

ACE-Obesity

Assessing Cost-effectiveness of obesity interventions in children and adolescents

Summary of Results

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Foreword

This report, *Assessing Cost-Effectiveness of Obesity interventions in Children* (ACE-Obesity) represents an important milestone in the compilation of evidence regarding the efficacy and value for money of a number of important public health interventions aimed at reducing obesity in children. It is the first time that a comprehensive and systematic approach has been taken to analysing the potential for such interventions to be ranked in terms of their cost-effectiveness. As a result it is now possible to provide comment on the likelihood of interventions being good buys or cost-saving for government. This work indicates the commitment in Victoria to delivering the best possible approaches to tackling one of the most significant public health problems now facing our community.

The study leading to the results contained in this report was designed almost three years ago. It was then apparent that the emerging obesity epidemic in Victoria and more widely across Australia was requiring an urgent and comprehensive response from public health policy makers. An initial examination of the information accessible to support decision-making by these policy makers revealed that there was a critical need to improve our knowledge of the problem. The material in this report represents a significant step in bringing together the best available evidence so that government can have greater confidence in weighing up appropriate intervention options.

The project has reviewed all available evidence regarding the efficacy of most recognised public health interventions designed to prevent obesity in children. From an initial list of around 30 interventions that were considered to be of potential public health importance, 13 were ultimately selected for this detailed study, as they were the only interventions where the available level and quality of evidence was sufficient to allow for a full economic analysis to be completed. The findings presented are consequently focused on a small number of prevention initiatives and do not represent all the possible options available to the public health community in tackling obesity.

The release of this report lends timely support to the commitment of the Victorian government in dealing with obesity. It also provides the opportunity for a more robust debate regarding key intervention choices that need to be made in order to improve the future health of our population. The material contained in this report relates closely to important information on the health of Victorians that is available in other publications. Readers are especially referred to the *Victorian Burden of Disease Study – Mortality and morbidity in 2001* and *Your Health – A report on the health of Victorians in 2005*. Both reports are accessible at <http://www.health.vic.gov.au/healthstatus/>



DR ROBERT HALL

Director, Public Health and Chief Health Officer
Rural and Regional Health and Aged Care Services
Department of Human Services

Acknowledgements

The Department of Human Services wishes to acknowledge the major contribution of the working group listed in Table 1.

The working group members were actively involved in:

- determining the interventions to be evaluated by the researchers
- providing input into the methods to be used, including the weight to be given qualitatively to different aspects of benefit (for example, cost-effectiveness, capacity to reduce inequity, acceptability to stakeholders)
- providing evidence and information on interventions within their own areas of expertise
- critically examining the evidence and analyses presented by the researchers
- formulating conclusions based on the presented evidence
- where appropriate, assisting with the dissemination, implementation and public discussion of results.

Thanks are also directed to the members of the Research team (Table 2) which was made up of both DHS staff and external personnel. This team has worked tirelessly to ensure that the project was completed at the highest possible standard and in a timely manner. The research team and working group members are indebted to Ms Barbara Scott and Ms Lorna Harrold for their work in supporting the project, especially in the compilation of the complex documentation required for all working group meetings.

Table 1 Membership of the ACE–Obesity Working Group

Name	Position and organisation	Role
Dr Robert Hall (Chair)	Director, Public Health and Chief Health Officer, Department of Human Services, Victoria	State policy maker
Dr Michael Ackland (Deputy Chair)	Manager, Health Surveillance and Evaluation Section, Department of Human Services, Victoria	State policy maker
Bill Bellew/ Elizabeth Devlen	Director, Health Promotion Branch, NSW Health Department	State policy maker
Associate Professor Rob Carter	Deputy Director, Program Evaluation Unit Head, Health Economics Group, School of Population Health, The University of Melbourne	Consultant to project, health economist, expert in priority setting
Professor John Catford	Dean, Faculty of Health and Behavioural Sciences, Deakin University	Obesity expert, expert in public health policy, Chair – Scientific Advisory Committee of the National Obesity Taskforce
Bonnie Field	National Centre for Monitoring Cardiovascular Diseases, Diabetes and Risk Factors, Australian Institute of Health and Welfare	Expert in analysis of obesity data
Dr Tim Gill	Executive Officer, Australasian Society for the Study of Obesity, Human Nutrition Unit, University of Sydney	Chair, Healthy Weight Alliance of NGOs, Australasian Society for the Study of Obesity, obesity expert
Dr Michelle Haby	Senior Epidemiologist Health Surveillance and Evaluation Section, Department of Human Services, Victoria	Project Manager, epidemiologist
Brian Harrison	Population Health Division, Australian Department of Health and Ageing	Australian Government policy maker, National Obesity Taskforce, health economist
Kellie-Ann Jolly and John Biviano – shared position	Director, Physical Health, VicHealth Director, Research Workforce and Tobacco Control, VicHealth	Experts in health promotion and obesity prevention programs
Dr Mark Lawrence and Cate Burns	Convenor, Food and Nutrition Special Interest Group, Public Health Association of Australia, School of Exercise and Nutrition Sciences, Deakin University	Member of Public Health Association of Australia, obesity expert
Dr Amanda Lee	Principal Public Health Nutritionist,	State policy maker

