americans) (74). As in other heterogeneous and affluent societies, in the USA there is a strong inverse correlation between socioeconomic status and obesity (178).

Possible Causes of Obesity
Research suggests that possible causes of overweight and obesity include diets comprised of a high proportion of high glycaemic foods (179-182), large portion sizes (with evidence that people do not adequately compensate for large meals by subsequently eating less) (183, 184), and eating a significant proportion of calories from meals prepared outside the home (185). In the USA, it has been shown that those who most often eat outside the home have higher BMIs than those who tend to eat at home (185). In addition, the energy, total fat, saturated fat, cholesterol and sodium content of foods prepared outside the home is much higher than in home-prepared food (185).
Effectiveness of Interventions to Prevent Overweight and Obesity

Reviews examining the evidence for the effectiveness of childhood obesity prevention interventions have used different frameworks for presenting the evidence. Generally, these frameworks have been based on either type of interventions (dietary education and/or physical activity), as in the latest Cochrane review (186, 187) or, more commonly, the setting of interventions (188-195). A settings approach for grouping interventions is based on places where people gather and where food or physical activity is involved e.g. schools, homes, neighbourhoods, primary care settings and communities (194). The following review of the effectiveness of interventions to prevent childhood obesity is organised under the headings listed below, in order to capture findings from the best available evidence:

- Breastfeeding
- Controlled Trials for Dietary Education and Physical Activity Interventions
  - Dietary Education Interventions
  - Physical Activity Interventions
- Macroenvironmental interventions.

The WHO summary shown in Table 4, above, listed regular physical activity and a high intake of dietary fibre as the two factors that most convincingly prevented excess weight gain. However, dietary fibre studies were conducted with adults rather than children (196, 197), as were most physical activity trials (198) - except for the controlled trials of physical activity +/- dietary interventions conducted with children in educational institutions or family settings, discussed below. In adults, the majority of dietary fibre studies have demonstrated increased satiety, reduced hunger, reduced energy intake, and body weight loss during consumption of high-fibre diets (196, 197). Thus, there is considerable reason to conclude that fibre-rich diets containing non-starchy vegetables, fruits, whole grains, legumes, and nuts, may be effective in the prevention and treatment of obesity in children.

*Breastfeeding*

As shown in Table 4, studies suggest that breastfeeding probably protects against childhood obesity. Five of approximately 20 studies found a protective effect (199-203), two found that breastfeeding predicted obesity (204), and the remainder found no relationship (156). Although there were probably multiple confounding effects in these studies, the three largest studies did show a protective effect (200,
In addition, it has been calculated that the reduction in risk of developing obesity observed by two of these studies was substantial (20-37%) (201, 203). The mechanism by which breastfeeding may protect against overweight or obesity remains uncertain, although suggested possible mechanisms include the following: breastfed infants may have more control over the amount of milk they consume; differential endocrine responses to formula and breast milk may promote more body fat deposition in the formula-fed infants; and food preferences subsequent to breastfeeding may be affected by the mode of infant feeding (205). A NZ study of approximately 1000 infants monitored up until 21 years of age showed that breastfeeding for >6 months showed a reduction in risk of overweight during late childhood and adolescence which became nonsignificant after adjusting for sex, birthweight, maternal education, and parents’ being overweight (206). Nevertheless, the ORs were comparable to those found in other large studies (201-203).

**Controlled Trials of Dietary Education and Physical Activity Interventions**

The latest Cochrane Database of Systematic Reviews on interventions for preventing obesity in children included all randomised controlled trials and non-randomised trials with concurrent control group that observed participants aged less than 18 years for a minimum of three months (186). Ten studies were identified from which it was concluded that there is currently limited quality data on the effectiveness of obesity prevention programmes and as such no generalisable conclusions could be drawn. It was suggested that a concentration on strategies that encourage a reduction in sedentary behaviour and an increase in physical activity could be fruitful. It also concluded that at a time when obesity prevention is a public health priority, the current research lacks the power to set clear directions for obesity prevention activity. These, plus four school-based studies and one community/family-based study published since the Cochrane Review that fit the same inclusion criteria (207-211), are summarised below according to type of intervention(s) and are listed in Table 5. The International Association for the Study of Obesity recently published a list of controlled trials undertaken to prevent childhood obesity that also includes several trials that did not meet the Cochrane Review’s criteria for inclusion, but is less up-to-date than the list shown below (Table 5) (212).
Table 5: Controlled trials evaluating childhood obesity prevention programmes.

<table>
<thead>
<tr>
<th>Author, Country, Year</th>
<th>Participants</th>
<th>Interventions</th>
<th>Results</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dietary Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epstein, USA 2001</td>
<td>Non obese children from families with at least one obese parent. Mean age: I=8.6 yrs, C=8.8 yrs. 65% female</td>
<td>Both groups received same 6-month treatment and followed the ‘traffic light’ diet, but targeted different dietary goals. Treatment meetings were facilitated by therapists: I: increased fruit and vegetable intake (n=13); C: decreased intake of high-fat/high-sugar foods (n=13). Follow-up: one year.</td>
<td>Percentage of overweight: Parents in the increased fruit and vegetable group showed significantly greater decreases (p&lt;0.05) in percentage of overweight than parents in the decreased high-fat/high-sugar group, while children showed a stable percentage of overweight over time.</td>
<td>Random allocation: method not described. Blinding: *children: unclear *providers: unclear *outcome assessors: unclear</td>
</tr>
<tr>
<td>Simonetti, Italy 1986</td>
<td>Children aged 3-8 yrs in kindergarten or primary school.</td>
<td>Two school groups received dietary education interventions that differed in intensity, and there was one control school as follows: School 1: multimedia action strategy (MA), n=367. School 2: written action strategy (WA) - pamphlet only n=358. School 3: control, n=596. Follow-up: one year.</td>
<td>A 12.2% reduction in obesity and a 12.1% reduction in overweight was found in the MA school. There were no significant changes in overweight or obesity in the WA or control schools.</td>
<td>Non-randomised allocation. Did not adequately describe attrition, the potential of contamination between study groups or the generalisability of the study.</td>
</tr>
<tr>
<td>James, UK 2004</td>
<td>Children aged 7-11 yrs in primary schools.</td>
<td>Twenty-nine classes from six primary schools were randomized into the intervention group (15 classes) or control group (14 classes). Intervention group: 4x 1 hr educational sessions to reduce the consumption of carbonated drinks (n=325). Control group: no sessions (n=319). Follow-up: one year (the end of the intervention).</td>
<td>A drop in consumption of carbonated drinks was observed in the intervention group of 0.6 glasses over 3 days compared with an increase of 0.2 glasses in the control group (mean difference 0.7, 95% CI 0.1-1.3). There was an increase of 7.5% in overweight and obese children in the control group compared with a decrease of 0.2% in the intervention group (mean difference: 7.7%, 95% CI 2.2-13.1%).</td>
<td>Random allocation: randomisation of classes stratified by school. Blinding: *children: at time of consent *outcome assessors: unclear</td>
</tr>
<tr>
<td><strong>Physical Activity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mo-Suwan, Thailand 1998</td>
<td>Kindergarten children. Mean age: 4.5 yrs 44% female.</td>
<td>Intervention: Kindergarten-based physical activity programme conducted by specially trained staff and including a 15 minute walk and a 20 minute aerobic dance session 3x a week (n=158 baseline, 147 at end of study). Control: no intervention (n=152 baseline, 145 at end of study). Follow-up: 29.6 weeks (the end of the intervention) and 29.6 weeks + 6 months.</td>
<td>Prevalence of obesity (triceps-skinfold thickness): Baseline: I=12.9%, C=12.2%. 29.6 weeks: I=8.8%, C=9.4%. 26.6 weeks + 6 months: I=10.2%, C=10.8%.</td>
<td>Random allocation: randomisation of classes stratified by school. Blinding: *children: unclear *providers: unclear *outcome assessors: unclear</td>
</tr>
<tr>
<td>Flores, USA 1995</td>
<td>School children (aged 10-13 yrs). Mean age: 12.6 yrs 54% female.</td>
<td>Intervention: Thrice weekly aerobic dance classes plus health education in place of regular school physical education programme (n=43). Intervention group vs control group: Change in BMI: I=-0.8, C=0.3, p=0.05. Change in heart rate (beats per minute): I=-10.9, C=-0.2, p=0.01. Boys: There were no differences between I and C groups.</td>
<td></td>
<td>Random allocation: randomisation of classrooms. Blinding: *children: unclear *providers: unclear *outcome assessors: unclear. Generalisability of study outcomes not considered; follow-up numbers of participants (n) not reported.</td>
</tr>
<tr>
<td>Robinson, USA 1999</td>
<td>School children (aged 8-10 yrs). Mean age: 8.9 yrs 47% female.</td>
<td>Intervention: 18 lessons aimed at reducing sedentary behaviours (TV, videotape and videogame use) (n=92). Control school: usual school curriculum. Follow-up: 6 months (the end of the intervention).</td>
<td>Intervention vs control change: BMI: intervention vs control change: 18.38 to 18.67 kg/m² vs 18.10 to 18.81 kg/m², respectively, adjusted difference -0.45 kg/m² (95% CI -0.73 to -0.17), p=0.002; *Triceps skinfold thickness: intervention vs control change: 14.55 to 15.47 mm vs 13.97 to 16.46 mm, respectively, adjusted difference, -1.47 mm (95% CI, -2.41 to -0.54), p=0.002; *Waist circumference: intervention vs control change: 60.48 to 63.57 cm vs 69.51 to 64.73 cm, respectively, adjusted difference, -5.36 cm (95% CI, -7.72 to -3.00), p&lt;0.001; and *Waist to hip ratio: intervention vs control change: 0.83 to 0.83 cm vs 0.82 to 0.84 cm, respectively, adjusted difference, -0.02 (95% CI, -0.03 to -0.01), p=0.001. *Intervention group watched significantly less TV (p=0.001) and played fewer video games (p&lt;0.01). *Groups did not differ for videotape viewing, daily servings of high fat foods.</td>
<td>Random allocation of schools. Blinding: *children: unaware of primary hypothesis *providers: unaware of primary hypothesis *outcome assessors: blinded</td>
</tr>
<tr>
<td>Firstname</td>
<td>Surname</td>
<td>Year</td>
<td>Country</td>
<td>Study Design</td>
</tr>
<tr>
<td>-----------</td>
<td>---------</td>
<td>------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>Robinson</td>
<td>USA</td>
<td>2003</td>
<td>Girls</td>
<td>60-10 yrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(n=50%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gortmaker</td>
<td>USA</td>
<td>1999</td>
<td>School children</td>
<td>6-8 yrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(n=50%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donnelly</td>
<td>USA</td>
<td>1999</td>
<td>School children</td>
<td>3-5 yrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(n=50%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sahota</td>
<td>UK</td>
<td>2001</td>
<td>School children</td>
<td>7-11 yrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(n=50%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mueller</td>
<td>Germany</td>
<td>2001</td>
<td>School children</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(n=50%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stolley</td>
<td>USA</td>
<td>1997</td>
<td>African-American girls</td>
<td>7-12 yrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(n=50%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Robinson**: Sixty-one African-American girls (and their parents/guardians) aged 8-10 years from low-income neighborhoods. Girls had BMI=50th percentile for age and/or at least one overweight parent/guardian.

- **Gortmaker**: School children (year 6-8). Mean age: 11.7 yrs. 48% female.

- **Donnelly**: School children (years 3-5). Mean age: 9.2 yrs. % female: not given.

- **Sahota**: School children (aged 7-11 yrs). Mean age: I=8.36 yrs, C=8.42 yrs. Sex: I=49% female, C=41% female.

- **Mueller**: School children. Mean age: 11.7 yrs. 48% female.

- **Stolley**: African-American girls (aged 7-12 yrs) and their mothers. Mean age: I=9.9 yrs, C=10.0 yrs. 62% of mothers and 19% of daughters were obese.
| Caballero | American Indian school children (aged 7-9 yrs). Mean age: 7.6 yrs 48% female. | Intervention: Pathways intervention to school children with four components: change in diet, increase in physical activity, classroom curriculum focus on healthy eating and lifestyle, and a family involvement programme (n=879 baseline, n=727 follow-up). Control: no intervention (n=825 baseline, n=682 follow-up) Follow-up: three yrs (the end of the intervention). | Intervention vs control change:  
*No significant reduction in percentage body fat (-0.2 kg/m², 95% CI: -0.84 to 1.31, p=0.004).  
*No significant difference in total energy intake (5.8 kcal, 95% CI: -40.0 to 51.5, p=0.80).  
*No significant difference in physical activity (20.43 average vector magnitude/min, 95% CI: -19.05 to 59.92, p=0.31).  
*Significant reduction in % energy from fat in school meals (-4.2%, 95% CI: -7.1 to -1.3, p=0.005).  
*Improved knowledge, attitudes and behaviours. | Random allocation of schools: stratified randomisation based on % body fat. Blinding:  
*children: unclear  
*providers: unclear  
*outcome assessors: blinded |
| Neumark-Sztainer | Mainly overweight high school girls who performed little daily activity. Mean age: 15.4 yrs. | Intervention: New Moves intervention instead of regular PE classes 5 days a week for 4 months. Physical activity four times a week, and nutrition and social support education sessions every other week. Each component consisted of several interventions based on a framework of Social Cognitive Theory. The intervention was followed by a two month maintenance component consisting of weekly healthy-lunch meetings and discussions. Control: written materials on healthy eating and physical activity that were distributed at baseline assessment. Follow-up: eight months. | Intervention vs control BMI:  
*No difference in mean BMI (I:C BMI: 26.64:26.65 kg/m², p=0.96).  
*Significant progression in stage of change for physical activity in the intervention (38% progressed, 11% regressed) compared with the control girls (20% progressed, 24% regressed), p=0.0004. | Random allocation of 6 schools. Blinding:  
*girls: unclear  
*providers: unclear  
*outcome assessors: unclear. |
| Sallis | School children in grades 6 to 8. Ages: 12-14 years. 49% female. | Intervention: Daily PE; promotion of PA at school during leisure times; more low-fat food choices at all school food sources; and policy changes to create healthier school environments that support these interventions (n=12 schools). Control: No interventions (n=12 schools). Follow-up: two years (the end of the intervention). | Intervention vs control BMI:  
*Boys: significant difference in mean change in BMI between the intervention group (20.12 to 19.84 kg/m²) and control group (19.68 to 20.04 kg/m²) for baseline and 2-yearly measurements, respectively (F=4.6).  
*Girls: no significant difference in mean change in BMI between the intervention group (19.76 to 19.88 kg/m²) and control group (19.52 to 19.73 kg/m²) for baseline and 2-yearly measurements, respectively (F=0.0). | Random allocation of 24 schools. Blinding:  
*children: unclear  
*providers: no  
*outcome assessors: unclear. |
Dietary Education vs Control

The Cochrane Review identified two studies, described as long-term on the basis that the period of observation was one year or longer, that evaluated the effect of a dietary education intervention versus control (186). One further study was identified that was of one year’s duration (208). These studies are described further below.

Epstein et al (213) evaluated the effect of an increased fruit and vegetable intake dietary intervention (n=13) against a control group which decreased intake of high fat/high sugar foods (n=13)(213). The study focussed on 6 to 11 year old children from families with at least one obese parent. The intervention was delivered to the parents. The changes in percentage of overweight in the children after 12 months were -1.10% +/- 5.29 in the increased fruit and vegetable group and -2.40%+/−5.39 in the decreased fat and sugar group. The differences in percentage of overweight were not statistically significant.

A study by Simonetti et al (214) assessed the effectiveness of two levels of intensity of dietary education aimed at reducing the prevalence of obesity and overweight in 1,321 kindergarten and primary school pupils in the 3-9 year age bracket. Therefore, one school (n=367) received a high intensity Multimedia Action (MA) strategy. MA involved the use of printed pamphlets, audio-visual aids and the use of qualified staff who promoted the project within the school. Another school (n = 358) received a lower intensity "Written Action" (WA) strategy which involved the distribution of printed pamphlet only. A further school (n=596) acted as a control school. At twelve-month follow-up, Simonetti reports a 12.2% reduction in obesity and a 12.1% reduction in overweight in the MA school with no significant changes in WA or Control schools. No further statistical analyses were reported. Overall, smaller weight changes were found in obese students compared to overweight students.

The latest study by James et al (208) assessed the effectiveness of dietary education aimed at discouraging the consumption of fizzy drinks and hence reducing the prevalence of overweight and obesity in 644 school children aged 7-11 years. Fifteen classes (n=325) received the intervention consisting of 4x one-hour sessions spaced throughout the school year involving: good health education,
promoting drinking water, composing music for a song with an anti-soft drink message, art presentations and a classroom quiz. Fourteen control classes received no intervention (n=319). At the end of the school year consumption of carbonated drinks over three days had decreased by 0.6 glasses (average glass size 250ml) in the intervention group and increased by 0.2 glasses in the control group (mean difference 0.7, 95% CI 0.1-1.3). Furthermore, the percentage of overweight and obese children had increased in the control group by 7.5% compared with a decrease in the intervention group of 0.2% (mean difference 7.7%, 95% CI 2.2-13.1%).

Physical Activity/ Reduction in Sedentary Activity vs Control
The Cochrane review identified one long-term and two short-term studies (≥3 months and <1 years duration) (215-217). One further short-term study was also identified by Robinson et al, 2003 (210). These are discussed in detail below.

The single long-term study by Mo-Suwan et al, 1998 (216) evaluated a physical activity intervention versus control. Specialists delivered a specific regimen of exercise (15 minutes of walking plus 20 minutes of aerobic exercise) to Thai kindergarten children (mean age 4.5 years, n=292), for 29.6 weeks. Follow-up measures were taken at this time. At this initial evaluation at 29.6 weeks Mo-Suwan found a reduction of the prevalence of obesity in the intervention pre-school children that nearly reached statistical significance (P = 0.057). The study showed that intervention girls had a lower likelihood of having an increased BMI slope than control girls (odds ratio 0.32; 95%CI, 0.18 - 0.56), while the opposite was true for boys (odds ratio 1.08; 95% CI, 0.62 - 1.89). Data at 6 months post-intervention has now been collected. Overall prevalence of obesity, using 95th percentile National Centre for Health Statistics triceps-skinfold thickness cut-offs, in the control group decreased from 12.2% at baseline to 9.4% at completion of the intervention at 29.6 weeks, and was 10.8% at 29.6 weeks plus 6 months. In the exercise intervention group, the prevalence of obesity was 12.9% at baseline, 8.8% at 29.6 weeks and 10.2% six months later. It is not known (information not available) if the changes at 29.6 weeks plus 6 months are statistically significant, but such small differences between groups are unlikely to be clinically significant.

A short-term study by Flores, 1995 (215) also evaluated the effect of physical activity interventions versus control. In this study, a 50 minute dance oriented physical activity curriculum replaced the
regular physical activity sessions of 110 African American and Hispanic boys and girls aged 10-13 years. In all, students received 150 minutes of dance per week (over three sessions), and the intervention ran for 12 weeks. Follow-up measures were taken at this time. Flores reports significant reductions in BMI between intervention (I) and control (C) girls (BMI: -0.8 kg/m²(I), 0.3 kg/m²(C), p<0.05), and in fitness (heart rate -10.9 beats/min (I), -0.2 beats/min (C); P<0.01). Results beyond 12 weeks are not available.

A further short-term study by Robinson, 1999 (217), evaluated the effect of an intervention aimed at reducing sedentary behaviours (rather than promoting physical activity), versus control. Specifically, the intervention aimed to reduce television, videotape and video game use in elementary school children (mean age 8.9 years). This was undertaken by existing school staff and consisted of 18 (30-50 minute) lessons delivered over six months. Follow-up measurements were taken at this time. In this study, after adjustment by mixed-model analysis of co-variance for the baseline values, age, and sex, the intervention group (both boys and girls) had statistically significant relative decreases in all measures of body fatness:

- BMI: intervention vs control change: 18.38 to 18.67 kg/m² vs 18.10 to 18.81 kg/m², respectively, adjusted difference -0.45kg/m² (95% CI -0.73 to -0.17), p=0.002;
- triceps skinfold thickness: intervention vs control change: 14.55 to 15.47mm vs 13.97 to 16.46mm, respectively, adjusted difference, -1.47mm (95% CI, -2.41 to -0.54), p=0.002;
- waist circumference: intervention vs control change: 60.48 to 63.57 cm vs 59.51 to 64.73cm, respectively, adjusted difference, -2.30cm (95% CI, -3.72 to -1.33), p<0.001; and
- waist to hip ratio: intervention vs control change: 0.83 to 0.83 cm vs 0.82 to 0.84 cm, respectively; adjusted difference, -0.02 (95% CI,-0.03 to -0.01), p<0.001.

In addition, relative to controls, intervention group changes were accompanied by statistically significant decreases in children's reported television viewing (p<0.001) and number of meals eaten in front of the television (p<0.02). There were no statistically significant differences between groups for changes in high-fat food intake, moderate-to-vigorous physical activity, and cardio-respiratory fitness. Given that there was no assessment beyond six months post-intervention, it is not possible to extrapolate the findings of this study to longer-term outcomes.
Recently, Robinson *et al*, 2003 (210) completed a 12-week randomised controlled trial in California that aimed to both increase physical activity and decrease sedentary activities, and was one of four pilot studies for the GEMS (Girls’ health Enrichment Multisite Studies). The GEMS is a multisite obesity prevention trial programme targeting 8-10 year-old African-American girls, sponsored by the National Heart Lung and Blood Institute (218, 219). The pilot study intervention involved 61 girls and their parents/ guardians from low-income neighbourhoods and consisted of after-school dance classes at three community centres, and a five-lesson intervention delivered in participants’ homes that was designed to reduce television, videotape, and video game use. The active control intervention consisted of disseminating newsletters and delivering health education lectures. Goal rates of retention were exceeded and participation rates were high except where transportation was lacking. At the end of the twelve-week interventions, girls in the treatment group, as compared to the control group, exhibited trends towards:

- Lower BMI: adjusted difference = -0.32 kg/m², 95% CI -0.77 to 0.012, Cohen’s d=0.38 SD units.
- Lower waist circumference: adjusted difference = -0.63 cm, 95% CI -1.96 to 0.67, d=0.25.
- Increased after school activity: adjusted difference = 55.1 counts/minute, 95% CI -115.6 to 225.8, d=0.21.
- Reduced TV, videotape and video game use: adjusted difference = -4.96 hours/week, 95% CI -11.41 to 1.49, d=0.40.
- Improved school grades: d=0.51, p=0.07.

Significant changes were reported in the treatment group compared with the control group for:

- Reduced household television viewing: d=0.40, p=0.007.
- Fewer dinners eaten while watching TV: adjusted difference = -1.60 meals/week. 95% CI -2.99 to -0.21, p=0.03.
- Less concern about weight: d=0.60, p=0.03.

**Dietary Education vs Physical Activity**

No studies were found to match the Cochrane Review criteria for inclusion that compared a physical activity intervention group with a dietary education intervention group.

**Combined Effects of Dietary Education and Physical Activity**

The latest Cochrane Review identified four long-term studies (220-223) and one short-term study (224) that examined the combined effects of interventions aimed at dietary education and physical activity.
Three more studies were also identified that had been published since the review and met the same criteria for inclusion (207, 209, 211). These studies are discussed in more detail below.

One programme entitled "Planet Health", Gortmaker et al, 1999 (221), examined a behavioural choice intervention which targeted school boys and girls in years 6 to 8 (ages 10 to 13). This programme concentrated on the promotion of physical activity, modification of dietary intake and reduction of sedentary behaviours (with a strong emphasis on reducing television viewing). Evaluation at two years post intervention showed that the prevalence of obesity among girls in the intervention schools was reduced compared with controls, controlling for baseline obesity (OR 0.47, 95%CI 0.24-0.93; p=0.03). Among boys obesity declined among both control and intervention students however, after controlling for co-variates, there was no significant difference in outcome (OR 0.85, 95%CI 0.52-1.39; p=0.48). In addition, there was greater remission of obesity among intervention girls vs control girls (OR 2.16; 95%CI 1.07-4.35; p=0.04). Gortmaker reports that the intervention reduced television hours among both girls (-0.58 hours; 95%CI -0.85 to -0.31; p=0.001) and boys (-0.4 hours; 95%CI -0.56 to -0.24; p<0.001). In addition, the authors report an increased fruit and vegetable consumption in girls (0.32 serves/day; 95%CI 0.14 to 0.5; p=0.003), resulting in a smaller daily increment in total energy intake among girls (-575 kJ; 95%CI -1155 to 0; p=0.05). Gortmaker concludes that reductions in television viewing predicted obesity change and mediated the intervention effect (in girls but not boys). Among girls, each hour of reduction in television viewing predicted reduced obesity prevalence (OR 0.85; 95% CI 0.75-0.97; p=0.02). Of additional interest was the finding that measures of extreme dieting behaviour remained unchanged (and low) throughout the intervention and were not different between intervention and control schools.