Name	Position and organisation	Role
Tony McBride	Statewide Health Promotion Unit, Public Health Services, Queensland Health Chief Executive Officer, Health Issues Centre, La Trobe University	Consumer perspective
Karen McIntyre	Manager, Health Development, Department of Human Services, Victoria	State funder of obesity prevention programs, State policy maker
Jan Norton	Director, Social and Environmental Health, Department of Human Services, Victoria	State policy maker, National Obesity Taskforce
Professor Boyd Swinburn	Director, Leptos Australia Pty Ltd Professor of Population Health, Centre for Physical Activity and Nutrition Research, Deakin University	Consultant to project, obesity expert
Assoc Prof Theo Vos	Centre for Burden of Disease and Cost- Effectiveness, School of Population Health, University of Queensland Senior Epidemiologist, Health Surveillance and Evaluation Section, Department of Human Services, Victoria	Expert in burden of disease and cost-effectiveness
Dr Melissa Wake	Associate Professor Director, Research and Public Health Centre for Community Child Health, Royal Children's Hospital, Victoria	Child obesity expert, paediatrician
Rowland Watson	Team Leader, Healthy Living Strategies, Health Development, Department of Human Services, Victoria	State funder of obesity prevention programs, State policy maker
Anna Peeters	Monash University	Researcher
Helen Egan	Executive officer Australian Chronic Disease Alliance	Chronic Disease expert
John Goss	AIHW	Economic and statistical expertise

Table 2 ACE–Obesity research team

Name	Position
Dr Michelle Haby	Senior Epidemiologist Health Surveillance and Evaluation Section, Department of Human Services, Victoria
Associate Professor Rob Carter	Deputy Director, Program Evaluation Unit Head, Health Economics Group, School of Population Health, The University of Melbourne
Professor Boyd Swinburn	Director Leptos Australia Pty Ltd Professor of Population Health, Centre for Physical Activity and Nutrition Research, Deakin University
Alison Markwick	Epidemiologist Health Surveillance and Evaluation Section, Department of Human Services, Victoria
Dr Marj Moodie	Research Fellow Health Economics Group, Program Evaluation Unit, School of Population Health, The University of Melbourne
Anne Magnus	Epidemiologist Health Surveillance and Evaluation Section, Department of Human Services, Victoria
Leah Galvin*	PhD Student Centre for Physical Activity and Nutrition Research, Deakin University
Margaret Rumpf	PhD Student Health Economics Group, Program Evaluation Unit, School of Population Health, The University of Melbourne
Kiusiang Tay-Teo**	Masters Student Health Economics Group, Program Evaluation Unit, School of Population Health, The University of Melbourne
Margaret McDonald**	Masters Student Health Economics Group, Program Evaluation Unit, School of Population Health, The University of Melbourne
Jaithri Ananthapavan **	Masters Student Health Economics Group, Program Evaluation Unit, School of Population Health, The University of Melbourne

* February to July 2004; ** from August 2004

Methods overview

The overall benefit of an intervention is evaluated in two stages. Initially the health benefit is measured in terms of a reduction in disability adjusted life years (DALYs) due to the intervention. DALYs incorporate changes in mortality, measured as years of life lost (YLL) and changes in morbidity, measured as years lived with disability (YLD). An incremental cost-effectiveness ratio (ICER) is then calculated as the incremental cost (\$) per incremental disability adjusted life year (DALY) saved. Simulation-modelling techniques are used to determine an uncertainty range around the costs and benefits to reflect the main sources of uncertainty in our assumptions. The comparator is current practice and the reference population and year is the Australian population in 2001. Finally, the Working Group that consists of stakeholders considers the potential impact of "second stage filter criteria". These are the judgement aspects of the decision making process and include consideration of issues of equity, feasibility of implementation, sustainability, acceptability to stakeholders, strength of the evidence, and potential for positive and negative side-effects.