In contrast, a study targeting elementary school children (years 3 to 5), that aimed to attenuate obesity and promote physical and metabolic fitness via a nutrition and physical activity intervention implemented over a two year period, found that while there were some positive changes in targeted behaviours, on follow-up at the end of the two years, the intervention had no impact on obesity (Donnelly et al, 1996) (220). However, the intervention resulted in statistically significant and positive changes in food provided at intervention schools (decreases in total energy and fat, and increases in carbohydrate and fibre (p<0.05)), and statistically significant differences in food provision, between
intervention and control schools. In addition, this intervention resulted in small, but statistically significant increases in the amount of activity undertaken in class (no p-values given). Unfortunately, there appeared to be compensation outside school for these changes in diet and physical activity. Therefore, over 24 hours there appeared to be no statistically significant differences in dietary intakes between intervention and control groups, and the intervention group were actually less physically active outside of the class than were the control group (no p-values given).

The APPLES study, Sahota et al, 2001 (223), assessed the impact of a primary school based intervention which included teacher training, modification of school meals, and the development of school action plans targeting the curriculum, physical education, tuck shops, and playground activities. Ten primary schools in Leeds, UK, were randomised to either the intervention or control group. Data were collected on 634 children aged 7-11 years. At 1 year, there was no difference in change in BMI between the children in the two groups, nor was there any difference in dieting behaviour. However, children in the intervention group reported higher consumption of vegetables (weighted mean difference 0.3 portions/day, 95% CI 0.2 to 0.4), but fruit consumption was lower in obese children in the intervention group (-1.0, -1.8 to -0.2). Sedentary behaviour was higher in overweight children in the intervention group (0.3, 0.0 to 0.7). Global self worth was higher in obese children in the intervention group (0.0, 0.3 to 0.6), but there was no difference in other psychological measures (dietary restraint, body shape preference, self-perception). Process evaluation showed that the APPLES intervention was successful in producing changes at the school level, in terms of changing the ethos of the schools and the attitudes of the children, but had little effect on children's behaviour other than a modest increase in the consumption of vegetables.

The fourth study which looked at the combined effects of dietary education interventions and physical activity interventions was the Kiel Obesity Prevention Study (KOPS), Mueller et al, 2001 (222). This differed from the other three studies as the same behavioural and educational messages were given to all children AND their parents. The key messages were to i) eat fruit and vegetables each day, ii) reduce high fat foods, iii) keep active at least one hour a day, and iv) decrease TV viewing to less than 1 hour a day. Data were collected on 1,640 children aged 5-7 years. At one year, there was no difference in change in BMI between the children in the two groups. The median BMI of children at
baseline was 15.2 in the intervention school and 15.4 in the control schools. At one year follow-up the corresponding data were 16.1 and 16.3. Contrary to BMI, the one-year changes in fat measured by triceps skinfold thickness (TSF) or sum of 4 skinfolds did reach statistical significance in favour of the intervention group. (Overweight was defined by TSF >90th centile of a child reference population from Germany). At baseline, the mean % overweight was 24.1 in the intervention school and 27.7 in the control schools. At one-year follow-up there was no change in these figures.

Stolley et al, 1997 (224), trialed the efficacy of a culturally specific obesity prevention programme designed for low-income inner-city African American girls and their mothers. This eleven-week (one hour per week) programme focussed on culturally appropriate modifications of diet and activity, and had a strong emphasis on experiential learning. On assessment at 12 weeks, results showed significant differences between the treatment and control mothers, with treatment mothers consuming less daily saturated fat (ounces) (-2.1oz, p<0.05) and a lower percentage of calories from fat (-7.9%, p<0.001). However, weight remained unchanged. Differences among treatment and control groups were also noted for the daughters' percentage of daily calories from fat (-3.9%, p<0.05). Longitudinal data has been collected in this study, however, it has not been analysed and remains unreported.

The Pathways study was a randomised controlled trial involving a multicomponent, school-based intervention for the primary prevention of obesity in public schools serving American Indian communities (207). A total of 1704 children (school years 3 to 5, mean age 7.6 yrs) from 41 schools were involved for three consecutive years. Interventions consisted of four components:

- Classroom curriculum: regular lessons designed to promote healthy eating and regular exercise.
- Food service: providing lower-fat school meals.
- Physical education: minimum of 3x 30-minute PE sessions per week plus exercises during recess of 2-10 minutes duration.
- Family involvement: educational material designed to promote healthy eating and physical activity, and family events at schools such as cooking demonstrations and healthy lifestyle activities.

Results showed no significant change in % body fat in the intervention group compared with controls (mean difference in BMI: 0.2 kg/m², 95% CI: -0.84 to 1.31, p=0.004). There was a significant
reduction in the percentage of energy from fat in the intervention schools compared with controls (mean difference % energy from fat: -4.2%, 95% CI: -7.1 to –1.3, p=0.005). However, there was no difference in directly observed total energy intake (mean difference in total energy intake: 5.8 kcal, 95% CI: -40.0 to 51.5, p=0.80) despite results from 24-hr dietary recall that showed a significant reduction in total energy intake (mean difference in total energy intake: -265 kcal, 95% CI: -437 to -94, p=0.003). Motion sensor data showed similar activity levels in intervention compared with control schools (mean difference in physical activity: 20.43 average vector magnitude/min, 95% CI: -19.05 to 59.92, p=0.31). Several components of knowledge, attitudes and behaviours were positively and significantly changed by the Pathways intervention.

The New Moves study was a randomised controlled trial involving a multicomponent, school-based intervention for the primary prevention of obesity in overweight adolescent girls who did very little daily physical activity (209). Six high schools were randomised to control or intervention conditions with 89 girls in the intervention group and 112 in the control group, averaging 15.4 years of age. The intervention school participants received the New Moves programme for five days a week for four months in place of the regular physical education class for academic credit. The interventions aimed to bring about positive changes in physical activity and eating behaviours for weight loss/maintenance, avoid unhealthy weight control behaviours and feel good about themselves. The main components of the programme included physical activity four times a week, and nutrition and social support education sessions that were offered every other week. Each component consisted of several interventions based on a framework of Social Cognitive Theory (225). The intervention was followed by a two-month maintenance component consisting of weekly healthy-lunch meetings and discussions.

Control school participants received written materials on healthy eating and physical activity that were distributed at baseline assessment. At eight months, a final follow-up assessment was completed. At baseline there was no significant difference in BMI between intervention and control girls (mean BMI 26.7 kg/m²); similarly, at four months (postintervention), there was no difference in mean BMI between the intervention or control girls (I:C BMI: 26.64:26.65 kg/m², p=0.96). In fact, there were no significant changes in any of the outcome variables apart from a significant progression in stage of
change for physical activity in the intervention (38% progressed, 11% regressed) compared with the control girls (20% progressed, 24% regressed), p=0.0004.

Sallis et al, 2003 (211) performed a randomized controlled trial of the effect of physical activity, nutrition, and school policy change interventions on students in 12 middle schools\(^3\) compared to students in 12 non-intervention middle schools in California. Students were aged from 12 to 14 years with a mean enrolment of 1109 students per school of whom 49% were female. The primary aims of the study were to increase total energy expenditure at school and decrease total dietary fat purchased at schools. Reduction in mean BMI was a secondary aim. Intervention schools received daily physical education and physical activity was encouraged during leisure time at school by providing equipment, organised activities, and supervision. School food sources were regulated to provide more low-fat choices and children were assisted and encouraged to bring lower fat lunches to school. Results showed a greater increase in physical activity in intervention schools compared with control schools, no significant difference in fat intake, and a significant reduction in BMI in intervention compared with control boys although no effect was observed for girls.

Some of the major problems with study methodology are commented on briefly in Table 5. In addition, measures of diet and physical activity are relatively weak estimates of actual behaviour. For example, in these studies, dietary data were usually collected by recall of the past 24 hours' food intake or by food frequency checklists. In ideal situations, dietary data should be collected over at least three days, including one weekend day to provide best estimates of actual intake (226, 227). Furthermore, while food frequency questionnaires are valuable in the clarification of major dietary patterns (228), they are considered to be methodologically inappropriate for measurement of usual intake in individuals (226, 227, 229, 230). A further problem with dietary records is the tendency for respondents to under-report energy intake, with under-reporting of energy intake observed to be greater in the obese and overweight (231, 232). The measurement of physical activity is similarly problematic (233).

\(^3\) Middle school is equivalent to Forms 1-3 in NZ (Years 7-9). American children start school 1 year later than NZ children.
Summary
In summary, as discussed above and shown in Table 5, studies examining combined dietary education and physical activity interventions in children have thus far failed to demonstrate any significant impact on BMI or obesity. Dietary education delivered by multimedia strategies to primary and kindergarten children, and education designed to reduce soft drink consumption in primary school children, were significantly associated with reductions in obesity prevalence. Physical activity interventions and interventions aimed at reducing sedentary activity were also associated with significant reductions in BMI in two studies and a trend towards significant reductions in BMI in the remaining two studies.

However, the public health implications of these findings are less certain for the following reasons:

- Only 14 studies were found for inclusion in this review.
- No studies have compared the relative efficacy of dietary vs physical activity interventions.
- There were multiple differences between studies in terms of study design and quality, target population, theoretical underpinning of intervention approach, delivery of interventions, and comparable outcome measures, making it impossible to combine results.
- The generalisability of study results is limited as most studies were done in the USA on children aged 7-12 yrs. In addition, the characteristics of nonparticipants and those lost to follow-up was not documented.
- Studies used different methods to estimate overweight and obesity, although Cole, 2000 (3), proposed standardised international definitions/cut-points that are now being used globally.
- As discussed above, measurement of dietary intake and physical activity has been flawed.
- The effectiveness of interventions and delivery of interventions is likely to be limited by poor understanding of the interface between individuals’ behaviour and the environment.
- Obesity prevention interventions may be considered too difficult to pursue in societies where the complex socio-political environment overwhelmingly supports our driving physiological goals to be sedentary and well fed.

Therefore, the difficulties in conducting research or interventions in this area and hence the limited data at hand, makes it difficult to conclude that one strategy or combination of strategies is more important than others in the prevention of childhood obesity. While existing literature suggests that limiting
children’s sedentary behaviours, increasing physical activity, reducing soft drink consumption, or
dietary education delivered by multimedia strategies may be effective in certain groups of children,
there remains an urgent need for well-designed studies in the area. The Cochrane Review group have
suggested that future studies should attempt to overcome the problems listed above, and also examine
the importance and effectiveness of those behaviours that could be targeted by obesity prevention
interventions. In addition, study designs should be based on the best and most appropriate available
theoretical models of behavioural change (186).

**Planned Obesity Prevention Trials**
Internationally, there are a number of major childhood obesity prevention trials currently planned or
underway that will add important information to the evidence base (186, 218, 234-237). In New
Zealand, there are currently two major trials being established that aim to prevent overweight and
obesity in children. The first is part of an Australasian study, the Pacific Obesity Prevention in
Communities trial, being co-ordinated by Boyd Swinburn (Deakin University, Australia) and Robert
Scrugg (Auckland University, NZ). This study is a multi-component, randomised controlled trial
involving Years 9-12 children from eight high schools in South Auckland, and is scheduled to begin in
Term 2, 2005, and is discussed in more detail below (Appendix One). The second study, ‘Activ8’, is a
randomised-controlled trial that involves 65 primary schools in Waikato in a two-year physical activity
programme, with 65 comparison primary schools (238). The study will be funded by Waikato District
Health Board and begins in August 2004.

**Macroenvironmental Interventions**
Currently, there are no studies that have directly examined the effects of changes in the physical/
political, economic, or sociocultural macroenvironments (Table 3), on the population prevalence of
overweight and obesity. However, most authors agree that action at societal level is required to counter
the macroenvironmental influences on physical activity and dietary intake, and changes are being
considered and implemented in policy, transportation/town planning, and the food industry at global
and national levels. Internationally, the International Obesity TaskForce (IOTF) has recently held a
workshop to develop an international framework for guiding decision-making in obesity prevention
that acknowledges both the paucity of evidence available for obesity prevention interventions, and the
importance of macroenvironmental factors (239). Macroenvironmental interventions that are proposed
or underway are discussed at the end of the next section.
Obesity Prevention Programmes Operating in Auckland

Swinburn’s ecological model (Figure 4) was used as the framework for describing the aetiology of obesity, and was valuable in identifying the influence environmental factors have on energy balance. The elements of the ecological model could be rearranged into the classic epidemiological triad of host, vector and environment (Figure 5) (75, 240). This can be used as a framework for strategies of action to prevent weight gain, within the broader framework of a settings or interventions approach. A settings approach is used below to present the existing programmes in Auckland that may help prevent obesity. It is useful to consider the components of the triad represented by the interventions delivered for programmes within each setting, as this helps ensure that all targets for intervention activities are addressed. In addition, the triad has the advantage of providing a framework for obesity prevention interventions that could allow comparisons with interventions used to control other epidemics e.g. smoking, coronary heart disease, injuries and infectious diseases (241-243), and is described in detail below. Similarly, the triad has been used to structure the final chapter outlining recommended strategies for action.

Figure 5: Epidemiological triad as it applies to obesity. The circles refer to the predominant strategies to address each corner of the triad. Source: (194).

*Host* factors for weight gain include biological, behavioural and cognitive factors, while host-based interventions to prevent obesity at a population level primarily consist of educational strategies. As shown in Figure 5, *vectors* for over-consumption are predominantly energy-dense foods and drinks,
and vectors for low energy-expenditure include machines/devices that are labour-saving or promote passive recreation. Many vector-based strategies for preventing obesity involve technical/engineering solutions, for example, reducing the energy density of manufactured foods. The environment incorporates the physical, economic, policy and sociocultural environments. Environmental changes generally need a strong lead from policy and/or social change. As detailed by Swinburn (194), lessons from other epidemics suggest that environmental strategies are often the most powerful and sustainable. In addition, serious investment in media campaigns and systemic changes are usually needed; social attitudes often follow policy changes, and broader government policies that impact on socioeconomic status gradients affect the risk for obesity and opportunities for interventions among low SES groups. An important lesson from other epidemics is that all three corners of the triad need to be addressed simultaneously i.e. individual, environment, and food/activity vehicles (194).

Appendix Two shows the questionnaire that was used to structure interviews with providers in the Auckland region. Appendix Three gives the list of Auckland providers interviewed for this project. A summary of results for each programme is presented in Appendix 4. As discussed previously, evidence for the effectiveness of interventions is sparse and sometimes lacking. In addition, a number of the programmes currently operating in Auckland might be expected to help prevent childhood overweight and obesity, but do not have obesity prevention as a goal and do not measure weight-related outcomes. However, all programmes have been included as some could possibly be altered to include obesity prevention as a primary aim and weight as a primary outcome. Auckland programmes are listed in Appendix 4 and described below, ordered according to the settings of interventions. Any gaps in services or barriers to services identified by providers have also been described. Several of the providers interviewed were able to suggest roles that ARPHS could or should take in the prevention of childhood obesity, and these are also summarised below.

Programmes

*Schools’ Setting: Multi-component Interventions*

**Adolescent obesity & diabetes prevention programme**

The AIMHI (Achievement in Multicultural High Schools) Project was an initiative of the Ministry of Education established in 1995 to improve the educational achievement of students in schools that serve
low socio-economic communities and have a high percentage of Maori and Pacific students (244). It involved students in nine Decile One urban secondary schools, eight of which were in South Auckland and one in Porirua. A survey of needs of the AIMHI students was carried out from which it was determined that children were eating a high proportion of junk food during school with associated significant behavioural and health outcomes noted by teachers, such as headaches, faintness, fatigue, and inattentiveness (245). In addition, Year 9 (ages 13-14 years) assessments of AIMHI school children revealed that >30% were obese (Jude Woolston, personal communication).

This resulted in the establishment of the NEW (Nutrition, Exercise and Weight) working party, consisting of a group of concerned stakeholders in South Auckland, with the aim of assessing, developing, and producing a programme to encourage healthy lifestyles in Year 9 AIMHI school children. The NEW working party subsequently collaborated with the Diabetes Projects Trust (DPT) in South Auckland to produce the ‘adolescent obesity & diabetes prevention programme’. This programme is currently operating in two South Auckland schools, McAuley and Southern Cross colleges, with plans to extend to three other Auckland AIMHI schools (Mangere, Hillary Collegiate and Tongaroa). The multi-component intervention consists of the following:

- A roadshow to explain the interventions, including a healthy eating/ PA video developed by DPT.
- Workshops one morning a month on aspects of healthy lifestyles including nutrition, Type 2 diabetes, and physical activity education. These educational sessions include guest speakers, videos, quizzes, spot prizes, free apples etc, and are currently being run by DPT staff (dietitian, public health nurses) and the school nurse. DPT have also produced three written educational aides, leaflets on the prevention of Type 2 diabetes, a comic strip on diabetes prevention, and a school diary with information about Type 2 diabetes.
- Lunch-time physical activity classes 3x a week. For example, Southern Cross College did a survey of year 9 students to determine, amongst other things, whether children would attend a lunch time exercise session (81.3% answered ‘yes’) and what activities they would prefer to do. Currently they have Hip–Hop and Taebo classes supported by Manukau City Council (MCC).
- A healthy tuck-shop contract between the provider and the school Board of Trustees. For example, the Southern Cross contract stipulates that food must conform to the National Heart Foundation’s (NHF) guidelines.
• Removal of all food and soft drink vending machines, although Southern Cross has two remaining that now contain healthy food snacks only.

• School health councils run by students for assessing and instigating ongoing health activities.

With respect to the epidemiological triad, this programme targets the host through physical activity and workshop interventions, the vector through provision of healthy food and removal of vending machines, and the environment by making unhealthy food less accessible through a healthy tuckshop policy.

Interventions are planned to continue for one year. Sustainability and expansion to other AIMHI schools will depend on obtaining further funding (for PA services and for DPT services as they are currently unfunded). Evaluation of the roadshow video is planned. Currently there are no formal evaluations of the interventions or any assessment of their effect on BMI. Other needs were also identified, such as the need for written information primarily targeting obesity prevention and for other providers to complement the limited resources of the DPT. There was also an identified need for a coordinator to manage and sustain the programmes operating in schools, and for a coaching/mentoring programme to help children set, achieve and maintain goals.

DPT suggested that ARPHS could take a role in coordinating community PA/ nutrition demonstrations. ARPHS could also keep an up-to-date inventory of effective childhood obesity prevention interventions and keep providers informed of new developments in the research literature. In addition, ARPHS could provide sound nutritional advice/education to school tuck shop retailers, aide in the formulation of a generic school tuck-shop food policy, and provide BMI charts by age for overweight and obesity to providers.

Health Promoting Schools
The Health Promoting Schools (HPS) programme commenced in Auckland primary schools in 1997. It is part of an international movement originating from the promotion of healthy schools and the development of the Ottawa Charter for Health Promotion by WHO (246, 247). HPS take a community development, health promotion approach focusing on the needs and priorities identified by each individual school, with activities in three main areas: providing health education, implementing health-related policies, and involving outside agencies and professionals in the planning and delivery of health
programmes. Recently, the Tipu Ka Rea three-level model was introduced by CMDHB (Kidz First) as a framework for developing HPS in a step-wise, sustainable fashion (248).

Various facilitators from governmental agencies and non-governmental service providers in the community are involved in supporting HPS. Facilitators in Auckland are based at ARPHS, CMDHB (Kids First, Pukekohe Public Health Nurses’ Office), MCC, ADHB (Auckland District Health Board, Community Child Health and Disability Service), and WDHB (Community Child and Family Services). Three facilitators are developing a Maori focus in Central and West Auckland. Providers involved in delivering HPS services include: NHF (School Food Programme, Jump Rope for Heart), ADHB (Food With Attitude = FWA, public health nurses - two public health nurses also provide nutritional support for developing food policies in secondary schools), Physical Education NZ (Te Ao Kori), SPARC (Sport and Recreation NZ), Sport Auckland (Young and Active, the PA programme run in conjunction with FWA), Harbour Sport (More Kids More Active More Often programme pilot), MCC (Food in Schools, School Gardens Project, annual mini olympics), AUT (research with HPS in North Auckland looking at how BMI varies with activity level, measured by pedometer, and ethnicity – not an ‘intervention’ per se), YMCA (Massey, Henderson), Pasifica Healthcare PHO (Primary Health Organisation) etc.

Initiatives taken within schools are variable as they are dependent on the priorities identified by individual schools. Initiatives aimed at preventing obesity are not yet operating and BMI has not been assessed as an outcome for any existing HPS programme, with the exception of FWA, which is aimed at treating rather than preventing obesity. A physical activity pilot programme is currently being run at Stanmore Bay school by Harbour Sport and the Ministry of Education that aims to increase children’s PA (see ‘More Kids More Active More Often’, below for details). These, and similar initiatives, such as plans for a dietitian and HPS facilitators to meet with school tuckshop operators to encourage the introduction of healthier food into schools, the development of Tii Raakau and Kapa Haka dance, and changes to how the school Health and Physical Education curriculum is taught, are not being evaluated as obesity-preventing interventions. Various other examples of HPS initiatives for increasing PA or improving nutrition are available on the HPS website (249).
Some of the programmes being run in HPS have been evaluated, i.e. FWA, the NHF School Food Programme and WSB, and these are discussed below. However, the effect on weight outcomes has only been assessed for FWA. HPS evaluations are available on the HPS website (250). While some programme outcomes were evaluated, for example, the change in profitability of tuckshops following the introduction of healthier foods, no obesity prevention programmes were identified or evaluated (251). Ongoing funding is provided by the Ministry of Health.

Problems were identified in focus, coverage, communication, sustainability, and programme delivery of HPS.

- **(1) Focus:** There is a need for schools prioritising obesity prevention to state their objectives clearly, and measure appropriate outcomes.

- **(2) Coverage:** The coverage of HPS is currently limited: many primary schools are not HPS, there is no equivalent programme running in Secondary schools apart from the limited coverage of AIMHI school programmes, and Kura Kaupapa have effectively been excluded due to a lack of exclusively Maori resources, for example, the School Food Programme is not exclusively in Maori. Similarly, Asian children are being excluded due to a lack of Asian resources and a lack of understanding of issues unique to Asians. For example, Asian children at North Shore HPS have been observed to be reluctant to bring traditional Asian food to school, with school lunches being replaced with less healthy bought food.

- **(3) Communication:** Communication between HPS Facilitators and their HPS/ community PA and nutrition providers was identified as a problem by Facilitators. Facilitators did not have current lists of HPS, their identified health priority needs, or details of programmes/activities being implemented in HPS. Facilitators also lacked a comprehensive overview of the Auckland providers working in childhood PA and nutrition.

- **(4) Sustainability:** School-based activities that run during school time need to be related to the curriculum if they are to receive Ministry of Education support. Teachers are unable to provide ‘extra’ services and often lack competency in nutrition and PA education. Collaboration and communication between community service providers and HPS is often fraught by different objectives and short-term funding/planning goals.
(5) Programme delivery: A comprehensive approach is needed in HPS to inform and involve parents, staff, children, and providers. Where schools have prioritised childhood obesity prevention, nutrition and PA components both need to be included.

HPS staff suggested that ARPHS could market/profile HPS to make other providers aware of the potential role that they could play in HPS. It was also suggested that ARPHS could take a more proactive role in keeping and distributing up-to-date lists of HPS, programmes and providers in HPS, and potential providers that could play a role in HPS. ARPHS could provide nutritional information to schools and their ‘stamp of approval’ for programmes meeting sound nutritional criteria.

**The Pacific Obesity Prevention in Communities (OPIC) Project**

This trial resulted from collaboration between The Wellcome Trust biomedical research charity and the governments of Australia and NZ to tackle preventable diseases in the Asia-Pacific region. Researchers in NZ (Associate Professor Robert Scragg at the University of Auckland) and Australia will look at the effectiveness of a range of interventions to prevent childhood obesity in Fiji, Tonga, NZ, and Australia (252). Funding of £2,350,000 for the OPIC project trial was provided by the Wellcome Trust biomedical research charity, the Australian National Health and Medical Research Council and the NZ Health Research Council. As mentioned previously, this trial begins in Term 2 of 2005 and involves eight Decile 1 or 2 High Schools in Mangere, South Auckland, that have a high proportion of Pacific children. It is a multi-component, randomised-controlled trial involving Years 9 to 12 children, and will run for 30 months. The details of school-based interventions have not yet been released but will incorporate activities from a number of provider groups including: MCC (HPS), the adolescent obesity & diabetes prevention programme mentioned above, Counties Manukau Sport, and 5 Plus a Day. A new curriculum package aimed specifically at obesity prevention that will target Years 9 to 11 and include a component on decreased TV viewing, will also be developed. In addition to the schools-based setting, 26 Pacific churches in Mangere will be targeted by the diet and activity programme developed for Pacific churches by the NHF Pacific Islands Heartbeat Programme.

Outcome measures for school children will include BMI, abdominal circumference, and bio-impedance to measure body fat, individual measures of diet and PA, and audits of the school environment. In addition, the level of church-based activities that might affect the target age group will be assessed and
used to develop a score of church exposure to interventions to rank students. This study was calculated to involve an effective sample size of approximately 1500 students.

**Waitemata DHB Wellbeing Schools’ Project**

The WDHB Wellbeing Action Group grew from WDHB’s involvement in the cardiovascular prevention project for which it receives funding for public health interventions. In 2003, the prevention of childhood obesity was identified as a major aim and the Waitemata Wellbeing Action Group, consisting of various stakeholders (e.g. WDHB coordinator, local Sports Trusts and SPARC, local councils and ARC, NHF, local PHOs, ARPHS public health dietitian, HPS, public health nurses, DPT, and AUT) was developed and organised by the WDHB public health coordinator. From this group, the Wellbeing Schools’ Project was developed which is a proposed collaborative model for schools in the Waitemata district that aims to improve nutrition and physical activity to prevent an increase in the prevalence of obesity. Currently, the groups involved in programme delivery include: Harbour Sport, NHF SFP, HPS, Team Solutions (Auckland College of Education, for teacher education and curriculum support), and the North Shore City Council (for school travel plans and WSB).

A three-tiered approach to interventions is proposed that will allow schools to progress through the different levels as they feel able (this 3-tiered approach is similar to the Tipu Ka Rea three-level model introduced by CMDHB (Kidz First) as a framework for developing HPS in a sustainable fashion (248)). A 2-3 year plan has been proposed that will allow all 172 schools in the Waitemata district to be approached and assisted with at least one Level, with the planning, marketing and recruiting of schools to take place between July 2004 and January 2005. Level 1 involves awareness-raising concerning health issues, wellbeing issues, and available programmes, and school-initiated change. Level 2 involves schools engaging in three main interventions: the NHF’s SFP, the SPARC-led SportsMark programme, and curriculum-based education workshops led by Team Solutions. The SportsMark for schools is a mark of quality in the delivery of sports services to young people. It is about best practice and uses a self-review tool that is based on the principles of the National Junior Sport Policy (253). Level 3 involves programme extensions/innovations and becoming leader schools used as examples for others. In addition, WDHB is looking at an initiative to schools, at principal/school board CEO level, to get schools to agree to remove sweetened carbonated drinks from vending machines. Other initiatives could also be discussed and introduced over time.
There are plans to evaluate the project by AUT or the University of Auckland, although the specific measured outcomes sought are not yet available. Funds are required to cover 3 FTEs (one each for Sports Trusts, Team Solutions, and NHF), marketing, project management, and project evaluation. The Waitemata Wellbeing Action Group identified several problems with service delivery to schools, which it has sought to address through its schools project, as follows: schools want increased coordination between programme providers to schools with a central organiser; schools want PA programmes to be delivered by sports bodies rather than by teachers who are already overstretched; there is a need for one or more dietitians working in health promotion as there are currently none employed by WDHB; despite their health promotion brief, PHOs currently have a patient-oriented approach to health promotion interventions rather than the community or population focus needed for obesity prevention efforts.

**Schools’ Setting: Nutrition Interventions**

**The School Food Programme**
The NHF School Food Programme (SFP) was introduced to NZ primary and secondary schools in 1989. The SFP is a health promotion programme which aims to improve the health of the school community by increasing children’s access to, and knowledge of, healthy foods. Recognition of achievement and motivational support is provided by a four-levelled Heartbeat Award that is awarded to schools meeting criteria in the following areas:

- Providing food choices consistent with the Food and Nutrition Guidelines (254) by ensuring that an appropriate school food and nutrition policy is implemented.
- Promoting/marketing healthy foods to students, staff, parents and caregivers.
- Nutrition education in the classroom using units developed from the ‘Health and Physical Education’ school curriculum.
- Promoting nutrition to the wider school community.

The annual cost of the SFP nationally is $700,000 per annum and is funded largely by the Ministry of Health (MoH).

Although the original SFP design did not incorporate evaluation measures and therefore did not collect baseline data or establish a control group, three outcome evaluations have been undertaken since its
inception, in 1992, 1999, and 2004. The 1992 outcome evaluation showed that participation in the SFP had influenced sales with schools reporting increased sales of low-fat, low-salt, low-sugar items and decreased sales of high-fat, high-sugar, high-salt items (255). A study done in 1999 measured the impact of the SFP on food sales in NZ schools (256). Increasing level of participation in the SFP was found to be significantly associated with a reduction in sales of doughnuts and cream buns (p=0.01), pies and sausage rolls (p=0.009), crisps (p=0.0065) and sweets (p=0.004). Sales of sandwiches and filled rolls increased (p=0.0005). Although this study was limited by the use of self-reported data, results indicated that the SFP was successful in achieving its aim of influencing the school food environment by improving healthy food choices.

The SFP was reviewed and rewritten in 1998 following the identification of a number of key issues, including a lower than expected uptake of the SFP, and limited flexibility within the programme to differentiate between variable effort by schools. A pilot of the modified programme was trialed in 1999-2000, and involved revising the Heartbeat Award criteria to link closely with the achievement objectives outlined in the Physical Education Curriculum, and introducing the four-levelled Heartbeat award system (257). It was externally evaluated in 2000 by Holibar-Fidler (258), with results suggesting that the SFP was fulfilling its aims of improving the school food environment and raising awareness of healthy eating amongst staff and students. Results from the 2004 evaluation will not be available until July 2004. Obesity prevention was not an aim of the SFP and weight-related outcomes have not been measured.

The main problem identified with service delivery has been with obtaining long-term support for the SFP. This was thought to be largely determined by the school principal’s attitude to the programme and the existence of competing needs and priorities within the school.

5+ A Day

Five-Plus A Day is an international programme that began in the USA in 1991 as a partnership between the vegetable and fruit industries and the US Government. It aims to increase the average consumption of fruit and vegetables to at least five or more servings every day (one serving fits in the palm of a hand), with the long-range goal of reducing the incidence of cancer and other chronic diseases by eating at least five servings per day of fruit and vegetables (259). The NZ Children’s Nutrition Survey
showed that 60% of NZ children ate three or more vegetables per day and 40% ate two or more servings of fruit per day (12). Of older children (11-14 years-old), 39% of males and 36% of females ate fruit at least twice a day compared with 46% and 55%, respectively, of younger children (5-6 years-old). Fried hot potato chips were included in ‘vegetables eaten’ and were the most frequent vegetable eaten by 65% of children. As discussed above, there is reason to conclude that fibre-rich diets containing non-starchy vegetables, fruits, whole grains, legumes, and nuts, may be effective in the prevention and treatment of obesity in children (196, 197). In addition, WHO has endorsed 5+ A Day as a tool in the fight against obesity following the International 5+ A Day Conference in 2003 (260). Nevertheless, prevention of obesity is not a primary aim of the 5+ A Day programmes, and children’s BMI or other weight-related outcomes have not been measured.

Interventions for children are targeted at educators in early childhood centres and primary schools, and have been in operation since 1994 in primary schools and 1998 in preschools. Recruitment of schools and preschools usually occurs during an annual week-long campaign which results in approximately 1000 schools enrolling; 1405 preschools enrolled in 2003. Subsequently, a further 100-200 kits per month are requested by schools and preschools. A resource kit is provided to each teacher in enrolled schools which includes nutrition activities that have cross-curricular links, posters, CDs, stickers, and website-based resources (http://www.5aday.co.nz/news/index.html). Resource materials are also being sent to the NHF, Cancer Society, and secondary schools’ food technology educators etc. Further intervention in secondary schools is limited by a lack of familiarity with other parts of the secondary school curriculum that could usefully incorporate the 5+ A Day resource.

Baseline data for 5+ A Day was collected in 1995. This was followed by an evaluation in 1999, conducted by Research International, which showed that the average number of servings eaten per day had increased to 4.4 compared with 3.9 in 1995, with 44% eating 5+ a day compared with 31% in 1995 (261). Subsequently, a telephone survey (of adults only) identified Pacific people as having the lowest intake of fruit and vegetables, followed by Maori (261). It also identified key barriers to eating fresh fruit and vegetables in these groups, viz knowledge concerning the relationships between food and health, and knowledge of the cost, planning, and preparation of fresh foods. More recently, ACNielsen conducted a questionnaire-based survey (8163 respondents) of New Zealand adults’ PA and nutrition
on behalf of the Cancer Society of NZ Inc (262). This showed that the most common perceived barriers to eating fruit and vegetables were the cost of fruit (34%) and vegetables (30%), and the rapid spoilage of fruit (28%) and vegetables (24%). In addition, low fruit and vegetable intake was associated with a greater proportion of obesity (20%) than those with recommended or higher intakes (14%), and a lower proportion of regular activity (35% vs 47%).

Consumer research of school children in 2001 showed that 73% of children had daily fruit or vegetables in their lunchboxes (263). A further external evaluation was done recently to assess the impact of the 5+ A Day campaign on consumer knowledge and behaviour, and results are currently being analysed by Massey University, Albany. Two research projects have also been undertaken by Massey University, Albany: (1) a trial to compare the acceptability and intake of fruit in children from ten primary schools receiving free fruit, with children from ten primary schools not receiving free fruit. The trial was funded by the MoH, with approximately 2000 children from low decile primary schools involved. Results showed a significant increase in fruit intakes in those who received free fruit although the effect of the intervention had disappeared within six weeks of the intervention ceasing (Dr Ashfield-Watt, personal communication). (2) An ongoing study to compare the knowledge and food habits of children in schools which have received 5+ A Day teachers’ resources, with schools which have not received these resources.

Funding for the 5+ A Day programme in NZ comes from the MoH and the fresh fruit and vegetable industry, United Fresh NZ Inc, which owns the 5+ A Day brand in NZ. The programme costs approximately $400,000 per year. Identified gaps in service include a lack of staff for visiting schools and other settings as the 5+ A Day programme consists solely of 1.5 FTEs. In addition, further work with secondary schools is needed to identify opportunities for incorporating the 5+ A Day programme. Public health dietitians have also noted that 5+ A Day does not promote tinned or frozen fruit and vegetables although they are equivalent to fresh fruit and vegetables with respect to nutrition and health benefits (Kate Sladden, personal communication).

**Breakfast in Schools**
Research shows that breakfast is intimately linked with health. It has been shown to improve attention, concentration, and test scores for memory, cognition, and verbal fluency (264-270). In addition,
regular nutritious breakfasts can help control body weight by decreasing dietary fat consumption and
minimising impulsive snacking (271). Studies have also shown that people who consume breakfast are
less likely to have excess body fat, and those who are overweight have been shown to eat less breakfast
than their leaner counterparts (266). Furthermore, the NZ Children’s National Nutrition Survey
showed that children from ethnic groups containing the greatest proportion with lower socioeconomic
status (Maori and Pacific), were also the least likely to eat breakfast at home before school, and the
most likely to be overweight or obese (12).

The NZ Nutrition Foundation (NZNF) has been running a national healthy breakfast in schools
campaign in August every year, since 1997. Targeted primary schools and preschools are supplied
with healthy breakfasts provided by the food industry. Breakfasts are accompanied by a breakfast
resource kit for teachers that links with the schools’ ‘Health and Physical Education’ curriculum. Low-
decile primary schools are selected preferentially although schools are also targeted to achieve good
geographic and population-based spread. Maori and Pacific are also targeted through preschools and
Pacific churches. The programme reaches approximately 6,000 children annually with up to 250
children per school receiving breakfasts. Cost is approximately $200 for 30 children. Programmes in
schools are operated by Public Health nurses, teachers etc; schools provide the required utensils,
community sponsorship sometimes provides extras, and the NZNF organises the programme. This has
often led to schools developing their own breakfast programmes, and Manukau City Council also
operates its own breakfast in schools programme.

Evaluation of the campaign was performed in 2002 by a dietetics student who assessed qualitative
information gained from focus groups involving 34 children aged 6-13 years (272). Results showed
that 70% of participants always ate breakfast, 12% sometimes, and 18% never. However, there was no
baseline data to compare results with. Nor were results directly comparable with those from the
National Children’s Nutrition Survey which measured the proportions of children who usually ate
breakfast (86.2% of males and 79.2% of females) (12). Seventy-one percent of participants reported
changes in their eating habits including having breakfast and choosing cereals in place of left-over
dinner. Barriers to eating breakfast were also assessed. Teachers noted that on the day of breakfasts,
children appeared calmer and there were no reports of hunger. However, it was also reported that
unless families were involved in the programme, it was difficult to change eating habits within families. Industry has also carried out consumer research to look at changes in the sales of breakfast food, and changes in consumer profiles. The effect of the breakfasts in schools programme on weight-related outcomes has not been measured.

The NZNF thought that nutrition in schools could be improved by all schools having a written, enforced food policy, and by involving the food industry as partners in helping to improve the quality and portion sizes of food supplied to school canteens. The NZNF also felt that there was a need for PHOs to be up skilled in imparting nutrition information. Efforts have been made in the past to add a PA component to the breakfast campaign, in the form of WSB, but the food industry have been unwilling to sponsor this initiative. The effectiveness of the breakfast programme is impaired by principals and teachers lacking the confidence/knowledge to teach nutrition, or having uninformed ideas about nutrition that are difficult to change.

The NZNF suggested that ARPHS and MoH could work alongside the food industry to produce healthy nutrition policies for the industry, put healthy nutrition messages in Supermarkets, and produce healthy food messages.

**Nutrition Education in Schools and Home Economics**

The NZ schools’ ‘Health and Physical Education Curriculum’ (HPEC) (273) is compulsory up to and including Year 10, and also provides the basis for senior students’ studies in Home Economics (HE) after Year 10. The curriculum replaced past syllabuses in health, physical education, and home economics. The HPEC covers a wide range of health-related issues, with food and nutrition and physical activity being key areas of learning relevant to obesity prevention, although obesity prevention is not directly targeted as an achievement objective. Most nutrition education in schools is taught in HE, which is usually introduced between Years 6 and 8. There are some related papers such as Food Technology and Hospitality, however these emphasise food production processes and food hygiene/safety, respectively, rather than nutrition. In HE years 11 to 13 there is some leeway given regarding the specifics of what is taught provided that a minimum of 24 credits are obtained from certain defined achievement and unit standards (274, 275) to satisfy NCEA (National Certificate of Educational Achievement) requirements. Only three of the achievement standards are likely to encompass learning
in the area of obesity prevention, one is taught in Year 12 (AS90243: determine and address a nutritional concern for a targeted group), and two in Year 13 (AS90531: explore a current nutritional health issue in NZ; AS90532: examine the nutrient content of food to meet individual needs). However, none of these standards are specific enough to ensure that obesity prevention is taught.

**Schools’ Setting: PA Interventions**

**Jump Rope for Heart**
Jump Rope for Heart (JRFH) is a nationwide, primary school based programme that promotes physical fitness through a range of curriculum-based skipping skills and activities, and has been operating in NZ schools for more than 18 years. At the end of the 10-week JRFH course, fundraising days are held to recover the programme’s running costs and raise funds to assist NHF research projects. JRFH formed a partnership with Pump water in 2003, with the aim of augmenting the programme to reach more children, and providing extra incentives for children to participate in JRFH (276). More recently, training workshops for teachers have been funded, in collaboration with the Todd Foundation, that aim to increase teachers’ understanding, knowledge and confidence in the programme, and its links to the Health and Physical Education Curriculum (277). The programme is to be evaluated in 2004, although weight-related outcomes are not being considered. It costs $400,000-500,000 per annum nationally, and is largely funded by Pump water (owned by Coca Cola). There are two Auckland-based JRFH field officers who promote the programme and fundraise in Auckland schools.

**More Kids, More Active, More Often**
More Kids More Active More Often (MK) is a two year physical activity pilot programme being run by Harbour Sport from 2003-2004. This programme is part of a joint venture between SPARC and the Ministry of Education (MoE) involving four schools in each of four areas: urban and rural Canterbury, Counties Manukau, and North Harbour. SPARC is funding physical activity coordinators from sports trusts in each area to provide PA programmes outside curriculum time, within schools and their communities, with the aim of ensuring that students have more opportunities to become more active, more often. SPARC funding is contingent upon schools having healthy tuck-shop food. The MoE is funding a Southern and Northern physical education and health advisor to guide teachers’ professional development within the Health and Physical Education curriculum. Counties Manukau Sport has one physical activity coordinator (PAC). Harbour Sport also has one PAC who has set up five programmes
for the four North Harbour schools: the sports leaders’ programme, a WSB, the before school jump jam, police bike education, and the community health promotion committee.

The sports leaders’ programme is currently operating one lunchtime per week at St Mary’s and Coatesville Schools, and involves senior children being trained (by the PAC and teachers) to organise and run physical activities for junior students while being supervised by the on duty teacher. Both schools have noted an increase in activity levels in Year 1 and 2 students, especially girls, an increase in leadership ability in older students, and a decrease in playground trouble (278). Two WSB routes have been started at Stanmore Bay School through collaboration between the Rodney District Council Road Safety Coordinator and the Auckland Regional Council (ARC) WSB Coordinator. The Before School Jump Jam is exercise to music choreographed by Brett Fairweather and involves two 20 minute sessions taken by a teacher twice a week. The aim is to have parents or a local leisure centre running it by the end of the year. The Police Bike Education programme aims to encourage bicycle use via a bike safety workshop covering rules, skills, and bike maintenance, and is run by a police education officer. The MK programme will be evaluated using PA-related outcomes rather than weight-related outcomes.

The Community Health Promotions Committee consists of the PAC from Harbour Sport, the school principal and teacher representative, a WDHB board representative, HPS, and a parent representative, and aims to create future sustainable links between schools and their communities in the delivery of PA programmes. Future links with other programmes having similar goals (e.g. NHF’s JRFH and SFP, ARC WSB, HPS etc) are planned, in concert with the WDHB’s Wellbeing schools project, described above. Identified gaps or problems include the following: a need for nutrition education to be linked with PA programmes, a need for primary school specialist physical education teachers, and a need for more research investigating how best to increase children’s activity. Harbour Sport also suggested that ARPHS could have a role in providing an overall view of existing PA/nutrition programmes and strategies in the Auckland region to Regional Sports Trusts.

Pre-Schools’ Setting: Multi-component Interventions

Healthy Heart Award
The Healthy Heart Award (HHA) is a national programme run by the NHF for early childhood centres that encourages and rewards early childhood teachers for promoting healthy food and physical activity
to the under fives and their families. Centres need to satisfy seven criteria in order to receive a healthy heart award:

- Provision of healthy food which involves either sending in guidelines for parents about lunchbox contents or sending in a copy of the menu if the centre has a food service.
- A written nutrition policy.
- A written PA policy.
- Parent/whanau education.
- Professional development.
- PA linked to the Early Childhood Curriculum (279), including documenting the daily PA available to children.
- Curriculum linked nutrition activities including documenting the weekly healthy food activities available to children.

Centres are provided with a HHA pack containing a manual, wall poster and other resources. The outcomes sought relate to fulfilment of the seven criteria listed above, rather than any weight-related outcomes.

A pilot evaluation of the HHA was completed in 2002 (280). Early childhood centres in Wellington who received the HHA pack and an opportunity for staff to attend workshops, were compared with non-intervention early childhood centres, and both groups were surveyed both before and after the six month intervention period. Intervention centres were more likely to have nutrition (p<0.0001) and PA (p<0.0001) policies, lunchbox guidelines (p=0.015), and food menus that cycled between different healthy choices on a periodic basis (p=0.052). Intervention centres were also more likely to involve parents in education sessions (p=0.005) and the children were more likely to have a piece of fruit or vegetable (p=0.0008) and less likely to have salty pre-packaged snack food (p=0.034) in their lunchboxes. The intervention teachers showed increases in nutrition and PA knowledge scores (p=0.029).

The annual cost of the HHA and the SFP is $700,000, with the HHA programme also sharing the two FTE health promotion coordinators in Auckland with the SFP. Gaps in service provision exist in Maori-only speaking early childhood centres, the Kohanga Reo, who will only adopt exclusively Maori
resources, and with a lack of ‘on the ground’ nutrition support for the programme as the NHF coordinators work at a more strategic level.

Pre-Schools’ Setting: Nutrition Interventions

ADHB Services

ADHB provides some nutrition services to pre-schools via ARPHS and the Community Child Health and Disability Service. ARPHS provides some nutrition workshops for early childhood staff, advocacy for more specific nutrition standards for Long-Day care centres, and in 2004 produced a practical food and nutrition manual for preschools (281). Gaps in services identified by ARPHS could be addressed by: an increased number of regional workshops for childcare staff, an advisory service for childcare centre staff that could include menu appraisals, and an advisory service for parents’ groups.

ARPHS has also collaborated with the ARC Botanic Gardens to help South Auckland communities create vegetable and fruit gardens in Pacific early childhood centres (282). The gardening programme began in September 2001, involving Samoan, Tongan, Niuean, Tokelauan, and Cook Island communities. The programme consists of educational workshops with pre-school centres, demonstrations, and an evaluation of the gardens with a prize-giving ceremony. The gardens have proven a practical way of increasing nutritious food choices and providing regular PA. Produce from the gardens has become part of the children’s lunchtime diets and is also circulated to the communities; gardens have also become a useful focus for educational activities such as literacy, numeracy and the sciences.

The Community Child and Disability Service has contracts to deliver Well Child services, health promotion using the HPS concept in preschools, promotional events such as the Well Child week which has a nutrition theme this year, and the refugee contract to assist refugees in accessing health services (see ‘Primary Care’ setting, below). Well Child services, provided by public health nurses, target high needs families from lower socioeconomic groups with problems requiring social support, maternal mental health services, help with domestic violence etc, all of which have an impact on childhood nutrition. Well Child services also promote breastfeeding for a minimum of nine months, provide good childhood nutrition advice for pre-schoolers, and monitor height, weight and risk factors for diabetes. Gaps in service provision exist as a result of targeting high-need families only and, in
addition, most problems with overweight begin at the time monitoring stops i.e. around school age. Ongoing monitoring could occur at strategic times.

Public health promotion with pre-schools follows the HPS framework that encourages centres to identify and prioritise their health needs. Two preschools to date have identified nutrition as a priority, and they have received nutrition education, developed their own vegetable garden, and utilised resources from NHF, Sanitarium, and 5+ A Day to provide demonstrations of healthy meals. However, gaps in this service exist as the health promotion team only target high needs pre-schools, and nutrition/PA interventions are only introduced if these problems are identified as a priority area.

In addition, the ADHB early childhood health team are currently looking at developing a Food With Attitude (FWA) resource for pre-schools (see below). This is a treatment rather than a prevention resource for overweight and obese children that involves one-on-one interaction between child, family, and nutrition educator, with PA input from Sport Auckland. Children are referred via their GPs, school nurses etc. There are also plans to work with the MoE to develop the Early Childhood Curriculum to reinforce nutrition, PA and other messages.