Overview of results

The results presented in this report are the key summary findings from this project. Further details of a technical nature are planned for publication in the future

The 13 interventions evaluated in the ACE-Obesity study fall into three groups in terms of their cost-effectiveness credentials, viz: Figure 1

- (i) a group of six interventions that are extremely good value-for-money (i.e. 'dominant' net Incremental Cost Effectiveness Ratios [ICERs]);
- (ii) a group of four interventions which are 'good' value-for-money (net ICERs less than \$30,000 per DALY; and
- (iii) a group of three interventions which are 'poor' value-for-money (net ICERs more than \$80,000 per DALY).

The other two major dimensions of interest include impact on health status as measured in (Disability Adjusted Life Years saved) as presented in Figure 2 and affordability (total cost) in Figure 3.

While the 13 interventions rank a little differently across the key dimensions of efficiency, impact and affordability; there is a general consistency to their performance.

- the three 'poor' value-for-money interventions also perform poorly on affordability and all dimensions of impact;
- the six 'dominant' interventions also perform well on affordability (are cost saving) and key aspects of impact (achieving excellent outcomes through low BMI per person + high reach [TV advertising] or high BMI per person + smaller reach [Family-based targeted]); and
- the four 'good' value-for-money interventions are the most variable with high cost/high impact [Laparoscopic Adjustable Gastric Banding; Multi-faceted school-based] or moderate cost/moderate impact [GP intervention; Orlistat].

The results are internally consistent in that the relationship between cost and impact matches the cost-effectiveness results in ways that are quite predictable

(i.e. high cost and low impact lead to a poor ICER). This in turn suggests areas for improvement for those interventions that might be favoured on broader policy grounds, but are struggling in terms of their economic credentials [Active After-School Communities; Walking School Bus].

There is little difference in which of the three groups the interventions belong in terms of their gross or net ICERs (and little shuffling within groups). In economic terms, this places less emphasis on the role of cost offsets in determining ranking.

It is also important to note, that in financial terms, six of the interventions offer the potential for net cost savings. Some of these savings are potentially very significant [TV advertising reduction saves approximately \$300 M].

Gastric banding, which is not considered as a public health intervention, was evaluated to gain benchmark evaluation data.