**Family Setting: Multi-component Interventions**

‘Food With Attitude’ and ‘Young and Active’

FWA is an evidence-based, overweight and obesity treatment programme for 5-12 year-olds that has been developed and run over the past five years by ADHB’s Community Child Health and Disability Service. While this is not an obesity prevention programme *per se*, its family focus may have positive effects on other family members in preventing or reducing weight gain, although to date the weight of other family members has not been recorded. FWA involves a multidisciplinary team (Public Health Nurse, Dietitian, Maori/Pacific Community Health workers, and a Medical Officer) who educate and provide long-term support for the children and their families using a ‘stages of change model’ and appropriate cultural assistance. Although it is acknowledged that attempting to change individual behaviour to prevent weight gain is generally ineffective, the literature of psychological and behaviour change models suggests that a multifaceted approach based on ‘stages of change’, and with good social support, is more effective than one-off educational sessions (283).
Children are referred to FWA by GPs/specialists, teachers, school public health nurses, family or self-referral. FWA is a year-long programme that involves monthly visits to the child at school or the home following an initial visit to the child and his family by a Public Health nurse and Dietitian. The family sign a contract to give their child lots of encouragement and help with healthy living, eating, and exercise. In addition, written information and advice are given, goals are reviewed and set monthly, a food diary is completed, and participants weight and height are measured at baseline followed by three-monthly. Success is measured by changes in behaviour, self-esteem, improvement in health risk, achievement of individual goals set according to stage of change (e.g. activity levels, TV watching, cooking methods, frequency of takeaways etc), and “growing into their weight”. After 12 months, a certificate of completion is awarded.

The FWA programme was evaluated in 2003 using questionnaires and data gathered from existing medical records, for 22 children and 22 family members (284). However, the small sample size and incomplete medical record data made it impossible to conclude causal relationships between FWA and measured changes, although improvements in shortness of breath, sports participation, and confidence levels may be occurring. Although Public Health Nurses reported that 40.9% of children had reduced their BMI, analysis of all medical records (n=39) for children enrolled in FWA showed that 28.2% of children had increased their BMI, 25.6% decreased, and 35.9% had only one record of BMI. Public Health Nurses also reported an increase in children’s self-confidence (54.5%) and PA (72.7%), and an improved diet (68.2%), although changes to BMI did not relate to any of these measures. However, a relationship was found between family members who had increased their PA and made positive dietary changes, and a decrease in their children’s BMI. This supports the view that whole-family participation is a key to programme effectiveness.

Identified gaps/problems with the programme included the following, and were identified in the latest evaluation:

- Poor medical record keeping for BMI as well as other physical indicators i.e. blood pressure, pulse rate, blood tests, snoring, sleep apnoea, shortness of breath on exertion, muscular pain, and flexibility.
• FWA needs the flexibility to devote the time to families that is needed for them to develop and maintain a significant level of commitment to FWA. Family commitment is perceived as being central to the programme’s effectiveness.

• FWA providers need more time to devote to their role within FWA that is not eroded by the other roles required of them, with a particular need for more Dietitian and Maori/Pacific-appropriate input.

As a conjunct to FWA, Sport Auckland has been funded by SPARC to work with FWA children and their families to develop appropriate exercise activities (Young & Active programme). However, not all children are identified as being ready to participate in Young & Active (YAA), and some do not have increasing PA as an individual goal. Those with PA goals are referred on to YAA via a green prescription and the family are subsequently visited in their home by the activity advisor, assessed, and started on an individual PA programme. YAA also hold weekly group activity sessions for the children and their families. During the first month children receive three home visits followed by monthly individual visits, and then bimonthly visits after six months with a total of one year on the programme. The activity advisor monitors children’s level of activity, level of sedentary behaviour, participation in community activity, cardiovascular fitness, strength, flexibility, and child/family attendance and involvement/application to goal setting.

Identified gaps/problems with the programme/services included the following:

• YAA has not evaluated any of the data collected due to lack of resources for evaluation, and suggested that it should be evaluated in combination with FWA.

• There is no committed funding of salaries for YAA workers.

• Sport Auckland sees a need to extend the YAA programme to overweight/obese children who are not on the FWA programme, and to children who are not overweight or obese.

• Harbour Sport have developed a PA manual (Action Kids) (285) to fit with the Health and Physical Education curriculum, but because there are no physical education specialists in primary schools, have delivered the programme to three schools themselves.

• Parents/caregivers often need more support from YAA, FWA, and from community sports and PA groups to help them to take responsibility for family PA and nutrition.
• There is a need to work with local/regional councils and involve communities in initiating environmental changes that support PA.

In addition, FWA suggested that ARPHS could keep track of existing PA/nutrition programmes, strategies, and research in the Auckland region.

**Kids in Action**

Kids in Action (KIA) is a family-based childhood obesity treatment programme that started in February 2003. It targets children and youth, especially Pacific people, who are clinically obese and hence are at high risk of diabetes and other chronic illnesses. Currently, there are no other childhood obesity treatment services in the CMDHB area (286). This programme was included because, like FWA, its family-based setting could possibly have a role in preventing other family members from becoming overweight/obese. Referrals are received from schools and primary/secondary care providers. The programme involves a paediatrician from Kidz First, a nurse and dietitian from South Seas Health Care, and exercise instructors who work with the children and their families. The programme involves:

• paediatrician assessments,
• dietary assessments and nutritional advice,
• a weekly exercise session, home visits from a nurse or other community health worker,
• family group conferences to develop strategies for families to create healthy environments and continue PA and healthy lifestyle upon exit from the programme,
• health promotion resources and information for families and children including nutrition information, PA messages, and
• links to other support services.

Children set goals for themselves (e.g. to walk to school and maintain their weight) and achievements are acknowledged with prizegivings. Clinical records are maintained including BMI. In 2003, an internal evaluation of data showed that 70% of 71 children had lost or maintained their weight, while 42% had lost weight. Twenty-five percent of children in KIA had medical comorbidities.

Problems identified with the programme included the following:

• Lack of resources require that effort be focused on motivated children and families as less motivated people require excessive resources for little or no positive outcome.
• When the programme is stopped during school holidays the children always gain weight suggesting that more time with families is required to develop exercise and healthy eating practices that have the flexibility to continue at all times.

• The paediatrician seeing KIA children received no funding for her role.

• There is a need to develop PA sessions that are suitable for the very obese children.

• Public health measures need to be oriented towards the family with more research required to see how families actually live and how this impacts on lifestyle. For example, 30% of the children are from single families with many adolescents eating irregularly and most not eating breakfast (12) due to a lack of time or food in the house or because they feel sick and not hungry. Many eat pies on the way to school and also have energy-dense, low nutrient foods for lunch such as sausage rolls and soft drinks (Dr Teuila Percival, personal communication).

Recently, KIA received funding from CMDHB to provide services to 70 children per year, at a total annual cost of $130,000.

It was suggested that ARPHS could have a role in holding small group seminars on nutrition, reading and understanding food nutrition labels, and how to select and prepare low-cost, nutritious food.

Primary Care Setting: Multi-component Interventions

Primary Health Organizations (PHOs)
Health promotion is a key component of the Primary Health Care Strategy (287) and all PHOs are required to develop and implement health promotion plans, although differences in PHO size cause great variability in resources, public health skills, and technical advice available to individual PHOs.

An initiative is currently underway between ARPHS and the Auckland DHBs which aims to link PHOs with key stakeholders in school health programmes, and other health settings, to promote the development of PHO health promotion plans. A meeting was held in January 2004 at CMDHB which looked at how PHOs in the Auckland region might develop health promotion plans for schools. At this meeting, secondary schools were identified as being desperate for health services partly because they have no dedicated funding for school nurses, the exception being the AIMHI schools mentioned above, which have MoH funding for a school nurse. Another current problem was the separation of health promotion from the school health curriculum, which could be addressed by PHOs and other school
health providers by working with Team Solutions to integrate health promotion into the school Health and Physical Education Curriculum.

PHOs also felt constrained from approaching schools with health promotion programmes due to a lack of knowledge of what programmes are currently in place in schools, or available to schools, and uncertainty regarding how best to approach schools. PHO’s also thought that the MoH/DHBs should perform a needs’ assessment of schools to find out what programmes schools required, the cost, people and other resources needed etc. PHOs did not think it appropriate to conduct this exercise individually due to a lack of funding confidence and not wanting to get into a ‘one PHO per school’ situation. In summary, PHOs did not want to provide health promotion programmes to schools unless they were properly costed, coordinated, and sustainable.

Secondary schools were felt to be too individualistic to embrace the HPS directive, instead preferring the more consultative approach operating in AIMHI schools, and it was suggested that PHOs might therefore find AIMHI schools an appropriate starting-point for designing and implementing HP plans. To date, no PHO health promotion plans, let alone plans in the arena of childhood obesity prevention, have been made in collaboration with schools. The following is a list of PHOs in the Auckland region and plans/programmes that they have in the arena of childhood obesity prevention.

**ADHB**

*Auckland PHO Ltd*

No obesity prevention projects.

*AuckPac PHO*

No obesity prevention programmes targeting children. AuckPac is collaborating with HealthStar Pacific and Procare to increase AuckPac members access to their PA programmes (e.g. Procare’s green prescription project and Health Star’s PA programmes), although these programmes mainly target adults.

**Primary Health Network for Auckland**

- Modified Green Prescription Project: the ProCare Network for Auckland is planning to extend the Green Prescription Programme whereby GPs recommend PA to high needs patients who
are then supported by workforce from the regional sports trusts. Procare plans to develop this idea further so that healthcare professionals can prescribe exercise to high need patients knowing that suitable and accessible programmes will be available (288). A pilot programme is currently running in Glen Innes, and similar multi-faceted community-wide campaigns have proven to be effective in getting people to be more physically active (289). The programme is aimed at adults, with modification and delivery to children and youth being considered for the future. The primary aim of the programme is to increase PA, with obesity prevention and weight reduction listed as secondary aims. Secondary outcome measures will include monthly BMI and waist-hip ratio, and bi-monthly blood pressure. There are current proposals to introduce the modified green prescription project into the Mt Roskill, Manurewa, and Clendon areas (288, 290).

**Tamaki Healthcare**

No obesity prevention programmes established currently.

**Tikapa Moana PHO**

Tikapo Moana PHO was only recently established on Waiheke Island (April, 2004), and has no health promotion programmes established.

**Tongan Health Society**

No known childhood obesity prevention programmes.

**CMDHB**

**East Health**

East Health delivers well-child checks, supports the NHF’s school food programme, children’s WSB, and collaborates with schools to improve PA through the health and physical education curriculum.

**Mangere Community Health Trust**

The Mangere Community Health Trust focuses on smoking cessation and has no childhood obesity prevention programmes.

**People’s Health Trust**

People’s Health Trust is a small PHO that only deals with childhood obesity treatment on an individual basis through children attending GP practices. Perceived barriers to healthy weight include: parental
denial of obesity as a problem (PHO population consists of Maori 45%, Iraqi 35%, and European 20%), and a general lack of school PA programmes for children who don’t do competitive sport.

**Primary Health Network for Manukau**

See Primary Health Network (Procare) for Auckland above.

**TaPasefika**

TaPasifika is a PHO targeted at Pacific people and consists of three clinical providers throughout Auckland (South Seas Health Care, Pasifika Healthcare, and Health Pacifica Ltd) and one health promotion provider, Health Star Pacific. There are currently three programmes for children that may have a role in obesity prevention, as below:

- **KIA Programme**: KIA is discussed above under ‘family setting’. As mentioned, it is run by South Seas Health Care.
- **School breakfast programme**: Health Pacifica is involved in providing sponsored breakfasts to some high-needs schools.
- **Pre-school programmes**: TaPasifika is involved in delivery of the well-child programme to Pacific pre-schools. Pasifika Healthcare is also involved in advocacy for pre-school nutrition policies, a pre-school dance to music programme four nights a week for 3 to 5 year-olds, and also runs a gardening programme with pre-schools where children get to look after their own plant. This is being extended to show parents how to cook and prepare garden produce, using the Pacific Fair this year as a medium to demonstrate produce preparation.

Barriers to good nutrition identified by TaPasifika staff included:

- The traditional Pacific view that weight is a sign of wealth and therefore desirable.
- Parents lack of knowledge of NZ produce and how to prepare and store it.
- Parents lack of understanding of the link between food and the physical/mental health of the body.
- Key school staff (Principal, nurse etc) often failing to appreciate the importance of establishing a healthy school environment.

**Te Kupenga o Hoturoa**

Currently, has smoking related health promotion plans only.

**Total Healthcare Otara**
Total Healthcare Otara has no childhood obesity prevention programmes, although it is currently piloting a PA programme (the Getting Started Programme) run from the Otara Leisure Centre that targets the adult population and includes nutrition and healthy lifestyle education. The PHO organises a well child party during well child week with participation from various providers including leisure and PA programme providers and public health nutritionists, and has future plans to support the DPT’s ‘Adolescent obesity & diabetes prevention programme’.

**WDHB**

**Coast to Coast**

No known childhood obesity prevention programmes.

**HealthWEST**

No specific childhood obesity prevention programmes.

- GPs from the PHO support the Push-Play campaign every year. This is a SPARC-led campaign promoting the message of 30 minutes of moderate-intensity PA on most days of the week (291).

- A youth clinic once a week and several school-based health clinics are currently in operation and occasionally deal with overweight or obese children.

- HealthWEST has contracted a dietitian for GP referrals who offers a service similar to FWA. However, there is no funded FWA programme available in WDHB, and therefore children’s families must pay for public health nurse and dietitian visits. Other barriers to good nutrition and achieving a healthy weight that have been noted by the HealthWEST dietitian include: poor participation by parent(s) who work or are solo, inadequate parenting skills resulting in poorly disciplined children, children given regular access to money for food, dysfunctional families, and overweight/obese parents. These problems highlight the need for a multidisciplinary team in the treatment and prevention of obesity, namely, a paediatrician, dietitian, physical education teacher, public health nurse (to visit children in schools so that parental availability does not become a limiting factor), and a psychologist (to help with parenting skills and dysfunctional families).

**North Harbour**
- Social Workers in Schools Programme: North Harbour proposes that social workers be placed in five schools on the North Shore (4 x primary, 1x intermediate) to address children’s health issues in concert with other local health providers. The programme plans to begin in July 2004.

- Child/Rangitahi Health: this programme aims to link in with the social workers programme, with social workers identifying health issues of importance to children, such as oral health and obesity, and offering parents information about available services. There are plans to develop a nutrition programme using the FWA framework that overweight/obese children could be referred to by utilising the dietitian services currently offered by North Harbour PHO. As with FWA, outcome measures will include change in BMI, and also changes in social behaviour. The combined cost of the social workers, dietitian and FWA programmes is estimated at approximately $200,000.

- Move for Health “Hikoi mo te Oranga”: this is a PA programme that runs one day a week at the Birkenhead Leisure Centre, but is aimed at all community members with no particular focus on children or youth.

**Procare Network North**

See Primary Health Network (Procare) for Auckland above.

**Waiora Healthcare Trust**

Waitakere Union Health Centre and Wai Health make up the Waiora Health Care Trust PHO with an enrolled population of around 10,409 people. It provides free well-child checks but no specific obesity prevention programmes for children (see ‘Te Whanau O Waipereura Trust’ below).

**The Centre for Youth Health**

The Centre for Youth Health (CFYH) was established in 1996 by South Auckland Health and supported by the University of Auckland. It aims to promote the well being and healthy development of young people in the context of their family/whanau and wider environment by the provision of the following services:

- Clinical services for youth with chronic, complex health issues. Obesity prevention/treatment is usually dealt with in the context of the prevention/treatment of other health problems such as diabetes mellitus, polycystic ovarian syndrome, and asthma etc.
• Assistance to other youth health providers. Evidence-based advice on how best to develop effective school- or family-based services for young people is provided in the form of workshops, seminars, or individual consultation. Advice covers issues such as service access, workforce structure, an understanding of the health promotion/ risk reduction philosophies underlying best-practice, how clinical personnel can best work effectively with youth etc.

• Education and training opportunities for tertiary students in youth health or related services.

• The Kidz First Resource and Information Service provides child and youth health information to planners, purchasers, providers, communities, young people and their families.

• Research on a range of relevant adolescent health studies in collaboration with other researchers.

• Advocacy for policy, planning and legislation that addresses the healthy development and well being of youth.

Although none of the above services include any specific childhood obesity prevention programmes, many of these services are important in reducing childhood obesity. For example, assistance to health providers is valuable for providers setting up obesity prevention services for youth; advocacy for policy is important for population-based obesity prevention in children, for example, policy regarding the school food and PA environment, and the advertisement of obesogenic foods to children; and research on youth behaviours provides a vital foundation for effectively addressing youth issues. For example, the Youth2000 survey provides a comprehensive population-based study of youth health problems, concerns, and risk factors, including patterns of PA and attitudes to body weight (18).

**Children and Young People’s Diabetes Prevention and Management Project (CYPDPMP)**  
The planning for this ADHB project began in 2003 from a joint partnership between Starship Child Health Services, Community Child Health and Disability Services, Tamaki Health PHO, and Pacific Health, and originated from two separate proposals: ‘Management of Childhood Obesity’ submitted by Child Health and Disability Services, and ‘Diabetes Outreach Services’ submitted by Starship Children’s Health. These proposals recognised that increasing obesity, reduced healthy lifestyles, and a lack of service coordination are leading to an inability to respond effectively to increasing diabetes, with a need to change focus to partnership and prevention management to meet the increasing childhood diabetes demands on services (292). The incidence of diabetes in Auckland’s children and young people is increasing rapidly with the annual incidence of Type I diabetes increasing by 10%, as
it has done for the last ten years, and the annual incidence of Type 2 diabetes growing by 25% annually (292). Over the next two years the number of children (<16 years of age) in Auckland with diabetes will increase from approximately 380 children to >500 children, with greatest increases in Maori, Pacific, and Asian children (292). Key drivers for this increase are increasing obesity in children and young people and reduced healthy lifestyles especially nutrition.

The CYPDMP aims to provide a management model for diabetes and obesity prevention and care for children and young people within a community framework using a population-based approach. One of the project’s four main objectives is to strengthen and develop agencies including NGOs (Non-Governmental Organisations) and PHOs locally with the capacity to undertake obesity prevention and management activities as outlined in the MoH’s Healthy-Eating-Healthy Action implementation plan (293). The project has three distinct, interlinking components, one of which involves promoting healthy lifestyles through the following interventions:

- Creating a database of current educational and health promotion materials on nutrition, obesity, and diabetes established and maintained, and made available to GPs.
- Training of primary care providers in the use of health promotion materials.
- Training of health workers, school teachers, and community leaders in diabetes and obesity prevention and management.
- Collaboration with/mobilisation of agencies such as PHOs, community groups, schools, ACC (Auckland City Council), Sports Auckland, and the private sector, to work in obesity prevention and management. Currently, there are plans to collaborate with NHF, FWA, HPS, AIMHI schools, well child providers, HealthWEST PHO, and ARPHS (Wendy Cook, personal communication).
- Establishment of an 0800 line for obesity prevention and management.
- Supporting community-based research programmes in the Auckland region.
- Supporting priority groups that promote healthy community environments for obesity prevention and management.

Specific outcome measures have not yet been stated, although results from the FWA programme will continue to be monitored, and hospital admission/length of stay data will be available for children with
diabetes and obesity-related diseases. Strategies for monitoring obesity per se have not yet been specified, except as mentioned above for the FWA programme. The project will be evaluated at inception (April 2004, April 2005), implementation (April 2006), and then six monthly to the Project Steering Committee and annually to ADHB standards. After 20-22 months an external review by an overseas expert (Paediatric Endocrinologist) will evaluate the performance of the diabetes and obesity prevention and management project. Currently, the cost of the project is approximately $700,000 annually.

**Maori Provider Setting: Multi-component Interventions**

**Te Hotu Manawa Maori**

Te Hotu Manawa Maori (THMM) is national health promotion organisation with the aim of reducing the likelihood of cardiovascular disease and death amongst Maori. It has three priority areas, two concerned with smoking and one with improving Maori health and well being through better nutrition and regular PA. Interventions related to THMM’s four nutrition and PA objectives are as follows:

- Increasing the knowledge and health promotion skills of Maori community workers with a Train-the-trainer course. This is a 15-day course that is run three times a year in different parts of NZ. Currently, this workshop is being provided by Te Whanau O Waipareira Trust in the Auckland region (see below). An annual two-day hui is held for those who have completed the course that provides updates on new resources, programmes, research and information in nutrition and PA.

- Developing and disseminating nutrition and PA education resources including posters, pamphlets, booklets (such as their recipe booklet) (294), and newsletters (295). THMM is also developing and adapting the NHF’s Healthy Heart Award for Maori. In addition, there is a need for adapting the SFP for Kura Kaupapa, of which there are 50 throughout the country.

- Facilitating networking opportunities and disseminating information through the THMM website (296), hui, and responses to individual requests.

- Performing an advisory and advocacy role, by advising on research projects, resource development, and proposals on issues affecting Maori, and advocating for Maori nutrition and PA issues at national level with the Obesity Action Coalition (OAC).

THMM’s Train-the-trainer course was evaluated externally four years ago by the Maori Unit at Auckland University, although the course has changed considerably since that time.
**Hapai Te Hauora Tapui Ltd**

Hapai Te Hauora Tapui Ltd (HTHT) is the MoH-funded, Auckland, Maori public health organisation that is involved in funding and overseeing the coordination, planning and workforce development of its four subregional providers. Each provider takes responsibility for leading in one area of public health. Of the four providers, Te Whanau O Waipareira Trust takes the lead role in PA and nutrition with Tuakau Homebuilders and Raukora having lesser roles. The public health issues addressed by each provider were determined by a combination of existing provider skills and community-identified priority issues. HTHT also provides support to HPS coordinators by providing advice on how best to work with the Maori community, using the Maori Ora Mauri Ora community development model (297). This model was initially developed in 2000 by HTHT as a mental health resource and is based on Maori Tikanga, Maori imagery to promote positive hauora concepts, and inclusion of the tangible and intangible worlds.

Gaps in service and barriers to healthy nutrition and exercise identified by HTHT include the following:

- There is a need to increase the workforce skill base particularly in the area of good nutrition.
- There is a need for providers to work within a wider range of settings e.g. schools, families, and food retailers.
- Healthy food is perceived to be more expensive.
- Environmental change, not gyms, is the answer for Maori e.g. cycle lanes, paths, pedestrian crossings and other features of urban design that encourage PA.

**Te Whanau O Waipareira Trust**

Wai Health, the health branch of Te Whanau O Waipareira Trust based in Henderson, is one of the largest providers of health services to Maori in New Zealand. These services include clinical, public health, and child care services (298). Child care services provide regular well child checks to kohanga reo, kura kaupapa and whakekura, and a child health service for tamariki aged 1 month to 5 years that includes home visiting, milestone checks and regular visits, education etc. Child care services also provide a Parents As First Teachers programme that involves visits from a personal educator, for families with 0-3 year-old children, who encourages parents to stimulate their child and encourage positive learning outcomes from birth. This could include advice about nutrition.
Public health services offer the ‘Kai and Nutrition’ training certificate, based on the Train-the-trainer course delivered by THMM, which is an AUT accredited course offered to people working in hauora from local marae, kohanga reo, churches, sports groups, kai mahi and health promoters, but includes anyone keen to learn about nutrition. In addition, Waipareira are organising the annual national nutrition hui 2004 for course graduates and kai mahi who work in nutrition and PA. Wai Health also offer healthy nutrition displays and promotions to community groups such as kura kaupapa, kohanga reo, churches, and young mothers groups. In the PA arena, daily PA programmes are offered, including touch running, netball, and the youth transition programme aimed at youth. The youth transition programme targets 12-18 year-olds and includes rap, break-dancing, and tagging/bombing (mural painting). Children and youth with weight problems are linked with Wai Health’s nutritionist or dietitian (visits from AUT once a week) and given healthy lifestyle and kai advice.

Wai Health also offers a free clinical service to children <18 years and operates a weekly mobile clinic to schools, kohanga reo, kura kaupapa, and caravan park locations in West Auckland. Waipareira Trust also runs a bilingual Te Rito early childhood centre with a focus on health.

Gaps in, and barriers to, services identified include the following:

- A greater need to reach and educate parents and families about healthy lifestyles.
- Conflicting health messages given by the health community are causing confusion, with a need for greater collaboration and alignment within the health community.
- There is a need for all-Maori resources for children within the exclusively Maori education system (Kohanga Reo etc.).