Figure 1 Incremental Cost-effectiveness of interventions

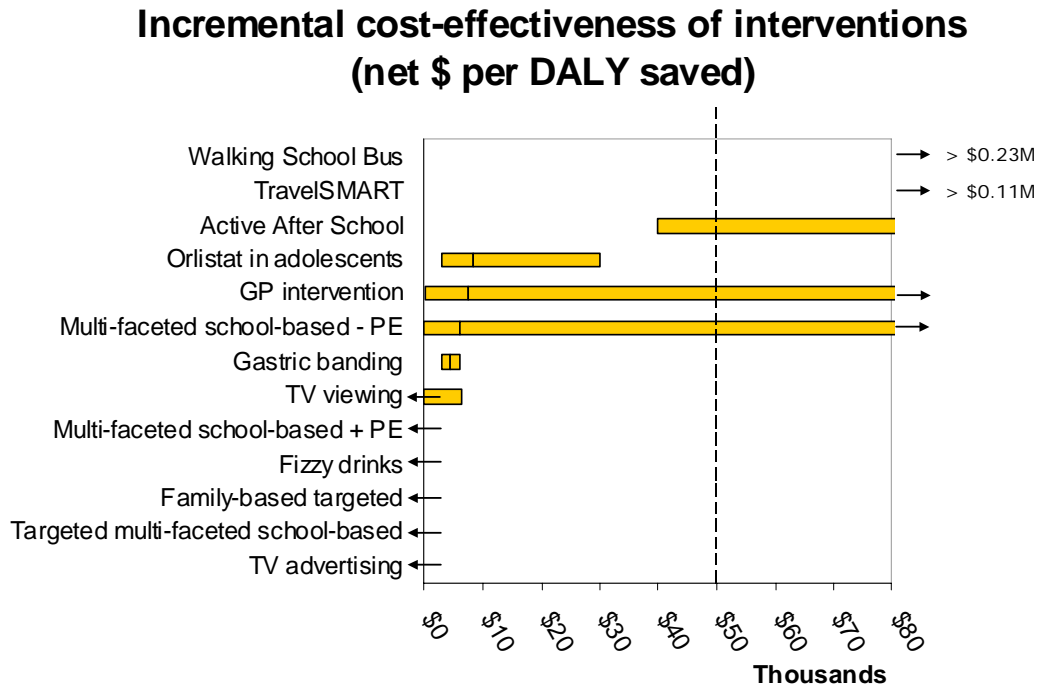


Figure 2 Affordability of intervention –total costs

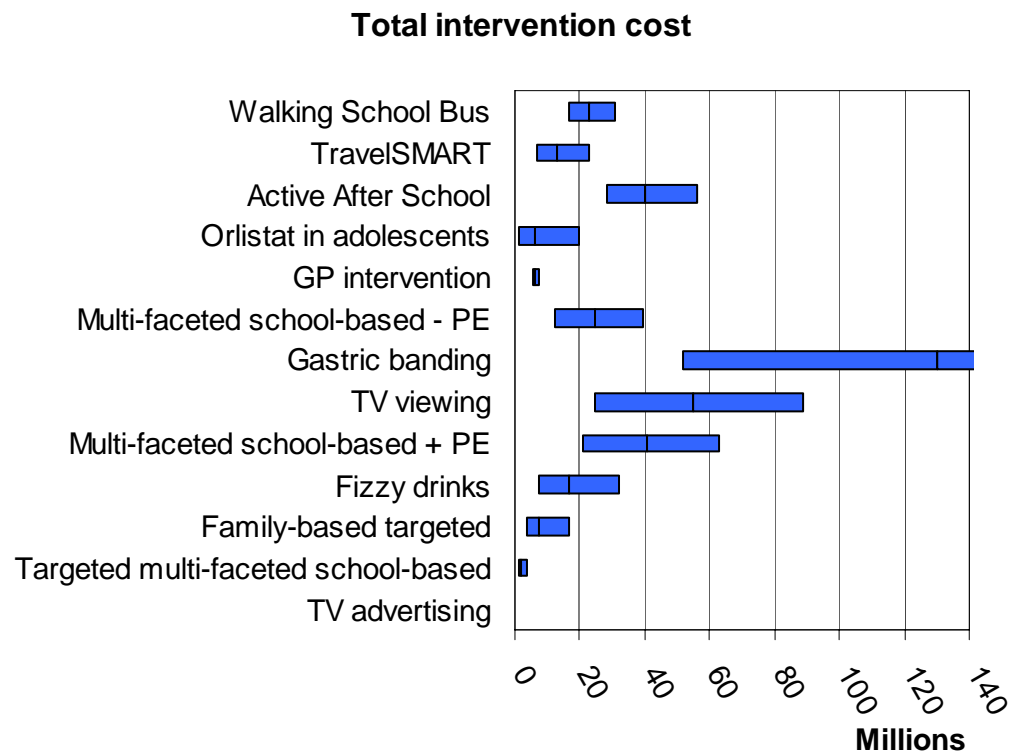
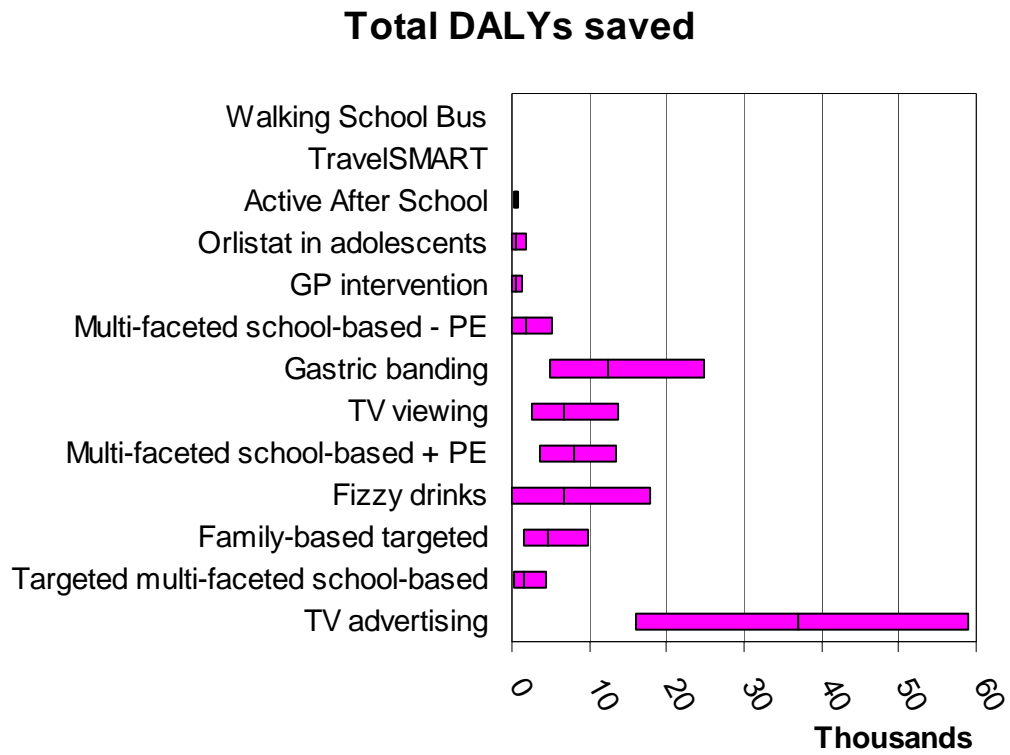


Figure 3 Impact of interventions - Total DALYs saved



Detailed Results

Intervention 1- Active Transport programs for Primary School Children: Walking School Bus

The intervention

The proposed intervention is based on the Walking School Bus (WSB) program as operated under the auspices of VicHealth. The program is run by local councils and funded by the Victorian Health Promotion Foundation for schools to increase the number of primary school children walking to school. Children are accompanied by 2 adult 'conductors' (at a ratio of 1 adult to 8 children) and travel along a set route through a neighbourhood picking up children along the way at designated stops and delivering them to school. The volunteer conductors complete an induction program, are given police checks, and are covered by a Council's volunteer insurance policy.

Key Assumptions:

- The mean reduction in BMI due to the intervention would be maintained over the life of the child (Protocol assumption).
- The point estimate is based on the recruitment and activity levels as currently exist under the VicHealth program (relatively low uptake at present).
- There is no offsetting effect of active transport on other energy expenditure or energy intake levels of the participants (eg. eating more as a result of doing physical activity, or creating good habits which are ongoing).
- The intervention was modelled on the basis that 50% of all enrolled participants in the WSB program are new to active transport to school.
- It is assumed that enrolled participants will be confined to years Prep to 2.

Cost-effectiveness results (with 95% uncertainty interval)

Gross cost per DALY saved	\$0.77M (\$0.24M; \$3.2M)
Net cost per DALY saved (with cost-offsets) with attribution of costs to obesity prevention only	\$0.76M (\$0.23M; \$3.32M)
Net cost per DALY saved with attribution of costs to all objectives	\$0.37M
Net cost per DALY saved with a range of measures to improve capacity utilisation	\$0.12M
Net cost per DALY saved with 65% of children new to active transport	\$0.28m
Overall result:	Not cost-effective under current assumptions