**Tuakau Homebuilders**

Tuakau Homebuilders (TH) is preparing to deliver a PA and nutrition programme to children and in June aims to start a nutrition programme for overweight/obese children. Preparations have included sending two members of TH to the Train-the-trainer course being run by Waipareira Trust, and introducing a PA programme for their own overweight workforce to avoid the irony/hypocrisy of having weight-loss messages being delivered by a significantly overweight workforce. Details of funding and specific outcome measures were not available.
Raukura Hauora O Tainui
Raukura Hauora (RH) in South Auckland provides a smoking cessation programme targeted at young Maori mothers, PA programmes, and more recently, a rangitahi (youth) nutrition programme. Currently, RH’s smoking cessation programme does not incorporate nutrition advice to help mothers replacing smoking with food to maintain a healthy lifestyle. PA programmes are aimed at all ages, with the waka ama programme particularly targeting children and youth. There are plans to incorporate nutrition advice into this programme although to date there have been no dietitians or nutritionists employed to provide this service. At present, the rangitahi nutrition programme targets intermediate and secondary school children and consists of a one hour education session.

Gaps/problems identified with providing PA and nutrition services to children are as follows:

- No nutritionist or dietitian available to provide advice to young Maori mothers ceasing smoking, to complement the waka ama programme, or to extend the rangitahi nutrition programme.
- Links between health providers in the areas of PA and nutrition are needed to provide a coordinated and comprehensive service.

Aotearoa Maori Netball Oranga Healthy Lifestyle Trust Inc.
Aotearoa Maori Netball (AMN) began as the Maori Women’s Welfare League in 1987 and was registered as a Constituted Charitable Trust in 1996. AMN uses netball for Maori women and girls as a vehicle to promote awareness of issues such as healthy nutrition, weight control, regular moderate exercise, and smoking cessation, using the overall Maori concept of Oranga (total well being). The Healthy Lifestyles Programme is delivered through annual national netball tournaments in one of the eleven regions in NZ, netball training live-ins that include the presentation of nutrition and PA information, occasional health promotion workshops/hui, blood pressure and diabetes screening clinics at tournaments, and the promotion of healthy nutrition at tournaments and team practices. Public health funding is provided by the MoH. This programme was evaluated in 2002 as part of an evaluation of the MoH’s nutrition and PA contracts in the northern region (299). Gaps in services included a lack of good nutritional information, including information on fad diets, presented in a culturally appropriate way, and funding for netball training camps. Perceived barriers to good nutrition included the affordability of fruit and vegetables, the relative convenience of fast foods, and poor budgeting skills in low-income families.
Pacific Islands Heartbeat

Pacific Islands Heartbeat (PIH) is the division of NHF devoted to the health of Pacific people. PIH provide the following services:

- A Train-the-trainer certificate in Pacific nutrition through AUT that runs twice a year.
- The Healthy Heart Award programme for Pacific early childhood centres.
- Nutrition pamphlets in a range of Pacific languages, nutrition videos, and newsletters (300).
- A fat kit visually demonstrating the fat content in popular Pacific foods used during educational sessions.
- Advocacy, media commentary.
- The Heartbeat Pacific Lifestyle Project was piloted in 2000 and aimed to encourage and empower the Pacific church community to promote and practise healthy lifestyles. Specifically, it aimed to reduce cardiovascular disease, diabetes and high blood pressure among Pacific people. The pilot programme involved training members of two Samoan churches in Auckland in healthy nutrition, PA, and lifestyle. Churches then signed up to deliver a PA session once a week and 10 group sessions a year on nutrition, PA, and smoking cessation. An evaluation of the programme pilot, based on data from very few families from each of the churches, showed that some changes in behaviour were reported with families eating fewer takeaways, less fat, smaller portions, more fruit and vegetables etc, with these changes extending to church-catered functions involving food (301). Families also reported doing more exercise. Baseline BMI measurements revealed that >70% of participants were obese and >20% overweight in one church, while >60% were obese and >30% overweight in the second church. These measurements did not improve, in the small sample evaluated, over time. The evaluation concluded that the church programme was appropriate for the Samoan church setting and that it had a positive impact on various aspects of family lifestyle although this was not reflected in the small amount of BMI data evaluated. The main problems identified included difficulty sustaining commitment among church programme leaders, and variable skills and resources between churches.
A more comprehensive study of adult BMI change over one year, compared the two pilot church participants (n=365) with participants from a non-intervention control church (n=106) (302). Baseline BMI for the intervention and control churches was (mean+/−s.e.) 34.8+/−0.4 and 34.3+/−0.9 kg/m², respectively. The intervention churches lost an average of 0.4+/−0.3 kg compared to a 1.3+/−0.6 kg weight gain in the control church (p=0.039, adjusted for confounders). The number of people who were vigorously active increased by 10% in the intervention churches compared to a 5% decline in the control church (p=0.007). Nutrition education had little apparent impact on knowledge or behaviour.

Other studies have revealed that there is an excess prevalence of obesity amongst church communities (303-305), and that church-based weight-loss interventions are effective (305-307). There is no literature showing how church-based interventions affect children’s BMI, although this will be researched as part of the Pacific Obesity Prevention in Communities Study, described above.

Other gaps identified in obesity prevention services included: lack of a comprehensive list of providers of childhood nutrition/PA programmes, and lack of consistent nutrition advice from health providers although all advice should fit with the NZ Food Nutrition Guidelines (254). Barriers identified to good childhood nutrition and PA included: poor Pacific parental involvement in their children’s nutrition and PA, partly due to the demands of work and a lack of involvement in the school community due to cultural and language barriers. There is also a lack of available and financially accessible resources for PA, for example free swimming pools. It was suggested that ARPHS could have a role in providing nutrition education, advice, and resources; advocating for change at a policy level (for example, by advocating for nationwide healthy school food policies); and providing links and coordination between childhood nutrition/PA services.

**Moto’otua Ltd**
Moto’otua Ltd is based in Otara and provides PA programmes to Pacific people. Currently they have no PA programmes aimed at children, although they are proposing to run a programme for morbidly obese adult Pacific people and Maori through Bruster’s recreation centre.
Community Setting: Physical Activity Interventions

In this section, community services discussed include activities and programmes provided by councils, regional sports trusts, ARPHS, and advocacy groups.

Councillors in Auckland:

Councillors in Auckland provide a variety of facilities and services that promote PA in the whole community. Auckland councils provide a number of recreational facilities such as swimming pools, recreational centres, and YMCAs. Facilities also offer a number of children’s PA programmes through CLM (Community Leisure Management) for preschoolers and primary-school age children including swimming, gym, holiday programmes, the Fit Kidz after-school gym programme for children aged 5-12 years of age, and the OSCAR (Out of School Care & Recreation) after-school programmes (308). Walking Schools Buses is a nation-wide programme aimed at school children that is supported by most Auckland councils and is discussed below. Programmes supplied by MCC and Waitakere City Council (WCC) are also discussed in more detail below.

MCC

MCC helps provide services to the eleven HPS in Manukau City including support for the following: an annual mini Olympics, school garden projects, student health team training in nutrition and how to hold meetings etc, the NHF’s SFP, and teacher training in the NHF’s JRFH, with plans to provide some physical education resources to schools (309, 310). In addition, as part of its role in the WHO ‘Healthy Cities’ project (311), MCC coordinates a Food in Schools (FIS) programme, and has developed a collaborative plan of action to reduce child poverty (312). The FIS programme provides healthy lunches and breakfasts to 40 schools (1355 children), including Kohanga Reo and early education centres, in Manukau. Resources and funding are provided by MCC and several sponsors, including members of the food industry.

Tomorrow’s Manukau, MCC’s strategy for the future of Manukau City from 2001-2010, lists improving health (including a CMDHB strategy to improve child health and reduce the level of obesity, and an objective to support groups delivering healthy lifestyles and active transport) and fitness (by promoting programmes that encourage more PA) as goals for obtaining a healthy and economically secure population (313) and has subsequently produced a health policy and action plan to support these goals (314). This is particularly important for the Counties Manukau population given that the
The proportion of physically active boys and girls in this region (62% and 55% respectively) is less than for boys and girls throughout NZ (73% and 64% respectively) (315).

**WCC**
WCC has made a concerted effort to provide services, programmes, and activities more suited to children and youth in recognition of the fact that 33% of Waitakere City’s population is under 20 years of age. WCC’s secondary schools youth council is seen as a practicable means of involving young people in decision making by allowing a two-way exchange for student concerns and council issues affecting youth (316). This has contributed to the formation of strong youth targeted programmes such as the following (317):

- **Time Out** – cheerleading, indoor sports, graffiti art etc for 12-18 year-olds.
- **Street Sports** – sports and activities for 11-18 year-olds.
- **Raise up ‘n’ Represent** – provides a safe socialising environment for encouraging and supporting personal growth, physical fitness, leadership skills, and self-respect. Includes basketball, hip hop, break dancing, phat, and skate-ramping for 13-18 year-olds.
- **Youth Fitness** – at the Massey Leisure Centre for ≥14 year-olds.
- **Ranui Youth Group** – PA programmes.
- **McLauren Park Youth Group** – discos, sport days, leadership training etc.
- **YMCA Basketball League**.

**Walking School Buses (WSB)**
In March 2000, ‘Zippy’s Walking Bus’ was launched at Gladstone School, becoming the first of its kind in the Auckland area (318). Its success prompted Infrastructure Auckland to review the programme. They concluded that it helped reduced city traffic congestion and subsequently made $1500 grants available through Road Safe Auckland for schools that adopted the system and maintained the WSB for a year. The WSB concept is promoted by Road Safety Coordinators at most of Auckland’s councils who encourage local schools to become involved, and in September 2002, the Auckland Regional Council (ARC) created a new role for a WSB Coordinator to organise and oversee the region’s efforts.

The WSB involves groups of children walking to and from school under adult supervision (usually two parents with one acting as a front driver and one a back conductor) along a set route complete with
stops that allow children to embark and disembark. A recent survey has shown that 40% of children in Auckland are driven to school (319), with a world-wide trend for declining levels of childhood activity; in NZ, 32% of school students aged 5-17 years are now inactive (315). However, parents see the health-promoting potential of walking (320, 321) as being more than offset by road safety concerns, perceived ‘stranger danger’ (322), and difficulty coordinating children’s walking between home and school with their own complex travel routines and ‘journey to work’ (323). Nevertheless, studies have shown that city streets become safer for walkers the more people walk (324), walking alleviates vehicular congestion (especially in the vicinity of schools), and enables children to accrue health benefits (325). Research has also shown that children prefer walking (326-328).

North Shore City Council (NSCC) have appointed a council-funded school travel plan coordinator to develop solutions to transport issues in collaboration with schools, parents, and pupils, that will reduce school-related car journeys and increase local road safety through a combined package of practical and educational actions (329). The aim is to encourage children to travel to and from school safely by walking including WSB, cycling, or public transport. This initiative has been branded the ‘TravelWise to School’ project and began in February 2002 (330). Currently, NSCC is developing travel plans with 22 primary schools, three of which have been completed and are available on the NSCC website (Bayswater, Brown’s Bay, and Vauxhall primary schools) (331, 332). As at April 2004, NSCC had 43 WSB routes involving 18 primary schools and 442 children, and this has led to a daily reduction of 158 cars at schools (333).

In addition, AUT worked with some NSCC schools on a case-control study to measure the effect of WSB on activity level using pedometers. No difference was found in the number of pedometer steps between children using the WSB and those not. However, only small numbers surveyed and many of the children who joined WSB were already walking to school. It was observed that children living 3km or more away accumulated significantly more steps than others, indicating that children walking ≥3km to school can accumulate significantly more daily PA than children who do not walk this distance to school (Dr Grant Schofield, personal communication). However, this study was not able to show that more school children were walking to school as a result of the WSB intervention.
Three Auckland evaluations of the WSB scheme have been carried out (334-336). The first was performed 15 months after the establishment of the first WSB at Galdstone School, mentioned above, and showed multiple benefits to children, parents, and the community at large, including the finding that 19.5 car trips per day were being saved as a result of the WSB (334). The second was commissioned in late 2002 by the ARC to obtain a snapshot survey of WSB in Auckland (335), and the third built on this research with the aim of surveying all schools in Auckland operating WSB to determine: numbers of children involved, number of car journeys saved, benefits and challenges, and sustainability (336). Findings as at Nov/Dec 2003 showed that 53 schools in Auckland have WSBs with 1738 children estimated to walk on WSBs per day. The majority of WSB coordinators reported a reduction in traffic congestion (1046 car trips saved per day) with two thirds reporting neighbourhood improvements. The previously observed gradient in favour of higher decile school communities remained, with proportionately low numbers of WSBs in Manukau City (Figure 6).

Figure 6: Walking School Buses - schools by decile and TLA (Territorial Local Authority) (336).

The main gaps/barriers identified to WSB services included: sustainability of parental input, poor uptake in lower decile schools where overweight and obesity prevalence is greatest, and differing levels of commitment to WSBs throughout the TLAs in Auckland. MCC is working to revamp its WSB service as currently it has only one in operation which was thought to be due to a lack of parental support and a lack of confidence in being able to walk safely to school in the neighbourhood.
Regional Sports Trusts
There are 17 regional sports trusts (RST) funded by SPARC that deliver sports-based programmes and promote healthy active lifestyles throughout NZ. Amongst their numerous activities, RST also promote SPARC’s Push-Play campaign that encourages 30 minutes a day of moderate intensity PA to all New Zealanders. The Push Play campaign was evaluated in 2003 and results showed that the campaign had achieved significant increases in message recognition and intent to become more active, but no impact on adult PA levels (337). In general, media campaigns and promotions can have a significant impact on awareness, attitudes, knowledge, and intention to change (338), but do not change behaviours unless the message is highly specific and achievable e.g. a campaign aimed at changing people from high to low-fat milk use (339). In addition, RST provide PA programmes to support the green prescription (this is mostly aimed at adults but there are plans to extend the programme to target children), provide links with other community centres and services, and sometimes work with schools to provide specific PA programmes (such as the MK programme provided to Stanmore Bay School by Harbour Sport). Programmes specifically aimed at children and youth are discussed below although some have already been discussed above e.g. the MK programme run by Harbour Sport with North Harbour Schools, and the ‘Young & Active’ programme run in conjunction with FWA by Sport Auckland. In addition, Sport Auckland have compiled a school lesson-plan manual of physical activities called the ‘Action Kids’ programme that has been designed for use with the Health and Physical Education school curriculum for primary children (285).

Fitt Kidz
Sport Waitakere and Bruce McLaren Intermediate School recently developed the Fitt Kidz health and fitness programme for school children and their families due to concern over increases in overweight and Type 2 diabetes in school children and the community. Interventions include the following:

- A school health council consisting of a local GP, school children, the deputy principal, the district nurse associated with the school, and the school counsellor. The council promotes a different project each term e.g. nutrition, sun smart awareness etc.

- PA coordinators (hired AUT students) to take lunch-time activities, with the choices changing every term, for example, hip-hop, cheer-leading, bowls (attracts few children but a large proportion of the obese school population), line-dancing, swimming (requires a bus trip), ten-pin bowling, extreme trampolining etc.
- The tuck shop has been enrolled in the SFP and has obtained a bronze award thus far, with the tuck shop and school undertaking not to advertise unhealthy foods.

- Parents walking group/evening exercise classes – these have attracted poor response rates.

**Community Setting: Nutrition Interventions**

**ARPHS Community Services**

ARPHS Nutrition Service has a role in promoting healthy food choices in the Auckland region to support healthy lifestyles. Initiatives include providing nutrition information to churches, preschools, schools, marae, and other community groups, for example, by demonstrating healthy cooking methods, providing food budgeting and labelling information, developing preschool gardening projects (see Pacific preschool garden project above), and via the Mangere Healthy Kai (MHK) project. The MHK project began in September 2003 as a collaboration between ARPHS, NHF, four local community health providers, and 12 retailers in the Mangere town centre, with the aim of encouraging retailers to provide healthy kai choices. Several nutrition promotion activities have been conducted at the Mangere shopping centre with contributions from stakeholders, including healthy eating messages, nutrition quizzes, cooking demonstrations, and PA classes. In addition, retailers whose wares fulfil certain healthy nutrition criteria are awarded a Mangere Healthy Kai banner to display in their retail outlets. MHK was internally evaluated in April 2004 by shopper surveys and by measuring the change in food sold by retailers (340). Comparisons were made with a baseline survey conducted in September 2003 prior to the programme launch. The percentage of Mangere Town Centre (MTC) shoppers that ate a healthy kai choice for their last meal/snack at MTC increased from 32% in September 2003 to 57% in April 2004 amongst those aware of MHK. Approximately half of those surveyed were aware of the MHK programme. Changes amongst MHK retailers were more difficult to measure, however, positive changes included more fish being grilled than fried, and more sandwiches and fewer pies were being sold.

**Public Health Dietitians**

Public health dietitians (PHDs) perform health promotion activities related to good nutrition and are essential for training other health workers and disseminating well-informed, consistent, healthy nutrition messages to the general public and various community groups such as school tuckshop owners, pre-schools, and refugee/migrant groups. They also have a role in liaising with and providing advice to the MoH. ADHB has two full-time and one part-time dietitians (2.3 FTE, services described
above) at ARPHS, and four part-time dietitians (2.6 FTE) working for CCHDS. The CCHDS dietitians spend approximately 20% of their time on health promotion which includes work with well child, FWA, HPS, and pre-schools. ARPHS is also in the process of employing two more dietitians/nutritionists with a public health community role: one will take a lead role in promoting healthy ‘ready to eat’ food choices in suburban shopping centres, and the other will have a role in providing nutrition expertise to health promotion programmes in the school setting e.g. HPS nutrition programmes. NHF employs nutritionists and a Pacific dietitian. CMDHB have one PHD who is also engaged in clinical work, and are currently considering a project to train the trainers in Primary Care around nutrition for the prevention of obesity. In addition, the Diabetes Projects Trust employs a PHD part-time and TaPasifika has a Pacific PHD.

Gaps in services identified include a lack of PHDs in WDHB and CMDHB and a lack of PHDs for input into programmes such as NEW and HPS. Until 1996, community dietitians were funded to do health promotion work but since then health promotion money has gone to the public health service, although the CCHDS community dietitians have continued to be funded in their health promotion role. This has led to the fragmentation of PHD services throughout the region, and the current need for a more directed and coordinated approach.

Advocacy Groups
There are a number of obesity prevention advocacy groups in NZ including FOE (Fight the Obesity Epidemic), OAC (Obesity Action Coalition), and ANA (Agencies for Nutrition Action). FOE is a voluntary organization that was founded in 2001 at a meeting of the International Diabetes Federation and WHO in Kuala Lumpur. FOE advocates for policy changes to stop the rise of obesity and Type 2 diabetes in children. Its initial aims are to improve children’s nutrition through legislation, regulation, taxation, and education by:

- Banning or severely restricting TV food advertising directed at children.
- Restricting all TV advertising of foods that are high in saturated fat and sugar.
- Removing soft-drink vending machines from schools.
- Introducing healthy food in school canteens.

To this end, FOE has undertaken several initiatives, including writing a report on legislative measures in place or proposed in other countries to reduce obesity (discussed in detail under
‘macroenvironments’ above) (341), helping in the preparation of a private members’ bill to restrict fast-
food advertising aimed at children, sending requests to schools for the removal of soft-drink vending
machines and inappropriate food from school canteens etc (342).

The OAC was formed in 2003 to provide a strong and united voice that can be heard at a political level,
and to provide a forum from which to inform members about planned advocacy so that organisations
can support and strengthen each other’s activities (343). The coalition members include the Cancer
Society, NHF, Public Health Association, NZNF, Diabetes NZ, the NZ Dietetic Association, and the
Health Sponsorship Council, plus other interested community groups. OAC aims to advocate for
government policy, regulation, and legislation that will help reduce obesity rates by changing the
environment from one where high energy food is available everywhere and there are limited
opportunities for exercise, to an environment that supports people in making healthy choices.
Examples of issues to be tackled include: sports’ sponsorship by the fast food industry, fat tax,
advertising to vulnerable groups, warning labels on high energy foods, and regulating foods available
in schools. Currently, OAC has been advised by the MoH that it is not able to lobby politicians using
MoH funding. However, as the bulk of funding for OAC comes from the MoH there is minimal
independent funding available for lobbying (344).

ANA is an incorporated society that was established in 1992 with six founding members: NHF,
THMM, National Diabetes Forum, NZ Dietetic Association, and the NZNF. More recently, the PI
Food and Nutrition Action Group and the NZ Recreation Association have joined, while SPARC and
the MoH are observer members of ANA. ANA aims to work cooperatively to support healthy weight
in New Zealanders through PA and good nutrition. Main approaches include the promotion of
consistent nutrition/PA messages, cooperation within the nutrition and PA sector through annual
forums, regular newsletters, and their website, and advocacy for a comprehensive environmental
approach to prevent obesity and support healthy eating and PA (345). In 2001 ANA produced the
document ‘Healthy Weight New Zealand’ to highlight the overweight/obesity issue and provide
strategies for intervention (56), and in 2002 ANA supported the establishment of the OAC to advocate
for government policy, regulations and legislation. In addition, ANA is funded by the MOH to keep a
national inventory of providers, programmes (346), and relevant research (347) which are available on
their website. However, the provider/programme listing is not comprehensive for the Auckland region and lacks detail regarding the programmes provided.

**Refugee and Migrant Health Setting**

ARPHS provides free comprehensive health screening to refugees arriving in Auckland. The Community Child Health and Disability Service of the ADHB provide some ongoing community care, as mentioned previously, such as the well child programme for under fives. ARPHS also provides some nutrition education sessions targeted at refugee families, and there is currently a refugee nutrition programme underway for Somalian families that is run in collaboration with the Community Child Health and Disability Service. In addition to nutrition education, this programme includes a PA component. Sport and PA is particularly important to refugee communities as it can produce benefits such as increased self-esteem, and provide avenues for social connectedness and a sense of belonging.

To this end, ARPHS, Procare, Sport Auckland, and Roskill Aquasport, have recently formed a collaboration to launch a Muslim women’s swimming group that will allow Muslim women to gain swimming instruction and PA once a week.

Data from the 1998-99 Hillary Commission, SPARC survey showed that men and women from other ethnic groups are least likely to be active compared to Maori, European, and Pacific people (348). There is also evidence of poor nutrition amongst the refugee community. An Auckland study published in 1998 showed that children from refugee and migrant backgrounds were at risk of rickets from Vitamin D deficiency (349). Poor oral health has also been observed in children from refugee backgrounds living in NZ, and is a reflection of high sugar intake, particularly from soft drinks (350). A survey of NZ refugee communities in NZ has shown that they are adopting NZ dietary patterns that are high in fat and low in fruits and vegetables (351), and overseas studies have linked this process of dietary acculturation with an increased disease risk in refugee and migrant populations, most particularly for obesity, Type 2 diabetes, and cardiovascular disease (352).

Numerous barriers to PA and healthy nutrition were identified including the following:

- Poor knowledge of NZ fruit and vegetables and how to recognise, prepare, and store them, combined with a traditional diet very low in vegetables.
• The combination of dark skin and clothing preventing much sun exposure leading to Vitamin D deficiency and problems such as fatigue and bone pain in adults and rickets in children.

• Compensation for poor diets in refugee camps often leads to over-consumption of energy-dense and sugary foods.

• Hot drinks are consumed with significant amounts of added sugar.

• Cultural taboos such as those preventing Muslim women from exposing their body to men during PA.

• Financial and language barriers.

• Mental trauma due to the refugee experience and prior persecution.

Gaps in services include:

• Lack of a nutrition team dedicated to refugee and migrant nutrition.

• Lack of funds for developing targeted interventions.

• Lack of research characterising the health status of refugee and migrant populations.

• Lack of information offering dietary advice e.g. targeted at the Muslim halal diet, despite there being 35,000 Muslims in Auckland.

• Lack of a well child resource targeted at refugees.

Asian Health Setting
Recently, ARPHS compiled a report on Asian public health needs for the Auckland region, which included a stocktake of the services available to the Asian population (353). There are 146,103 Asians in Auckland, representing 12.5% of the Auckland population. Twenty percent of the Asian population in Auckland is aged between 0 to 14 years and another 20% aged between 15 and 24 years, with diabetes being one of the six top potentially avoidable causes of death due to lifestyle changes affecting diet and PA leading to obesity and hyperlipidaemia (354). Overseas studies have shown that compliance with ‘Western’ dietary advice is poor, probably due to language and cultural barriers (355). However, no childhood obesity prevention programmes targeted at Asian youth were identified.

Multiple gaps in services were identified including the following:

• Lack of an Asian nutrition programme at ARPHS.

• Lack of an Asian branch of the NHF.
- HealthWest has a population that is 11% Asian, but recently dissolved its only health promotion coordinator position.

Barriers identified to good nutrition and PA in the Asian community included:

- Changes in lifestyle and type of food eaten in NZ compared with Asian countries. This includes an increase in car ownership with transportation by car rather than by walking/cycling.
- Both parents often work and are not available to take children to recreational venues. In addition, there are often no extended family available to help out.

It was also suggested that ARPHS could have a role in providing a half-time person for refugee, migrant, and Asian nutrition. In addition, ARPHS could provide a budget for community trainers to work alongside organisations such as Plunket and PHOs to coordinate and maintain community and personal care programmes

**The Food Industry Setting**

No trials of macroenvironmental interventions aimed at preventing childhood obesity and involving the food industry have been implemented, although taxation, reducing TV advertising to children, and federal control of the school food environment are interventions in place in some countries. The effect of food nutritional labelling on the prevalence of overweight and obesity has not been studied. In NZ, the National Heart Foundation’s ‘Pick the Tick’ programme aimed to encourage a healthy food supply by allowing industry to use the tick logo for foods meeting criteria for healthy levels of fat, added sugar, sodium, fibre, and calcium (Soya milk only). However, subsequent evaluation has shown that while the food industry has responded by reducing salt content in frequently eaten foods (356), the public were confused by the significance of the logo (357). It is not known if ‘Pick the Tick’ has impacted on BMI, chronic disease, the dietary quality of the population, or whether it influences the food choices of one demographic more than another. Similarly, national media campaigns, such as ‘5 + a day’ that aims to increase consumption of fresh fruit and vegetables, and the healthy food pyramid that aims to illustrate recommended dietary guidelines, have lacked obesity prevention goals or outcome measures (358, 359). Research on nutrition labelling in the USA has shown an association between label readers and female gender (360), higher educational attainment (361), greater nutrition
knowledge (362), and a reduction in percentage of energy in the diet obtained from fat (361, 363). This suggests that nutrition labelling of food needs to be accompanied by strategies that influence the food choices of less educated and lower socioeconomic groups (362).

The food industry’s primary aim is to make money and to continue to grow in a competitive environment. The strategies used to encourage growth often harm the health of the consumer and include the following: the use of cheap saturated fats and sugars in fast foods, snack foods, and processed foods to reduce price, improve palatability, and hence encourage consumption (121, 122, 125); increasing portion sizes that also encourage people to over-consume (125-128); increasing the variety of fat- and sugar- laden snack foods as variety also encourages over-consumption (129), for example, the variety of Oreo cookies grew from 6 to 27 in the 1990s in the USA (Professor Marion Nestle, personal communication); increasing the availability of food e.g. via vending machines encourages consumption (364); advertising of energy-dense foods to children (170); lobbying and threats to influence the wording of dietary guidelines, for example the food industry successfully lobbied to have the following recommendation removed from the draft WHO strategy on ‘diet, nutrition and the prevention of chronic diseases’ (156), fearing that it would impact adversely on the soft- and fruit- drink industry: no more than 10% of daily calories should be consumed in the form of sugars (365, 366), etc.

Nevertheless, there may be a place for the food industry in helping to prevent obesity in the population. How the food industry might be engaged in health promotion is an issue that ARPHS and other health-promoting organisations are currently grappling with, for example, should ARPHS allow McDonalds to display its Mangere Healthy Kai banner because it now provides the ‘Salads Plus’ menu when the rest of its menu is cheaper, tastier, more filling and energy-dense, and available in larger portion sizes? NHF’s ‘Pick the Tick’ programme, discussed above, involves the NHF endorsing certain food products in exchange for payment from the food industry. This faces the NHF with a potential conflict of interest when it is vital that any health-promoting organisation is seen to be able to maintain integrity for its primary aim of ensuring that the population’s health benefits. It may also be misleading to endorse ‘products’ instead of nutrition and lifestyle, as no food or food product can singly promote health. In addition, as mentioned above, there is no evidence that Pick the Tick has done anything for
the population’s health apart from lowering the salt content of endorsed food products (356), although the Auckland University’s Clinical Trials Unit is currently working on a trial to examine the impact of Pick the Tick on some potential health outcomes (Dr Jo Wall, personal communication).

In April 2004, members of the food industry involved in a coalition of food industry groups chaired by the ANZA (Association of NZ Advertisers Inc) became signatories to the ‘Food Industry Accord’ (367). This is a collaborative document involving representatives of major groups within the food industry and its associated business partners that aim to help reduce obesity, improve nutrition, and increase exercise. Accord members have agreed to develop relationships with the nutrition and PA industries, develop strategies to support the promotion of healthy eating with priority given to ensuring appropriate messages to children, promote industry-specific initiatives consistent with the MoH’s Health Eating-Healthy Action (HEHA) Plan, and develop a communication strategy for implementing the Accord objectives. CMDHB has begun negotiations with local members of the Food Industry Accord to enlist their help with obesity prevention as part of CMDHB’s diabetes prevention plan (Meeting with the food industry and CMDHB, 23.08.04). The Food Industry Accord are funding the development of a nutrition and PA health promotion series featuring the unbranded character ‘Willie Munchright’ which will screen during children’s TV time but will cut into programme rather than advertising time. At this stage the food industry in Auckland are not considering limiting the advertising of food and drink to children.

While the food industry is, not surprisingly, more devoted to healthy profit than healthy nutrition, there may be a place for industry to promote health by funding PA campaigns, sports, and PA programmes, ideally without using industry logos/advertisements to show sponsorship. Nestle is a foundation sponsor of the Millenium Institute of Sport and Health and together they have produced a number of resources: ‘Be Healthy Be Active’ advice on PA, and nutrition, diet, and recipe information (368-371). Coca Cola has a campaign entitled ‘activity balance choice’ that promotes activity while heavily advertising its beverages under the ‘choice’ part of its campaign (372). It has also formed a partnership with the National Association of OSCAR with which it formed the ‘Go Kids’ PA programme for children after-school (373-375). Sarah Ulmer has partnered with McDonalds to promote their ‘Eat
Smart Be Active’ campaign which promotes McDonalds at the same time as promoting activity. In Sarah’s words (376):

*Earlier this year I approached them with an idea of how we could work together – to teach people about the importance of exercise and a balanced diet, how McDonalds fits in with that…*

*As an athlete I watch my diet carefully. I eat a range of foods, including burgers…*

Watties has partnered with Plunket to produce a series of information pamphlets on baby’s and young children’s nutrition which contain the Watties and Plunket logos. While many of the PA and nutrition programmes produced by industry claim to aim at promoting healthy weight, none have been evaluated for weight-related outcomes, although effects on consumer consumption, company profit, and consumer satisfaction are regularly evaluated.

**Policy Setting**
The WHO has recently released its global strategy on diet, physical activity and health, listing as one of its four main goals that “…policies and action plans are developed to improve diet and increase physical activity that are sustainable, comprehensive and actively engage all sectors, including civil society, the private sector and the media” (377). It continues on to discuss policies that could protect public health, for example, preventing inappropriate food advertising to children, establishing healthy school policies and programmes, and appropriately pricing and taxing unhealthy foods. In NZ, key Ministry of Health documents have identified overweight and obesity prevention as a priority area for action (12, 39, 57, 61, 378, 379), although currently in NZ there are no legislative interventions that aim to control or reverse the obesity epidemic. Of note, the recently released HEHA Implementation Plan 2004-2010 for NZ, aims to adopt policy to improve PA and nutrition in schools, and to develop ‘policy options’ for the advertising of foods to children (293). Following release of the HEHA Plan, a memorandum of understanding was jointly signed by the MoE, MoH, and SPARC, that aims to improve student’s wellbeing by working with other government agencies, schools, and their communities to implement an effective annual programme of activities in schools, particularly targeting nutrition, PA, and obesity (380).
A report prepared for Fight the Obesity Epidemic (FOE, NZ) and Diabetes NZ Inc, summarises key legislative measures in place overseas that could be used as a basis for legislative measures in NZ (341):

- Restrictions on the sale of certain foods and drinks in schools: the USA has strong federal regulation of food and drink sold in school cafeterias during lunch, and has recently begun targeting food and drink sold at other times and places, with the federal government and many states introducing bills to limit the sale of unhealthy foods. California now has legislation in place that limits the sale of unhealthy foods in schools. In NZ, guidelines for vending machines in schools are apparently being developed in conjunction with the Ministry of Education (381). In addition, the Education Minister aims to make extra funds available to schools that have appropriate measures in place to combat child obesity e.g. to schools selling only healthy foods and not soft drinks and sweets (382). A recent NZ study of food sold in school canteens found that the food environment was not conducive to healthy food choices for NZ school children (383). The ratio of ‘less healthy’ to ‘more healthy’ main choices was 5.6:1, for snacks 9.3:1, and for drinks 1.4:1. ‘Less healthy’ choices dominated food sales by more than 2:1 with pies being the top selling item.

- Restrictions on TV advertising to children: there is a wealth of proposed and completed legislation restricting advertising to children in general, and some useful examples of restrictions targeting unhealthy foods. Many states such as Sweden, Norway, Belgium, Denmark, and the Canadian province of Quebec prohibit advertising during children’s programmes, and many more have strict regulations. The UK and Ireland have both considered Private Member’s bills that seek to specifically prohibit the TV advertising of unhealthy food and drink during children’s programmes. In fact, since the report by the Commons Health Select Committee (1), the UK Labour party has announced that it will ban companies from targeting children with advertisements for a range of unhealthy foods including burgers, crisps, fizzy drinks and sweets (384).

- Taxes on certain foods and drinks to fund health promotion: taxation at the state level in the USA provides an excellent example of the revenue-gathering potential of small taxes on soft drink and snack foods for spending on public health. However, a small tax may not reduce the consumption of unhealthy foods, although it may be more politically feasible than a steep tax. USA surveys found that 45% of adults would support such a tax if revenue was spent on health education – this
was prior to the current media furore over the obesity epidemic. There is also some evidence, at a microenvironmental level, that food pricing affects food choices. For example, a study involving 12 secondary schools and 12 work sites showed that price reductions of 10%, 25%, and 50% on low-fat snacks in vending machines increased the percentage of low-fat snack sales by 9%, 39%, and 93%, respectively (385). Two studies have shown that lower pricing is just as effective in promoting sales of healthy foods such as fresh fruit and vegetables as it is for sales of energy-dense vending machine snacks (385, 386).

It has been cogently argued that macroenvironmental and global strategies are needed to control the food industry, similar to those used against the tobacco industry (387). Lessons from the tobacco epidemic have shown that policy/legislative changes often have the greatest impact on reducing prevalence. For example, in NZ, where we are considered to have the most comprehensive tobacco control programme in the world, tobacco consumption decreased more rapidly than in any other country with adult prevalence reducing by one quarter (from 32% to 24%) between 1981 and 1996 (388). Most of this success was attributed to legislation and tax increases; the tax increase of 50 cents in 1991 increased the price of a 20-pack of cigarettes by 17% and decreased sales by 15% over the next 12 months. Similarly, a 13% increase in price in 1998 decreased consumption by 13% (388). Tax rates were increased in line with consumer prices and increases were linked with other methods of tobacco control such as advertising the health message behind tax increases and increasing people’s access to effective cessation treatments and services (389). The Smoke Free Environments (SFE) Act 1990 and its subsequent amendments have also been effective in establishing smoke-free environments and have had a role in reducing disease from second-hand smoking and the social acceptability of smoking (390).

**Transportation and Town Planning Setting**

Evidence shows that New Zealand children are spending less and less time in transportation-related physical activities such as walking or cycling to school. The 1997/98 NZ Household Travel Survey revealed that twice as many car trips were being made to schools than in the 1989/90 survey (391). In Auckland, where residential intensification is reducing the safety and accessibility of outdoor spaces, and urban planning is focusing on reducing commuting times by proposing the construction of new motorways and prioritised lanes for vehicular buses (336), precipitous declines in rates of walking have
been observed. This was illustrated in a survey which found that more than one-third of Auckland children spend less than five minutes walking per day (392). In fact, a 1996 survey showed that 40% of all Auckland children were being driven to and from school (319). While there have been no large-scale interventions to improve urban design in Auckland in favour of increasing children’s physical activity (393), the recent introduction of the Local Government Act 2002 requires that community plans reflect the community’s social, environmental, and other aspirations, and that such aspirations are determined through proper community consultation (394). Therefore, the Act provides a means whereby the urban environment could be changed in response to society’s increasing need for living environments that stimulate physical activity.

An American study has shown that transit-oriented neighbourhoods generated 120% more pedestrian and bicycle trips than automobile-oriented neighbourhoods. Transit-oriented neighbourhoods had gridded street patterns with four-way intersections that were initially built around a streetcar or railroad line, while automobile-oriented neighbourhoods often had random street patterns designed without regard for transit lines (395). Other studies have shown that residents from communities with higher density, greater connectivity, and more land use mix report higher rates of walking/cycling for utilitarian purposes than low-density, poorly connected, and single land use neighbourhoods (2, 396-398). The USA Department of Transportation is implementing ways to increase walking and cycling for transportation, and has calculated that up to 50% of the population could commute by bicycle as that proportion lives within five miles of work/school (399).
Recommendations

The following list of recommended strategies for action is based on the above review of causes for childhood obesity, interventions for obesity prevention, gaps identified by providers in existing Auckland services, and the role for ARPHS suggested by other providers in childhood PA and nutrition. Recommendations are split into those appropriate at a national or local (Auckland region) level, and are further divided according to the part of the epidemiological triad that each strategy addresses and the category or setting for each recommendation. Current evidence suggests that, as a population, we are not undereating sufficiently to compensate for being underactive in our modern society where overabundance of food, few opportunities to be physically active, and a physiology geared to avoiding starvation rather than caloric excess, regularly overwhelms our capacity for regulating appetite and energy balance (400). This situation, along with lessons from other epidemics, suggests that all three parts of the epidemiological triad must be addressed (environment, vector, and host), and that environmental strategies are often the most powerful and sustainable (194).

In agreement with many authors in the field of obesity prevention (1, 75, 240, 377, 400-405), these recommendations acknowledge the need for policy-driven structural changes in the environmental determinants of eating and PA patterns to address the underlying factors that predispose to and perpetuate obesity. The argument underlying environmental solutions is that lifestyles are determined more by the environment within which choices are made than by individual will. Such strategies are termed ‘passive’ as they do not require individual behaviour change and may be more successful than those requiring active decision-making (406) as they do not require health to be the basis of decision making and also help reshape community norms (407).

Such strategies must be combined with vector-based strategies that increase the availability of low-energy, high-nutrient foods while reducing the availability of high-energy snacks and drinks. Host-based strategies that enable the development of lifeskills and individual competence to influence factors determining health are also needed, particularly as the environment is unlikely to return to one in which cognitive control of body weight is not required.
More research is needed to examine how individual behaviours that lead to energy excess are affected by environmental factors, for example, how the amount of TV viewing is associated with the safety of Auckland neighbourhoods; how the consumption of soft drinks relates to soft drink vending machines in schools; how levels of PA correlate with factors such as the proximity, density, attractiveness, or safety of recreation facilities or spaces; how a child’s family food environment influences eating behaviours etc. This includes NZ research to determine what behaviours are associated with low socioeconomic status and poorer PA and nutrition outcomes.

As mentioned previously, the scientific literature on childhood obesity interventions is currently lacking in its ability to guide strategies and actions. Research barriers to be overcome include: conducting trials of sufficient size and duration, using best methodology including good measures of diet and PA, and identifying appropriate BMI cut offs for defining overweight and obesity in non-European populations especially Maori, Pacific, and Asian (this includes identifying Asians as a separate ethnic group in NZ research and presenting separate results for this group). However, in the words of John Catford, given the seriousness of the trends in childhood obesity, we must also “guard against nihilists and procrastinators who require top-level evidence from randomized controlled trials before action is taken” (408).

Mass media campaigns, such as the Push Play campaign and 5+ A Day, to promote PA and healthy nutrition. For example, campaigns could promote cycling and walking as means of transportation, and promote water as the daily drink of choice etc. There is also a need to raise awareness that obesity and overweight is a growing problem that has many undesirable health and economic consequences, as people must become concerned enough to support social changes that address the problem.
The schools’ role in PA and nutrition/lifestyle education needs to be reassessed and strengthened. A concerted campaign is required to educate schools and pre-schools concerning the importance of PA and nutrition especially in relation to childhood obesity. As the child obesity statistics given above have shown, the time has come for schools and the MoE to give nutrition education, PA, and the role of the school environment in encouraging healthy eating and PA, the same priority as its scholastic functions.

A curriculum-based approach is needed to influence eating patterns, reduce soft drink consumption, reduce sedentary behaviours (especially TV viewing), promote PA, and provide daily PA. School-based education could be delivered using a multimedia or multi-strategy approach, as is currently being used by the DPT in delivering monthly education sessions to Southern Cross High School as part of its adolescent obesity and diabetes prevention programme.

Schools should provide all school children with regular PA classes, preferably five days a week, with the aim of getting all children active as well as catering for those who like sporting activities. To this end, all schools, including primary schools, need dedicated PE specialists who could also help coordinate externally-provided PA programmes.

Pedometers could be issued to children at school as part of the PE curriculum with teaching around their use, desired targets, and ways of increasing activity. Pedometer information could also be used to monitor the level of PA in our nation’s children and evaluate various interventions to increase PA.

FAMILY

- Promote healthy home-cooked meals and nutritious low-fat snacks that appeal to children including raw fruits and vegetables.
- Address the decline in level of cooking skills in families, perhaps through the introduction of compulsory healthy cooking classes to schools.
- Promote parental regulation of the amount of TV viewing and other sedentary activities such as computer, play-station and video activities per day.
- Motivate parents to get active and encourage PA in their children.
- Promote family-friendly work policies such as flexible working hours that would allow parents to participate in activities such as after-school sports coaching, have time after work to
prepare home-cooked meals of high nutritional value and appropriate energy density, or walk home with young children after school etc.

**COMMUNITY/ PRIMARY CARE**

- Continue to inform and support women of child-bearing age in healthy nutrition, weight control, and not smoking, to help prevent obesity and other chronic health problems developing in themselves and their offspring.
- Continue to educate, encourage, and support women to breastfeed infants up until at least six months of age.
- Continue to inform and support preschool children and their parents regarding healthy weight, nutrition and PA. For example, through healthy pre-school nutrition policies such as are advocated by the NHF’s Healthy Heart Award and using the Well Child checks to monitor growth, BMI, nutrition, and PA. In order to be effective, Well Child checks must also be structured to target particularly at-risk groups such as Maori, Pacific, Asian, Refugee, and Migrant groups.
- Health workers should encourage healthy foods and drinks, appropriate portion sizes, PA and other positive actions in children rather than dietary restriction. Although, to date, the long-term effectiveness of medical interventions has been low (409, 410), ARPHS is currently planning a study to examine the effect of computer-generated nutrition messages tailored to individual stage of change on various health indicators including BMI, and this may prove to be a more effective means of improving adult and family nutrition (Kate Sladden, personal communication).

**Environment**

**POLICY**

- National policy is required to prevent the marketing of fast foods and soft drinks to children, especially on TV during children’s viewing hours and in pre-schools and schools. Similarly, marketing of low-energy, high-nutrient foods could be encouraged.
- National policy should ensure that food labelling listing energy, fat, sugar, and other content, is accurate and ultimately of benefit to the consumer in enabling healthy food choices to be made, especially the most at-risk consumer groups. To this end, research on labels such as the Tick logo for Pick the Tick is needed to determine if consumers’ health has benefited and to
identify the demographic characteristics of consumers. In addition, energy-density criteria are needed to limit the Tick logo to products with lower energy density.

- Appropriate pricing +/- a fat tax on energy-dense foods of low nutritional value would be of value if it achieved the aim of reducing consumption in at-risk groups and was not used primarily as a means of obtaining money for health-promotion. As with tobacco tax, food taxation should increase in line with consumer prices and be accompanied by campaigns to advertise the health message behind tax increases, increased access to nutritious food of low energy density, and opportunities for PA. In addition, as noted by Swinburn and Egger, 2002, it would also be important to include public health nutrition consequences into the decision-making process for current fiscal food policies (194).

- An intersectoral, national policy on obesity control could be developed. To this end, a method is needed for measuring the health impact of current and proposed policies across all sectors as a result of their effects on food supply/consumption and PA (411). This could require health professionals with skills across sectors: urban planning, transportation, education, finance, and acumen in the areas of legislation and regulatory policy.

- The health sector should lead the way by introducing nutrition policies, healthy food, and PA options into its workplaces. For example, remove McDonald’s outlets and vending machines containing non-diet soft drinks and energy-dense snacks from hospitals.

RESEARCH

- Government needs to support policy with appropriate surveillance of dietary habits, patterns of PA, BMI and associated morbidity and mortality, and applied research and evaluation of different policies and interventions. To this end, it would be useful if future surveys such as the National Children’s Nutrition Survey (12) and SPARC’s Physical Activity Survey (348) were conducted, and that outcomes were also examined by school, locality, method of transportation to school, and other markers useful for evaluating the effect of policy in different settings. It may also be possible to combine the collection of children’s nutrition and PA facts in one regional or national survey.

- SPARC’s survey identifying barriers to PA in adults (412) should be repeated for children and youth.

SCHOOLS
• Serious thought needs to be given to the siting of schools and surrounding food retailers. It is not appropriate that dairies and fast-foods are readily available (unavoidable in the case of schools such as Southern Cross where the school’s main entrance has a zebra crossing that discharges crossing children directly into one of the local dairies) to children during breaks or immediately before and after school. Future zoning and planning could regulate the location, density, or hours of junk-food outlets around schools.

• Active transportation to and from school must be encouraged in all schools with the establishment of WSB and other innovations, for example, safe cycleways and walkways; the school bus route could terminate a kilometre or so from school in a safe area with children forming a WSB to complete the journey to school etc.

COMMUNITY

• There is an urgent need for urban design to reflect the growing need for children and adults to engage in active transportation, i.e. walking, cycling, or taking public transport (which often involves regular short walking journeys) to common destinations such as schools, shops, and the workplace. To this end, a working relationship between the health sector and local/regional councils and the transportation sector must be established. Initiatives could include: safe cycle- and walk-ways that go somewhere useful, creating mixed-use neighbourhoods integrating residential and commercial real estate that make active transportation more likely, slowing or banning traffic from some areas; modifying building design to encourage the use of stairways, providing safe parking at a distance from public venues such as schools and shopping centres, protecting open recreational spaces, providing more drinking fountains in public buildings and outdoor areas, providing formal recreation facilities such as sports grounds or recreation centres etc. Changes in urban design could ideally be combined with mass-marketing of active-transport options in order to influence long-term behaviours. Marketing proved successful in a pilot study in Perth where a 14% reduction in car travel was observed and associated with increased walking, cycling and use of public transport (413).

FOOD INDUSTRY

• The health sector needs to firmly establish what it can realistically achieve by working with the food industry, and to determine how an ethical relationship can be maintained without compromising its primary health goals.
Vector POLICY

- National policy is needed to prevent soft drink vending machines in any of our schools and pre-schools (including school-based marae and Maori-speaking schools), or at least to limit vending machines to those providing diet soft drinks, water, and possibly milk products.

- National policy is needed to ensure that all snack-vending machines are prohibited in schools or at least provide low-energy, high-nutrient snacks such as fresh fruit, salads, wholemeal sandwiches, and salad rolls.

- National policy is needed to ensure that all food sold in school tuck shops or provided in early childhood centres is consistent with the National Nutrition Guidelines. Nutritious menus could be developed in concert with the NHF’s SFP.

SCHOOLS

- Water fountains should be readily accessible throughout schools, kept clean and hygienic, and provide water that is pleasant-tasting.

- In school tuck shops, the healthiest choices should also be the cheapest.

- Nutritious food policies must be supported by preventing children from leaving school grounds for food during breaks.

FOOD INDUSTRY

- Work with restaurants, fast-food outlets and food retailers is needed to improve the content of foods and reduce their energy density through changes in food processing and food preparation e.g. changing to unsaturated rather than saturated fats for deep-frying of fast foods, and using low-calorie cooking methods such as stir fry, steaming and baking/microwaving.

- Involve the food industry in helping to reduce the energy density, improve the nutritional quality, and reduce the portion sizes of food supplied to school tuck shops.

Local Strategies for Action
The strategies mentioned above are obviously also important for the Auckland region but have not been repeated below.

Host
SCHOOLS
• There is a need for more obesity prevention information to be available for school children such as the video and diabetes prevention comic produced by DPT.