Second stage filter analysis

Level of evidence	Equity	Acceptability	Feasibility	Sustainability	Side-effects
<p>Limited evidence of effectiveness:</p> <ul style="list-style-type: none"> No Level I or II evidence Modelling based on Level IV evidence <p>Further effectiveness data sought but does not appear to support its effectiveness.</p>	<p>Likely issues:</p> <ul style="list-style-type: none"> Less access for children in rural and remote areas 	<p>Possible issues:</p> <ul style="list-style-type: none"> Less acceptable to older children in primary schools Requires a big time commitment from the school community, which may not be acceptable to all schools 	<p>Likely issues:</p> <ul style="list-style-type: none"> Variations in service delivery model between states make national implementation complex and question of appropriate auspicing body difficult. 	<p>Likely issues:</p> <ul style="list-style-type: none"> Program requires a high level of ongoing funding & support, which may impact on sustainability. 	<p>Positive:</p> <ul style="list-style-type: none"> Less traffic, pollution, safer around schools. Facilitates social networks. Increases awareness of local neighbourhoods Enhances pedestrian skills. Fosters good exercise habits May be positive impacts on family travel behaviour <p>Negative:</p> <ul style="list-style-type: none"> Potential to decrease the number of parents walking
<p>Limited evidence of effectiveness: “may be effective”</p>	<p>Moderate issue</p>	<p>Not a major issue</p>	<p>Some significant concerns</p>	<p>Issue which needs to be addressed</p>	<p>Potential wider positive benefits, but only with much greater WSB reach and uptake</p>
<p>Policy considerations: The WSB intervention is not cost-effective in terms of its effect on obesity in children under current uptake results. Action to improve uptake is worthy of consideration. Further, the intervention was not designed as an obesity prevention initiative, but as a program to produce change in the travel behaviour of students and to promote a safer traffic environment around schools. Lack of data on the incremental change in the numbers taking up active transport as a consequence of the intervention is a key limitation.</p>					

Intervention 2- Active Transport programs for Primary School Children : TravelSMART Schools

The intervention

TravelSMART Schools (TSS) is a program specifically targeted at children in years 5 & 6, which has been piloted in six schools in Victoria. It involves a number of key components designed to engage the whole school community (school councils, administrators, teachers, students, parents and families). It includes meetings and information sessions about the program; a professional development program for teachers; classroom activities for year 5 and 6 students (approximately 20 hours over 4 weeks); whole of school activities and events designed to engage the whole school community (such as bike servicing and identification engraving by Police; involving parents and carers through activities such as 'Leave the Car at Home' Week); and promotion of the program within the local community.

Key Assumptions:

- The mean reduction in BMI due to the intervention is maintained over the life of the child (Protocol assumption).
- New converts to active transport as a result of the program are assumed to walk, cycle or use public transport to school three days per week. The number of new recruits to active transport is based on a survey of 35% of Grade 5 and 6 students who participated in the pilot about their travel behaviour one week before and after the program.
- There is no offsetting effect of active transport on other energy expenditure or energy intake levels (eg. participants do not eat more following the physical activity session).
- The effectiveness results do not take into account any changes in the active transport participation of other students (non Grades 5 and 6) in the school, or of other family or community members.
- The intervention was modelled on the basis that 50% of all Australian primary schools (government, Catholic and independent) took up the intervention.

Cost-effectiveness results (with 95% uncertainty interval)

Gross cost per DALY saved	\$260,000 (\$120,000; \$530,000)
Net cost per DALY saved (with cost-offsets) with attribution of costs to obesity prevention only	\$250,000 (\$110,000; \$520,000)
Net cost per DALY saved with attribution of costs to all objectives:	30%: \$170,000 70%: \$70,000 80%: \$40,000
Net cost per DALY saved with broadening of benefit to other children	\$140,000
Overall result:	Not cost-effective unless joint costs spread over health/transport objectives

Second stage filter analysis

Strength of evidence	Equity	Acceptability	Feasibility	Sustainability	Side-effects
<p>May be effective:</p> <ul style="list-style-type: none"> Based on one small pilot study (level III study design) Very low response rate (35%) Only measured change in % of students using active transport BMI not measured Would benefit from further research and/or pilot studies before implementation 	No major concerns	Issues of acceptability to schools, teachers	<p>Issues that may arise:</p> <ul style="list-style-type: none"> Level of ongoing funding & support required. Long lead time to achieve curriculum change Take-up rate by schools 	<p>Issues likely to arise:</p> <ul style="list-style-type: none"> Program requires ongoing funding and support, which may impact on sustainability 	<p>Positive:</p> <ul style="list-style-type: none"> Less traffic & pollution, safer traffic environment Enhances pedestrian skills Improves sense of personal security Positive impacts on family travel Raised awareness of environmental, & health issues <p>Negative:</p> <ul style="list-style-type: none"> None identified
May be effective but further research needed before implementation	Not an issue	Possible concerns need attention	Some significant concerns	Needs to be entrenched in curriculum	Significant wider positive benefits
<p>Policy considerations: The TSS intervention is not cost-effective in terms of its effect on obesity in children. However, the intervention was not designed as an initiative to promote weight loss but as a program to produce change in the travel behaviour of students and their parents and families. There are several potential positive side-effects not incorporated in the cost-effectiveness results. A larger study and longer term effectiveness is required in order to make a more definitive assessment of the intervention's effectiveness in reducing BMI. Key decision points are: cost-effectiveness, strength of evidence, feasibility and sustainability.</p>					

Intervention 3- Active After-School Community Program:

The intervention

The intervention is based on the Federally-funded Active After-School Communities program, which is currently being implemented by the Australian Sports Commission (ASC). It consists of:

- An invitation to primary schools and approved out-of school hours care services (OSHCS) to be involved in the program;
- The preparation by schools/approved OSHCS of a physical activity needs analysis as part of their expression in the program;
- The appointment of physical activity program coordinators for each OSHCS;
- The specification of a physical activity program for each OSHCS;
- The delivery of the program, in conjunction with local sporting clubs. The program is delivered two or three times per week for one hour.
- The supply of a nutritional afternoon tea to after school hours attendees;
- The duration of the program is eight weeks, and is available for four terms per year.

Key assumptions

- The mean reduction in BMI due to the intervention is maintained over the life of the child (Protocol assumption).
- An additional one hour is spent on physical activity per session resulting in the additional energy expenditure of 4.0 metabolic equivalent intensity units.
- The program is delivered two or three days per week for four 8-week terms.
- There is no effect of physical activity as part of the program on the children's other energy expenditure or energy intake levels (eg. eating more after attending).
- Based on 3,300 sites at a national level as proposed by the ASC.
- Average funding of \$6,000 per site.
- 50% of participants were previously not doing any physical activity after school, whilst for an additional 20%, the program supplements activity already being undertaken (and maintained) in the after-school period.
- Participants who benefit from the program are equally spread across Prep to Grade 6 classes.

Cost-effectiveness results (with 95% uncertainty interval)

Gross cost per DALY saved	\$90,000 (\$50,000; \$180,000)
Net cost per DALY saved (with cost-offsets)	\$80,000 (\$40,000; \$170,000)
Net cost per DALY saved with reduced regional coordinators	\$75,000
Net cost per DALY saved with reduced state coordinators	\$80,000
Net cost per DALY saved with same wage rate applied to all site coordinators	\$75,000
Net cost per DALY saved with reduced regional and state coordinators	\$70,000
Net cost per DALY saved with full benefit applied to all	\$55,000
Net cost per DALY saved with multiplier effect on physical activity	\$55,000
Overall result:	Not cost-effective under current assumptions