• School-based BMI checks could continue after Well Child checks finish at age five, by public health nurses in schools. Overweight children could be identified early on and referred to FWA, Young and Active, or some other school or community based programme. This would require extending the capacity of these services; in fact Sport Auckland have already identified a need to extend the YAA programme to include overweight and obese children who are not on the FWA programme and children who are not overweight or obese.

FAMILIES

• The barriers to consumption of fresh, frozen or canned produce identified by Maori, Pacific and migrant/refugee providers, 5+ A Day (261), and the recent Cancer Society survey (262), included: perceived cost, the planning ahead required, knowledge of proper storage of produce, lack of knowledge regarding available fruits and vegetables or the methods of preparation, lack of time to prepare home-cooked meals, children preparing meals without adequate knowledge of produce preparation etc. Survey findings should be used to help plan public health measures aimed at improving nutrition by promoting fresh, frozen, and canned produce, and removing real and perceived barriers to access.

• Families need help with identifying healthy foods and choosing wisely within the available choices e.g. choosing the Salads Plus menu for lunch at McDonalds instead of a burger combo. Media campaigns and providing comprehensible point-of-sale nutrition information could help families make healthy choices. However, a nutrition message may need to be presented in various ways before it is widely accepted. For example, media messages about the fat content of fries and burgers may have no impact until the same message is associated with, for example, a family member dying of a heart attack while eating a hamburger at a fast-food outlet. This may be because eating burgers is usually associated with happy times with friends and family, and that experience needs to be challenged before the implications of burgers and fries are accepted. More research is needed to determine what drives food choices.

• A large need for enhancing parenting skills in families was identified. Family-based programmes such as FWA, YAA and KIA require extra resources to provide more family
support to enable caregivers to provide children with an environment that supports healthy weight and lifestyle.

COMMUNITIES

- There is a need for non-dietitian nutrition educators to provide simple and consistent messages. However, educators themselves must have a much deeper knowledge of the subject that is based on scientific fact and not obscured by cultural beliefs and traditions that encourage obesity. In addition, many of our current providers in childhood nutrition are obese and this gives children mixed messages. Would we expect our children to be educated against smoking by an educator who smokes? Therefore, it seems desirable that standards of knowledge and behaviour are set for educators, and that workplaces fully support educators to obtain these standards by providing education, professional development, healthy workplaces, and support for healthy lifestyles such as subsidised or free gym memberships. These standards should also be taught as an integral part of all regional train-the-trainer courses. Some Maori providers (RH and AMN) identified a particular need to provide their workforce with more nutrition knowledge.

PRIMARY CARE

- None of the PHOs have childhood obesity prevention programmes, including TaPasifika which provides the dietitian service for the childhood obesity treatment programme, KIA. PHOs who have identified childhood obesity prevention as a priority area could liaise with the PHO Plans Coordinator based at ARPHS and the ARPHS nutrition service to obtain information about existing or planned obesity prevention programmes and to link with PHOs having similar goals.

ARPHS

- There is a need for ARPHS to take a more proactive role in coordinating HPS in the Auckland region in order to address the problems mentioned previously. HPS Facilitators should maintain their links with HPS and keep up-to-date lists of HPS, their health goals, the programmes running in each school, and the PA/ nutrition (and other) programmes available locally that HPS can access if required. The Regional Coordinator should keep this information updated for the whole region. Furthermore the Coordinator could take a proactive role in the professional development of Facilitators, work with them on important regional
health issues, such as obesity prevention, to coordinate strategies for action across the region, and help ensure that programmes have clear objectives with measured outcomes and evaluation if appropriate. Work is also required to determine the specific health needs of Maori schools and Asian pupils and provide appropriate programmes. Facilitators must work to establish sustainable relationships between HPS and programme providers by ensuring that programmes meet the school’s specific goals and that sustainable funding is available.

- ARPHS could have input into improving pre-school nutrition by holding more regional nutrition workshops for childcare staff, and providing advice on pre-school menus.

- A need has been identified for the ARPHS nutrition workforce to include a public health dietitian or nutritionist to work with the Asian, refugee, and migrant community.

- There is a need for one or more public health dietitians in the Waitemata and Counties Manukau regions to provide nutritional advice and support to programme providers such as HPS, NEW, PHOs, pre-schools, schools, community groups and the general public. FWA dietitians require more time for their role in FWA and more Maori and Pacific input.

PROGRAMME EVALUATION/ RESEARCH

- Due to the extreme lack of both international, national, and local research regarding the efficacy of childhood obesity prevention interventions, where possible children’s programmes aimed at increasing PA or improving nutrition should have obesity prevention as an additional primary goal, with weight-related measures (BMI, waist circumference, or skin fold thickness) included as an outcome. Even programmes that do measure weight, i.e. FWA, Well Child, KIA, and the PIH pilot, have significant data problems, with the possible exception of KIA. FWA has a large amount of data missing or unrecorded, Well Child weight data has not been evaluated or published, and the PIH pilot evaluation involved very small numbers of family members, while one subsequent evaluation of BMI was for adults only. Data collection and recording needs to be identified as a specific programme goal supported by education and monitoring of collected data. Collection of weight data (and also possibly diet and PA/pedometer data) seems particularly appropriate for the larger school-based programmes, for example, HPS where obesity prevention is an identified goal, the adolescent obesity & diabetes prevention programme, and possibly schools running the SFP. ADHB’s Diabetes Project and PHOs offering programmes to children in future could also be well-placed to
collect data. Some of the programmes run by RST with schools and the community, such as Fitt Kidz and MK, could consider collection of weight-related data in addition to PA/pedometer information.

- Programme evaluation must be built into the cost of programmes and include baseline measurements and ongoing process and outcome evaluation. The University’s School of Population Health, AUT’s Department of Sport and Recreation, ARPHS Nutrition Service, ADHB’s Children and Young People’s Diabetes Prevention and Management Project, or private evaluators could provide some advice regarding the structure and evaluation of PA and nutrition programmes. The YAA programme has PA data that remains unevaluated due to lack of resources (funding and expertise). In future, YAA data could be evaluated with FWA data.

- Programmes that aim to increase PA need better measures of PA such as could be obtained with the use of sealed pedometers or accelerometers. Similarly, dietary measurements should be taken over a minimum of three days including one weekend day.

- There is a need for programmes targeted at individuals to be based on best models of behavioural change. Some work is being done in this area by ARPHS for adults (using computer-generated nutrition messages based on the stages of change model), and by Massey University’s Department of Commerce who are planning to look at the association between the success of obesity prevention programmes and the model of behavioural change on which programmes are based (Jacinta Hawkins, personal communication).

- More local public health measures need to be directed towards lower socioeconomic status families, with more research needed to determine how families are actually living and how this impacts on lifestyle. For example, 30% of the children attending KIA are from single families; a large proportion eat pies on the way to school for breakfast and buy energy-dense foods such as sausage rolls and soft drinks for lunch (Dr Teuila Percival, personal communication).

**Environment**

More nutrition/PA programmes in the Auckland region should incorporate non-host (i.e. environmental or vector based) interventions to help prevent childhood obesity, such as those described above under ‘national recommendations’. Currently, such interventions are limited to: healthy tuck
shop/nutrition policies in some schools and pre-schools (that have proven to be extremely difficult to maintain over time), removal of soft drink vending machines from some AIMHI schools, school travel plans such as TravelWise, food in schools and the breakfast in schools campaign, school and pre-school gardening projects, MHK, advocacy for policy and planning changes, and advocacy for fat taxes, food labelling, restricting TV food advertising to children and environmental change supporting PA.

SCHOOLS

- WSB and other forms of active transport need to be established and supported, particularly in the lower socioeconomic areas of Auckland. Research is needed to identify factors important to increasing their success in these areas.

- Many of the problems experienced locally by schools, such as teachers lacking the knowledge, confidence and time to teach nutrition or take PE classes; difficulty enforcing healthy food policies; lack of coordination between externally-provided programmes with programmes remaining separate from the school Health and Physical Education Curriculum; the absence of ‘obesity prevention’ from the school curriculum etc, could be resolved if there were intersectorial recognition of: (1) the importance of PA and good nutrition in schools, (2) the need for national school policy regulating: tuck shop food, soft drink and snack vending machines, daily PA coordinated and led by trained PE teachers, and the PA and nutrition opportunities in the wider school environment. To this end, as mentioned above, a concerted campaign is required to educate the Health and Education Sector and local schools/pre-schools about the importance of PA and nutrition especially in relation to childhood obesity.

COMMUNITIES

- Schools and communities need to lobby and work with councils to help plan and initiate the environmental changes, described above, that support PA and healthy nutrition.

- NHF could take a lead role in formulating school tuck shop food policy at a local or regional level.

ARPHS

- ARPHS, as the regional provider of public health services, could have a role in initially defining the relationship between Auckland health providers and the food industry, and subsequently working with industry on nutrition policy, product labelling with health
promotion messages, and promoting nutrition messages and healthy choices in supermarkets and food retail outlets.

- ARPHS could take a lead role in providing regional workshops educating tuck shop retailers in nutrition education. This could initially be done in schools enrolled in the NHF’s SFP and in HPS, and extended to all other schools in time. ARPHS could also have a role in advocating for environmental-level policy such as regional or nationwide healthy school food policy.

MINISTRY OF HEALTH

- There is a lack of awareness amongst providers of children’s PA and nutrition programmes available in the Auckland region. MOH and SPARC make efforts to coordinate the strategies that they fund and keep lists of providers. In addition, ANA is funded by the MOH to keep a national inventory of providers, programmes, and relevant research. However, there is a need to maintain more comprehensive, detailed and up-to-date lists of providers and programmes, increase provider awareness of, and access to, relevant programmes and providers, and further help providers build collaborative relationships in the area of childhood obesity prevention, nutrition, and PA.
References

15. Deurenberg P, Deurenberg-Yap M, Guricci S. Asians are different from Caucasians and from each other in their body mass index/body fat percent relationship. Obesity Reviews 2002;3:141-6.
69. OECD. OECD health data: OECD; 2003.


125. Horovitz B. Portion sizes and fat content out of control. USA Today 1996 February 20;Sect. 1.


164. Mattes R. Dietary compensation by humans for supplemental energy provided as ethanol or carbohydrate in fluids. Physiology and Behaviour 1996;59:179-87.


238. NZPA. $2.3m pledged to obesity trial. NZ Herald 02.06.2004.

251. Wylie A, Postlethwaite I, Casey E. Health promoting schools in northern region: overview of evaluation findings of pilot project: Health Funding Authority Northern Office; 2000.


291. SPARC. Push play day! Available at: www.pushplay.org.nz. SPARC Active Communities 2003;Spring:1-2.


312. Te Ora o Manukau - Manukau the Healthy City. The collaborative action plan on child poverty in Manukau 2003. Manukau City: Te Ora o Manukau - Manukau the Healthy City; 2003 November.


379. Northern Region Public Health Steering Group. Promoting physical activity and nutrition within a primary care environment: Ministry of Health; 2003 February.
384. Hennessy P. We will ban junk food TV adverts, says Labour. UK Telegraph 30/05/2004.


Appendices

Appendix 1: Auckland component of the Pacific Obesity Prevention in Communities (OPIC) study for children in Years 9 to 12.

SUMMARY OF AUCKLAND COMPONENT

1.1 Specific design features-South Auckland

1.1.1 Background:
A multi-sectoral intervention study is planned in Mangere, South Auckland, focused mainly around schools, but also involving Pacific Island churches and other local community settings. The intervention area was chosen because it has a large Pacific population and it is a reasonably localised area, which is bounded by water on three sides. This study meets all the concerns raised by a recent review of interventions for preventing obesity in children (191). It has an adequate sample size to detect achievable changes in BMI, an intensive intervention planned for a period of 30 months, and it is multi-faceted through the involvement of schools, parents and churches.

1.1.2 Design-School interventions:

Sample: The intervention group will comprise year 9-12 students (first 4 years of high school) from 4 co-educational high schools from the Mangere region who will be invited to participate in the survey. The control group will come from four control schools in other parts of South Auckland. Within each group, there are 2 schools with SES decile 1 rating and 2 with SES decile 2 rating. We have met with principals at the intervention schools, who all support the study. Other parts of Auckland with a significant Pacific community geographically distant to Mangere, such as West Auckland, are not suitable as the control area because their schools all have higher SES decile ratings (range of 3-6) and a lower proportion of Pacific pupils.

Interventions: During 2004 discussions will be held with schools to implement a range of school interventions, starting in Term 2 of 2005 after baseline measurements are taken in Term 1. We have met with community groups involved with school-based interventions, and we will incorporate their activities into the program: Manukau City Council (Health
Promoting Schools); Manukau District Health Board (Healthy Schools Project); Counties Manukau Sport (Sports Mark Quality Assurance Programme); and '5 Plus a Day' (school fruit donation programme). These organizations have agreed to focus their school-activities in the intervention schools. Gaps for implementing some interventions have been identified (eg. sporting equipment, payment for after-school sporting co-ordinators, provision of water fountains, subsidies for fruit purchased from school canteens) and have been budgeted into this application. A new curriculum package, specifically aimed at obesity prevention, will be developed for Years 9-11 (first 3 years of high school). This will be an intensive course, running for the 3 years, and will include a component on decreasing TV viewing. Resources for this are budgeted.

**Input & Outcome Measures**: Main measurements in intervention and control schools will be at baseline (term I, 2005), 12 months (term I, 2006), and 30 months (term 3, 2007) and will include: 1) Audits of the school environment, using the ANGELO framework; 2) Individual student diet and physical activity (including hours of watching TV) by the food frequency questionnaire and activity questions used in the NZ national children's nutrition survey. A general questionnaire will also collect information on demography (parents' occupation), ethnicity, name of church and frequency of attendance during the intervention period; 3) Individual student outcomes - weight and height (shoes removed and in light clothing, to calculate the primary outcome of BMI), abdominal circumference (for fat distribution), bioimpedance to measure body fat using an IMP 5 analyser, and blood pressure (in duplicate using an electronic Omron digital blood pressure monitor). Socio-cultural, economic and quality of life measurements will also be taken. All students (Pacific and non-Pacific) in Years 9-12 will be surveyed at each time point, so some will only contribute 12 or 18 months of follow up data. With an estimated 80% response rate and a 30% drop out rate at follow up, the effective sample size is expected to be approximately 1500.

1.1.3 Design -Church interventions:

**Sample**: There are 26 churches in Mangere, nearly all with Pacific Island congregations.
**Interventions:** The diet and activity program developed for Pacific churches by National Heart Foundation's Pacific Islands Heartbeat Programme will be promoted to all Pacific churches in the study region and run by Pacific Heartbeat. It involves a range of health activities (eg. cooking classes, aerobics sessions) that are supported by individual churches with signed agreements for completion.

**Input & Outcome Measures:** Since the individual measurements will be done in the school setting, our evaluation measures will only be at the church level. The input measures will focus on assessing the level of church-based activities that might affect the target age group during the 30-month follow-up period. This information will be used to develop a score of church exposure to interventions to rank students. Qualitative data (key informant interviews) will assess the changes that occur at a church level towards a supportive environment for healthy eating and physical activity.
Appendix 2: Key informant structured questionnaire.

**Key Informant Structured Questionnaire**

1. Name:

2. Organization:

3. Work role:

4. What child obesity prevention services do you offer?
   
   - Programme/intervention provided:
   
   - Target group (ages, settings):
   
   - Locality of service:
   
   - What, if any, evaluations have been done on your obesity prevention programme(s)?
   
   - What resources does your obesity prevention programme require (cost, people, time, materials)?
   
   - What, if any, gaps have you identified in the service delivery of this programme?

5. What gaps have you identified in wider Auckland’s child obesity prevention services:

6. What services or role do you think ARPHS could offer?

7. What research or surveys have you carried out on obesity prevention?

8. What other child obesity prevention services do you know of?
   
   - Service:
   
   - Contact details:
### Appendix 3: List of Auckland providers interviewed (ordered by organisation).

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
<th>Work Role</th>
<th>Interview Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paula Dudley</td>
<td>5 Plus-A-Day</td>
<td>General Manager</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Lilian Armitage</td>
<td>ADHB</td>
<td>PRO Funding</td>
<td>Interview</td>
</tr>
<tr>
<td>Wendy Cook</td>
<td>ADHB</td>
<td>Project Manager: Children and young peoples diabetes prevention and management project</td>
<td>Interview</td>
</tr>
<tr>
<td>Leanne Ellis</td>
<td>ADHB - Community Child &amp; Family Services</td>
<td>Public Health Nurse</td>
<td>Interview</td>
</tr>
<tr>
<td>Vikki Ham</td>
<td>ADHB - Community Child Health &amp; Disability Service</td>
<td>Health Promoting Schools Facilitator</td>
<td>Interview</td>
</tr>
<tr>
<td>Grace Hinder</td>
<td>ADHB - Community Child Health &amp; Disability Service</td>
<td>Team leader child and youth health</td>
<td>Interview</td>
</tr>
<tr>
<td>Fiona Smith</td>
<td>ADHB - Community Child Health &amp; Disability Service</td>
<td>Community Dietitian - Food with Attitude</td>
<td>Interview</td>
</tr>
<tr>
<td>Penny Wilson</td>
<td>ADHB - Community Child Health &amp; Disability Service</td>
<td>Team Manager early childhood health</td>
<td>Interview</td>
</tr>
<tr>
<td>Wayne Uittenfeld</td>
<td>ADHB - Starship Hospital</td>
<td>Diabetes Specialist: Kiwi Leader: Children and young peoples diabetes prevention and management project</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Trin Bradley</td>
<td>Aoteaore Moari Netball Oranga Healthy Lifestyle Trust</td>
<td>National health coordinator</td>
<td>Interview</td>
</tr>
<tr>
<td>June Manu</td>
<td>Aoteaore Moari Netball Oranga Healthy Lifestyle Trust</td>
<td>National coordinator</td>
<td>Interview</td>
</tr>
<tr>
<td>Evelyn Taumunu</td>
<td>Aoteaore Moari Netball Oranga Healthy Lifestyle Trust</td>
<td>Assistant national coordinator</td>
<td>Interview</td>
</tr>
<tr>
<td>Rangimarie Basset</td>
<td>ARPHS</td>
<td>Health promoting schools coordinator</td>
<td>Interview</td>
</tr>
<tr>
<td>Janet Chen</td>
<td>ARPHS</td>
<td>Asian public health coordinator</td>
<td>Interview</td>
</tr>
<tr>
<td>Chirs Cook</td>
<td>ARPHS</td>
<td>Dietitian: Mangere Healthy Ks and community health promotion</td>
<td>Interview</td>
</tr>
<tr>
<td>Cheryl Hamilton</td>
<td>ARPHS</td>
<td>Manager, Special Projects. Coordinator of PRO plans in Auckland</td>
<td>Interview/Follow-up</td>
</tr>
<tr>
<td>Annette Mortensen</td>
<td>ARPHS</td>
<td>Refugee and migrant health coordinator</td>
<td>Interview</td>
</tr>
<tr>
<td>Kasalanata Puniani</td>
<td>ARPHS</td>
<td>Nutrition and health promotion advisor. Pl pre-school gardening projects</td>
<td>Interview</td>
</tr>
<tr>
<td>Megan Yunks</td>
<td>ARPHS</td>
<td>Maori services development</td>
<td>Interview</td>
</tr>
<tr>
<td>Vivian Cheung</td>
<td>Asian Network Centre for Asian &amp; Migrant Health AUT</td>
<td>Charperson/ Researcher</td>
<td>Interview</td>
</tr>
<tr>
<td>Erica Laws</td>
<td>Auckland City Council</td>
<td>Leisure Manager</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Sue Kendall</td>
<td>Auckland Regional Council</td>
<td>Walking School Buses Coordinator</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Kyn Ne'ema</td>
<td>Auckland PAC</td>
<td>Project Management</td>
<td>Interview</td>
</tr>
<tr>
<td>Susie Yamefuna</td>
<td>Auckland PAC</td>
<td>Practice Nurse</td>
<td>Interview</td>
</tr>
<tr>
<td>Elaine Rush</td>
<td>AUT</td>
<td>Body Composition &amp; Metabolism Research Centre</td>
<td>Interview</td>
</tr>
<tr>
<td>Grant Scholfield</td>
<td>AUT</td>
<td>Senior lecturer (sport &amp; recreation)</td>
<td>Interview</td>
</tr>
<tr>
<td>Carolyn Watts</td>
<td>Cancer Society</td>
<td>Ex-dietician. Fruit/vege campaign (Wgtn)</td>
<td>Interview</td>
</tr>
<tr>
<td>Simon Denny</td>
<td>Centre for Youth Health</td>
<td>Youth2000 report NZDA Conference 2003</td>
<td>Interview</td>
</tr>
<tr>
<td>Peter Watson</td>
<td>Centre for Youth Health</td>
<td>Manager. Clinics for 2 diabetes</td>
<td>Phone interview</td>
</tr>
<tr>
<td>John Newman</td>
<td>Centre for Youth Health (WOHB)</td>
<td>Paediatrician (Futures West clinics)</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Pat Fagan</td>
<td>CMDHB</td>
<td>Professional Leader &amp; Dietitian CMDHB</td>
<td>Interview</td>
</tr>
<tr>
<td>Arun Gangadhikshar</td>
<td>CMDHB</td>
<td>Paediatric Fellow</td>
<td>Interview/Follow-up</td>
</tr>
<tr>
<td>Andrew Lindsay</td>
<td>CMDHB</td>
<td>PRO contracts CMDHB</td>
<td>Interview</td>
</tr>
<tr>
<td>Alison Vogel</td>
<td>CMDHB</td>
<td>Paediatrician CMDHB</td>
<td>Interview</td>
</tr>
<tr>
<td>Jude Woolston</td>
<td>CMDHB</td>
<td>Projects co-ordinator: Healthy schools</td>
<td>Interview</td>
</tr>
<tr>
<td>Alison Sykora</td>
<td>Coca Cola</td>
<td>Activity/Balance/Choice campaign</td>
<td>Interview</td>
</tr>
<tr>
<td>Cathy Newman</td>
<td>Counties Manukau Sports Foundation</td>
<td>Team Leader Sport Development</td>
<td>Interview</td>
</tr>
<tr>
<td>Lance Watene</td>
<td>Counties Manukau Sports Foundation</td>
<td>Active living team leader</td>
<td>Email response</td>
</tr>
<tr>
<td>Helen Gibb</td>
<td>Diabetes Projects Trust (Sth Ak)</td>
<td>Dietitian</td>
<td>Interview</td>
</tr>
<tr>
<td>Karen Pickering</td>
<td>Diabetes Projects Trust (Sth Ak)</td>
<td>Manager</td>
<td>Interview</td>
</tr>
<tr>
<td>Judy Rowden</td>
<td>Diabetes Projects Trust (Sth Ak)</td>
<td>Nurse. Adolescence project co-ordinator. Lifestyles.</td>
<td>Interview</td>
</tr>
<tr>
<td>Kate Smallman</td>
<td>Diabetes Projects Trust (Sth Ak)</td>
<td>Lifestyle Nurse Co-ordinator</td>
<td>Interview</td>
</tr>
<tr>
<td>Robyn Yoomah</td>
<td>POE (Fight the Obesity Epidemic)</td>
<td>Spokesperson (Endocrinologist-Wgtn)</td>
<td>Email response</td>
</tr>
<tr>
<td>Robin White</td>
<td>POE (Fight the Obesity Epidemic)</td>
<td>Editor of POE</td>
<td>Email response</td>
</tr>
<tr>
<td>Katherine Clarke</td>
<td>Haepai Te Haurua Tapu Ltd</td>
<td>Chief Executive Officer</td>
<td>Interview</td>
</tr>
<tr>
<td>Ria Burgess</td>
<td>Harbour Sport</td>
<td>Physical Activity Co-ordinator</td>
<td>Interview</td>
</tr>
<tr>
<td>Sarah Cunningham</td>
<td>Harbour Sport</td>
<td>CEO</td>
<td>Interview</td>
</tr>
<tr>
<td>Eden Puni</td>
<td>Health Star Pacific</td>
<td>PH health ( preschool, school, radio programmes)</td>
<td>Interview</td>
</tr>
<tr>
<td>Alan Greenslade</td>
<td>HealthWest PHO</td>
<td>CEO</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Trinh Lawher</td>
<td>HealthWest PHO</td>
<td>Project Manager Westinds</td>
<td>Interview</td>
</tr>
<tr>
<td>Colleen Stewart</td>
<td>HealthWest PHO</td>
<td>Dietitian</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Feula Percival</td>
<td>Kids First</td>
<td>Paediatrician (obesity clinic)</td>
<td>Interview</td>
</tr>
<tr>
<td>Jane Harding</td>
<td>Liggins Institute</td>
<td>Barker's hypothesis</td>
<td>Email response</td>
</tr>
<tr>
<td>Gillian Rushion</td>
<td>Lynfield College</td>
<td>Teacher (Food and Nutrition)</td>
<td>Interview</td>
</tr>
<tr>
<td>Yvonne Townsend</td>
<td>Lynfield College</td>
<td>Faculty Manager/Teacher in Home Economics</td>
<td>Interview</td>
</tr>
<tr>
<td>Shelley Edwards</td>
<td>Manukau City Council</td>
<td>Health promoting schools manager</td>
<td>Interview</td>
</tr>
<tr>
<td>Tony Kake</td>
<td>Manukau City Council</td>
<td>Manager of community advocacy and funding</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Sam Noon</td>
<td>Manukau City Council</td>
<td>Community leisure planner</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Heather Smith</td>
<td>Manukau City Council</td>
<td>Food in schools programme</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Sue Zimmerman</td>
<td>Manukau City Council</td>
<td>Planner for health and wellbeing</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Pauline Ashfield-Watt</td>
<td>Massey University (Albany)</td>
<td>Lecturer (Nutrition). Evaluation of 5+ a day.</td>
<td>Mail</td>
</tr>
<tr>
<td>Jocinia Hawkins</td>
<td>Massey University (Albany)</td>
<td>PhD in childhood obesity prevention programmes</td>
<td>Interview</td>
</tr>
<tr>
<td>Elizabeth Stewart</td>
<td>Massey University (Albany)</td>
<td>Evaluation for 5+ a day with Dr Ashfield.</td>
<td>Interview</td>
</tr>
<tr>
<td>Phillipa Vanek</td>
<td>McCauley High School</td>
<td>School nurse (AIM HI school)</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Beverley O'Laughlin</td>
<td>McCauley High School</td>
<td>School nurse (AIM HI school)</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Shayne Nahu</td>
<td>Ministry of Health (Penrose)</td>
<td>Portfolio Manager: Public Health Directorate</td>
<td>Interview</td>
</tr>
<tr>
<td>Barbara Lusk</td>
<td>Ministry of Health (Penrose)</td>
<td>Portfolio Manager: nutrition &amp; physical activity contracts</td>
<td>Interview</td>
</tr>
<tr>
<td>Megan Grant</td>
<td>Ministry of Health (Wellington)</td>
<td>Portfolio Manager: Health Promotion plan</td>
<td>Interview</td>
</tr>
<tr>
<td>Moananu Okesene</td>
<td>MOH/PHA Ltd</td>
<td>MOH/PHA programmes</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Anna Lindross</td>
<td>National Heart Foundation</td>
<td>School settings manager</td>
<td>Interview</td>
</tr>
<tr>
<td>Carol Murray</td>
<td>North Shore City Council</td>
<td>Road safety co-ordinator</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Bernadette Walsh</td>
<td>North Shore City Council</td>
<td>CEO</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Bronwen</td>
<td>NZ Nutrition Foundation</td>
<td>Breakfast in schools campaign</td>
<td>Interview</td>
</tr>
<tr>
<td>Celia Murphy</td>
<td>Obesity Action Coalition (Wellington)</td>
<td>Coalition Director</td>
<td>Email response</td>
</tr>
<tr>
<td>Name</td>
<td>Position/Role</td>
<td>Setting</td>
<td>Status</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------------------------</td>
<td>------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Henga Amosa</td>
<td>Pacific Islands Heartbeat Programme</td>
<td>Church</td>
<td>Interview</td>
</tr>
<tr>
<td>Maria Cassidy</td>
<td>Pacific Islands Heartbeat Programme</td>
<td>Nutritionist</td>
<td>Interview</td>
</tr>
<tr>
<td>Mafi Funaki-Tahifote</td>
<td>Pacific Islands Heartbeat Programme</td>
<td>Dietitian</td>
<td>Interview</td>
</tr>
<tr>
<td>Estelle Meuller</td>
<td>Pasifika Health Care</td>
<td>CEO</td>
<td>Interview</td>
</tr>
<tr>
<td>Annetis Schwalger-Miller</td>
<td>Pasifika Health Care</td>
<td>Pi preschools</td>
<td>Interview</td>
</tr>
<tr>
<td>Siobhan Match</td>
<td>People's Health Trust</td>
<td>Manager</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Jenny Tanner</td>
<td>PHO (Health West)</td>
<td>Health promotion in schools coordinator</td>
<td>Resigned</td>
</tr>
<tr>
<td>Nicola Young</td>
<td>Procare</td>
<td>Health Promoter</td>
<td>Mail</td>
</tr>
<tr>
<td>Sue Grant</td>
<td>Public Health Nurse, Pukekohe</td>
<td>Health promoting schools facilitator</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Elaine Preston</td>
<td>Raukora Hauora o Tainu</td>
<td>Executive Manager of Whanau &amp; Community Health</td>
<td>Interview</td>
</tr>
<tr>
<td>Jackie Dawson</td>
<td>Rodney City Council</td>
<td>Road safety coordinator</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Karlyne Barry</td>
<td>Southern Cross High School</td>
<td>Health Centre Manager</td>
<td>Interview</td>
</tr>
<tr>
<td>Debbie Edwards</td>
<td>SPARCS</td>
<td>Auckland regional sport and recreation strategy</td>
<td>Interview</td>
</tr>
<tr>
<td>Lisa Logan</td>
<td>Sport Auckland</td>
<td>Green prescription manager, Auckland</td>
<td>Interview</td>
</tr>
<tr>
<td>Simon Peterson</td>
<td>Sport Auckland</td>
<td>Chief executive</td>
<td>Interview</td>
</tr>
<tr>
<td>Rachelle Hobbs</td>
<td>Sport Waitakere</td>
<td>Programme co-ordinator (Fit Kidz Programme)</td>
<td>Kay Lindley</td>
</tr>
<tr>
<td>Kay Lindsey</td>
<td>Sport Waitakere</td>
<td>Active living manager</td>
<td>Interview</td>
</tr>
<tr>
<td>Aumea Herman</td>
<td>Tau Pacifica</td>
<td>Health promoter/ public health registrar</td>
<td>Interview</td>
</tr>
<tr>
<td>Soana Maumuhiheata</td>
<td>Tau Pacifica</td>
<td>Community health promoting Dietitian</td>
<td>Interview</td>
</tr>
<tr>
<td>Laurie Wharemate</td>
<td>Te Huto Manawa Maori</td>
<td>Nutrition &amp; physical activity manager</td>
<td>Interview</td>
</tr>
<tr>
<td>Julia Peters</td>
<td>Tikapa Moana PHO</td>
<td>Health Promoter</td>
<td>Interview</td>
</tr>
<tr>
<td>Te Ata Teau</td>
<td>Tuakau Homebuilders</td>
<td>CEO</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Robert Scragg</td>
<td>University of Auckland</td>
<td>Lead researcher: the Pacific Obesity Prevention in Communities Project</td>
<td>Interview</td>
</tr>
<tr>
<td>Lynne Eagle</td>
<td>University of Massey (Albany)</td>
<td>Associate professor in marketing, Department of Commerce</td>
<td>Interview</td>
</tr>
<tr>
<td>Rocky Tahuri</td>
<td>Waipareira Trust</td>
<td>Team Leader - public health arm</td>
<td>Interview</td>
</tr>
<tr>
<td>Helen Anderson</td>
<td>Waitakere City Council</td>
<td>Leisure projects leader</td>
<td>Interview</td>
</tr>
<tr>
<td>Joanne Evans</td>
<td>WDHB</td>
<td>Health promotion</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Maria Kekua</td>
<td>WDHB</td>
<td>Public health nurse</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Hope Munro</td>
<td>WDHB</td>
<td>Health Promoting Schools Co-ordinator Waitakere</td>
<td>Interview</td>
</tr>
<tr>
<td>Robyn Whittaker</td>
<td>WDHB</td>
<td>Childhood obesity prevention</td>
<td>Interview</td>
</tr>
<tr>
<td>Sue Wilson</td>
<td>WDHB</td>
<td>Public Health Nurse</td>
<td>Phone interview</td>
</tr>
<tr>
<td>Robyn Kimmars</td>
<td>WDHB - Community Child &amp; Family Services</td>
<td>Health Promoting Schools Co-ordinator North Shore</td>
<td>Interview</td>
</tr>
</tbody>
</table>
Appendix 4: List of programmes in Auckland having a role, or potential role, in childhood obesity prevention.

<table>
<thead>
<tr>
<th>Programme/ Organisation</th>
<th>Target Group (ages/ settings)</th>
<th>Interventions</th>
<th>Locality</th>
<th>Evaluation/ Measured Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting: Schools</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Adolescent obesity & diabetes prevention programme. Diabetes Projects Trust & NEW working party. | 13-14 year-olds (form 3=Year 9). High Schools. | *Roadshow to explain the interventions, including a healthy eating/ PA video.  
*Workshops one morning a month on aspects of healthy lifestyle.  
*Lunch-time physical activity classes 3x a week.  
*Healthy tuck shop contract; removal of coca cola from vending machines etc.  
*Student health council. | AimHi Schools in Manukau. Currently established in two AimHi schools: Southern Cross College and McAuley High School. | None. Plans to evaluate the roadshow video and interventions. Completed pilot survey (Year 9 assessment) of all AimHi schoolchildren. Southern Cross have also evaluated children’s attitudes to the Year 9 assessment. |
| Health Promoting Schools. Ministry of Health/ Ministry of Education. | 5-12 year-olds (Year 1 to Year 8). Primary Schools. | Various PA and nutrition services in schools where increasing activity and improving nutrition have been identified as priority areas. For example, healthy tuckshop policy, augmented nutrition education given as part of the school curriculum, the NHF School Food Programme, WSB, lunchtime PA organised by Sports’ Trusts such as the “Young and Active” programme run by Sport Auckland in conjunction with FWA etc. | Primary schools throughout the Auckland region. Nationwide project. | Evaluations have been done on WSB, FWA, and the NHF School Food Programme. FWA is the only programme measuring and evaluating BMI outcomes. Young and Active also measures BMI outcomes but results have not been reported or evaluated. Broader evaluations of the HPS programme have been done, but the overall effect on weight has not been assessed. |
| The School Food Programme. National Heart Foundation. | Primary and secondary schools. | *Providing food choices consistent with the Food and Nutrition Guidelines by ensuring that an appropriate school food and nutrition policy is implemented.  
*Promoting/marketing healthy foods to students, staff, parents and caregivers.  
*Nutrition education in the classroom using units developed from the ‘Health and Physical Education’ school curriculum.  
*Promoting nutrition to the wider school community | Nationwide. | Outcome evaluations were conducted in 1992, 1999, and 2004 (in progress). No weight-related outcomes reported. Outcomes evaluated were changes in the school food environment. |
| The Pacific Obesity Prevention in Communities Study. The University of Auckland and Deakin University, Australia. | Years 9 to 12 children (13-16 years-old). Secondary Schools. | RCT with multi-component interventions. Interventions will involve nutrition/PA education, environmental changes, and increased PA. | Mangere Secondary Schools (x8) and Mangere churches mainly PI (x26). | *Weight-related measures: BMI, abdominal circumference, and bio-impedance to measure body fat.  
*Individual measures of diet and PA.  
*Audits of the school environment.  
*The level of church-based activities that might affect the target age group will be assessed and used to develop a score of church exposure to interventions to rank students. |
| 5+ A Day. United Fresh NZ Inc. | Mainly preschool and primary school children. | *Fruit and vegetable nutrition education packages supplied to teachers of 5+ A Day schools and preschools.  
*Trial of fruit to schools programme in 10 year-old South | Nationwide in interested primary and preschools. Also part of some Food | Evaluations have been conducted: Baseline evaluation in 1995. Outcome evaluation in 1999 of knowledge of nutrition, and fruit consumption. |
<table>
<thead>
<tr>
<th><strong>Breakfast in Schools Campaign.</strong> NZNF.</th>
<th>Auckland schoolchildren.</th>
<th>Technology courses at secondary schools.</th>
<th>Consumer survey 2001 of fruit consumption. Two evaluations in progress assessing consumer knowledge and consumption. No weight-related outcomes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainly primary school children and some preschool children.</td>
<td>*Nutritious school breakfasts. *Teachers' resource packs containing educational material.</td>
<td>Nationwide to primary and intermediate schools.</td>
<td>Evaluation conducted in 2002 which showed that 70% of participants always ate breakfast, 12% sometimes, and 18% never. 71% reported changes in their eating habits including having breakfast and choosing cereals in place of left-over dinner. No weight-related outcomes measured.</td>
</tr>
</tbody>
</table>


| **Jump Rope for Heart. National Heart Foundation.** | Primary school children. | *School curriculum-based skipping skills and activities. *JRFH promotional activities such as "Jump Rope All Stars" visits. *JRFH workshops to educate teachers about the programme and how it links with the schools' Health and Physical Education Curriculum. | Nationwide to primary schools. Evaluation to be conducted in 2004. No weight-related outcomes. |


| **Setting: Pre-Schools** | Under five years-old. | Nationwide to preschool centers. | Pilot evaluation: Intervention centres were more likely to have nutrition (p<0.0001) and PA (p<0.0001) policies, lunchbox guidelines (p=0.015), food menus that cycled between different healthy choices on a periodic basis (p=0.052), parents in education sessions (p=0.005), children were more likely to have a piece of fruit or vegetable (p=0.0008) and less likely to have salty pre-packaged snack food (p=0.034) in their lunchboxes. The intervention teachers showed increases in nutrition and PA knowledge scores (p=0.029). No weight-related outcomes. |

| **Healthy Heart Award. NHF.** | HHA pack aiming to achieve the following seven criteria: *Provision of healthy food which involves either sending in guidelines for parents about lunchbox contents or sending in a copy of the menu if the centre has a food service. *A written nutrition policy. *A written PA policy. *Parent/whanau education. *Professional development. *PA linked to the Early Childhood Curriculum (283), including documenting the daily PA available to children. *Curriculum linked nutrition activities including documenting the weekly healthy food activities available to children. | Nationwide to preschool centers. | No formal evaluations. Body weight is recorded by Well Child services. |

| **ADHB Services. ARPHS and Community Child Health and Disability Services.** | Under five years-old. | Auckland early childhood centres. | No formal evaluations. Body weight is recorded by Well Child services. |

<table>
<thead>
<tr>
<th>Setting: Family</th>
<th></th>
<th>Setting: Primary Health Care</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food With Attitude.</strong> Community Child Health &amp; Disability Service (ADHB).</td>
<td>5-12 year-olds and their families. One-year programme.</td>
<td><strong>Modified Green Prescription Project. ProCare PHO.</strong></td>
</tr>
<tr>
<td><em>Individual goal-setting, nutrition education, and on-going assessments using a 'stages of change' model and engaging family support.</em></td>
<td></td>
<td>Adults (≥18 years old) currently. Plans to extend and modify the programme to</td>
</tr>
<tr>
<td></td>
<td>ADHB area.</td>
<td>*Procare patients that are overweight/obese etc are given a green prescription which prescribes participation in PA programmes that are provided by the regional sports trusts.</td>
</tr>
<tr>
<td><strong>Young &amp; Active. Sport Auckland.</strong></td>
<td>FWA participants referred to YAA via a green prescription. One-year programme.</td>
<td></td>
</tr>
<tr>
<td><em>Individual goal-setting, PA education, and assessments engaging family support.</em></td>
<td>ADHB area.</td>
<td>Current plans include the Procare population in Mt Roskill, Manurewa, and Clendon areas.</td>
</tr>
<tr>
<td><em>Weekly group PA sessions held by Sport Auckland.</em></td>
<td></td>
<td>The proposed evaluation will measure the primary outcome of change in PA, and the secondary outcome of change in BMI. Secondary outcome measures will include monthly BMI and waist-hip</td>
</tr>
<tr>
<td>Programme</td>
<td>Population</td>
<td>Services</td>
</tr>
<tr>
<td>-----------</td>
<td>------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Support for various existing programmes. East Health PHO.</strong></td>
<td>Preschool and school-age children.</td>
<td><em>Well-child checks.</em> <em>Supports the NHF’s school food programme, children’s WSB, and collaborates with schools to improve PA through the health and physical education curriculum.</em> East Health PHO population in the CMDHB area.</td>
</tr>
<tr>
<td><strong>Various programmes. TaPasifika PHO.</strong></td>
<td>Pre-school and primary school children.</td>
<td><em>KIA programme run by South Seas Health Care.</em> <em>School breakfast programme supported by Health Pacifica.</em> <em>Pre-school programmes: TaPasifika - well-child programme to Pacific pre-schools. Pasifika Healthcare - advocacy for pre-school nutrition policies, a pre-school dance to music programme four nights a week for 3 to 5 year-olds and a gardening programme with pre-schools. This is being extended to show parents how to cook and prepare garden produce.</em> TaPasifika PHO population throughout the South (South Seas Health Care, Health Pacifica Ltd) and West (Pasifika Healthcare) Auckland region.</td>
</tr>
<tr>
<td><strong>HealthWEST PHO.</strong></td>
<td>Children of all ages.</td>
<td><em>Provide annual support for the Push-Play campaign.</em> <em>A dietitian is contracted by HealthWEST for GP referrals - offers a service based on the nutrition component of FWA but not funded by HealthWEST so patients must pay.</em> HealthWEST PHO population in West Auckland.</td>
</tr>
<tr>
<td><strong>Move for Health “Hikoi mo te Oranga”, and Child/Rangitahi Health programme. North Harbour PHO.</strong></td>
<td>Move for Health: all ages (adults and children). Child Health: primary and intermediate aged children.</td>
<td><em>Move for Health: PA programme one day a week at the Birkenhead Leisure Centre, aimed at all community members.</em> <em>Child Health: social workers identify health issues of importance to children, such as obesity, and offer parents information about available services. Plan to develop a nutrition programme using the FWA framework so that overweight/obese children could be referred to the dietitian services currently offered by North Harbour PHO.</em> North Harbour PHO population in North Auckland.</td>
</tr>
<tr>
<td><strong>The Centre for Youth Health.</strong></td>
<td>Focus on adolescent youth.</td>
<td><em>Clinical services for youth with chronic, complex health issues.</em> <em>Assistance to other youth health providers.</em> <em>Education and training opportunities for tertiary students in youth health.</em> <em>Kidz First Resource and Information Service.</em> <em>Research on a range of relevant adolescent health studies.</em> <em>Advocacy for policy, planning and legislation that addresses the healthy development and well being of youth.</em> South Auckland.</td>
</tr>
<tr>
<td><strong>Children and Young People’s Diabetes Prevention and Management Project.</strong></td>
<td>Children and youth.</td>
<td><em>Database of educational and health promotion materials on nutrition, obesity, and diabetes established and maintained.</em> *Training of primary care providers in the use of health Auckland region.</td>
</tr>
<tr>
<td><strong>ADHB.</strong></td>
<td><strong>Setting: Maori Providers</strong></td>
<td><strong>Wai Health Programmes.</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><em>Training of health workers, school teachers, and community leaders in diabetes and obesity prevention and management.</em>&lt;br&gt; <em>Collaboration with/mobilisation of agencies such as PHOs, community groups, schools, ACC (Auckland City Council), Sports Auckland, and the private sector, to work in obesity prevention and management.</em>&lt;br&gt; <em>Establishment of an 0800 line for obesity prevention and management.</em>&lt;br&gt; <em>Supporting community-based research programmes in the Auckland region.</em>&lt;br&gt; <em>Supporting priority groups that promote healthy community environments for obesity prevention and management.</em>&lt;br&gt; <em>External review by an overseas expert is planned.</em>&lt;br&gt; Specific outcome measures have not yet been stated, although results from the FWA programme will continue to be monitored, and hospital admission/length of stay data will be available for children with diabetes and obesity-related diseases.</td>
<td><em>Developing and adapting the NHF’s Healthy Heart Award for Maori pre-school children.</em>&lt;br&gt; <em>Nutrition and PA education resources including posters, pamphlets, booklets (such as their recipe booklet aimed at Maori youth), and newsletters.</em>&lt;br&gt; <em>Advisory and advocacy role.</em></td>
<td><em>Child care services: well child checks to kohanga reo, kura kaupapa and whakakura, a child health service for tamariki aged 1 month to 5 years, and a Parents As First Teachers programme that involves visits from a personal educator, for families with 0-3 year-old children.</em>&lt;br&gt; <em>Public health services: ‘Kai and Nutrition’ training certificate, annual national nutrition hui 2004, healthy nutrition displays and promotions to community groups such as kura kaupapa, kohanga reo, churches, and young mothers groups, daily PA programmes, the youth transition programme targeting 12-18 year-olds which includes rap, break-dancing, and tagging/bombing (mural painting).</em>&lt;br&gt; <em>A nutritionist and dietitian (visits from AUT once a week) are available for healthy lifestyle and kai advice.</em>&lt;br&gt; <em>Free clinical service to children &lt;18 years, a weekly mobile clinic to schools, kohanga reo, kura kaupapa, and caravan park locations in West Auckland.</em>&lt;br&gt; <em>Te Rito early childhood centre with a focus on health.</em></td>
</tr>
<tr>
<td>Setting: Community Providers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Food in Schools.</strong> Manukau City Council.</td>
<td>Pre-school and school-aged children.</td>
<td>*Healthy lunches and breakfasts are supplied to 40 schools including Kohanga Reo and early education centres.</td>
</tr>
<tr>
<td><strong>Walking School Buses.</strong> Auckland TLAs and ARC.</td>
<td>Primary school children.</td>
<td>*Children walk to and from school under adult supervision (usually two parents with one acting as a front driver and one a back conductor) along a set route complete with</td>
</tr>
<tr>
<td>Setting: Refugee and Migrant Health</td>
<td>Setting: Food Industry</td>
<td></td>
</tr>
<tr>
<td>------------------------------------</td>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td>Refugee and Migrant Health. ARPHS/ CCHDS.</td>
<td>All ages.</td>
<td></td>
</tr>
<tr>
<td>None. No weight-related outcomes measured.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Various community services. ARPHS.</th>
<th>All ages.</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Mangere Healthy Kai evaluation April 2004: percentage of shoppers who ate a healthy kai choice for their last meal/snack at MTC increased from 32% in September 2003 to 57% in April 2004 amongst those aware of MHK. Approximately half of those surveyed were aware of the MHK programme. Changes amongst MHK retailers included more fish being grilled than fried, and more sandwiches and fewer pies being sold. *No weight-related outcomes monitored.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Public Health Dietitians.</th>
<th>All ages.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluations of programmes PHD are involved in has often been done e.g. FWA, PIH, MHK etc (see above).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advocacy Groups. FOE, OAC, ANA.</th>
<th>All ages with a focus on children.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>*A school health council promoting a different project each term e.g. nutrition, sun smart awareness etc. * PA coordinators (hired AUT students) to take lunch-time PA. * Tuck shop enrolled in the SFP. Tuck shop and school have undertaken not to advertise unhealthy foods. * Parents walking group/ evening exercise classes.</td>
<td>Bruce McLaren Intermediate School.</td>
</tr>
<tr>
<td>None. No weight-related outcomes monitored.</td>
<td></td>
</tr>
</tbody>
</table>

| Stops that allow children to embark and disembark. | WSBs per day; 1046 car trips saved per day; two thirds report neighbourhood improvements; gradient in favour of higher decile school communities with proportionately low numbers of WSBs in Manukau City. |
Various programmes - most in partnership with health-promoting organisations.  

All ages.  

*Mangere Healthy Kai.  
*McDonalds 'Salads Plus' menu.  
*Pick the Tick.  
*Watties nutrition pamphlets advising on babys' and young children's nutrition.  
*PA resources: Nestle 'Be Healthy Be Active'; Coca-Cola 'activity, balance, choice’ and OSCAR PA programme; McDonalds 'Eat Smart Be Active'.  

Auckland region and national.  

None.

<table>
<thead>
<tr>
<th>Setting: Policy</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Setting: Transportation and Town Planning</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Various.</td>
<td>All ages.</td>
<td>*Local Government Act 2002: Community plans must reflect community’s environmental, social needs etc. *Transit-oriented neighbourhoods. *USA Department of Transportation: Interventions to increase transportation by walking and cycling.</td>
<td>National and International.</td>
</tr>
</tbody>
</table>