Second stage filter analysis

Level of evidence	Equity	Acceptability	Feasibility	Sustainability	Side-effects
<p>No evidence of effectiveness:</p> <ul style="list-style-type: none"> • There is no Level I or II evidence. • Evidence used in the modelling is based mostly on Level IV parallel evidence. • Program logic modelled. • Other studies of physical activity within school settings have shown no significant effect (Sallis 1993, Mosuwan 1998), except for very intense interventions (Dwyer et al. 1983) 	<ul style="list-style-type: none"> • May not be available to children in rural or remote areas, or • Use may be restricted by reliance on school bus service for transport home. • Potential to decrease inequity as designed to encourage lower SES children to participate • Some schools offer program on rotating basis, so children unable to participate for all four terms. • Potential to attract already active children 	<p>May be issues of acceptability to</p> <ul style="list-style-type: none"> • children: - depend on whether they perceive their attendance to indicate that they are 'fat'; • parents: - changes nature of OSHCS; - acceptability depends on costs that they incur • schools: • OSHCS: • local clubs: may be issues regarding extra demand for membership 	<p>No real issues because the program is already in place</p>	<p>Issues likely to arise:</p> <ul style="list-style-type: none"> • The program requires ongoing funding and support, which may not be sustainable. • Reliance on regional coordinators may not be sustainable. 	<p>Positive:</p> <ul style="list-style-type: none"> • May encourage local sporting club participation and membership support, • Improve motor skills of children <p>Negative:</p> <ul style="list-style-type: none"> • Regular OSHCS attenders may be discouraged from attending for fear of being labelled 'fat'.
No evidence of effectiveness at this stage	Some issues	Any such issues need to be addressed	No real issues	Considerable issues of long-term funding	Potential for negative side-effects
<p>Policy consideration; The Active After-School Communities Program is the major initiative in the Howard government's childhood obesity package, to which it has directed substantial levels of funding (\$90M) for roll-out over the next three years. To date, there is no evidence available of its effectiveness or participation rates, although external evaluators have been appointed. In modelling the intervention, broad assumptions have been made about the numbers of children who will be new to physical activity in the after-school period. Whilst the program is intended to attract 'inactive' children, it is unclear as to what strategies will be employed to gain their participation. Furthermore, there is a potential danger that children already attending OSHCS may be discouraged from continuing to attend, which could have the effect of simply moving them to the 'non-active' group. The long-term sustainability of the intervention is also of serious concern. The program is reliant on the intense involvement of regional coordinators, who account for 25% of the program costs. It is not clear the extent to which the program would be sustainable in the long-term if the role of the regional coordinator was removed.</p>					

Intervention 4- Orlistat therapy in Australian Adolescents

The intervention

This economic evaluation examines the cost-effectiveness of a proposed treatment with orlistat in Australian adolescents based on the RCT by Chanoine et al (2005) following the FDA approval for the use of orlistat in adolescents in the USA.

The intervention consists of treatment with orlistat 120mg, given three times daily orally in conjunction with dietary, exercise and behavioural modifications. It is delivered over a period of 12 months for adolescents aged between 12 to 16 years, inclusively, with a BMI of 2 units additional to the BMI units corresponding to the 95th percentile of the age- and gender-specific BMI distribution. The evaluation proposes that GPs and dieticians will deliver the intervention to eligible adolescents under the existing primary care setting. The total number of consultations (of varying duration) with a GP and a dietician for those adolescents who complete the 12-month intervention, are 17 and 4, respectively.

Key assumptions:

- The mean reduction in BMI due to the intervention is maintained over the life of the child (Protocol assumption).
- The mean reduction in BMI as a direct consequence of orlistat therapy and the health benefits deriving from such reduction in BMI would be maintained over the remaining life of the adolescents.
- 1% of patients meeting the BMI criteria will be excluded according to the exclusion criteria.
- Dietary and behavioural components of the intervention are only considered as verbal advice. Therefore, no cost item associated with changes in diet or physical level is included in the analysis.
- Only adolescents who have lost at least 5 per cent of their baseline weight will continue the treatment up to the 12-month end point. Of these adolescents, only those who achieve 100% adherence to the treatment regimen will contribute towards the total BMI loss.
- Adolescents who discontinue the treatment after the third month and those who fail to adhere do not accrue any benefit from the treatment but incur some treatment costs.

Draft cost-effectiveness results (with 95% uncertainty interval)

Gross cost per DALY saved	\$14,000 (\$8,000; \$36,000)
Net cost per DALY saved (with cost-offsets)	\$8,000 (\$3,000; \$30,000)
Overall result:	Cost-effective

Second stage filter analysis:

Strength of evidence	Equity	Acceptability	Feasibility	Sustainability	Side-effects
<p>Level II Evidence:</p> <ul style="list-style-type: none"> Evidence obtained from one 12-month RCT by Chanoine et al (2005) Several short term pilot studies 	<p>Potential to increase inequity due to:</p> <ul style="list-style-type: none"> Accessibility to primary care services especially in rural/remote areas High out-of-pocket costs for patients as orlistat is not listed on the PBS – implication on the ability to pay 	<p>Patients/family: likely to be affected by the high costs, time commitment, and the gastrointestinal side effects of the intervention</p> <p>Clinicians: may be poorly received due to the lack of definitive efficacy and safety in adolescents</p> <p>Policy: likely to be deterred by the high costs of treatment and the curative paradigm</p>	<p>Delivered through existing general medical practice</p> <p>Involves modest total cost with high percentage impact on patient and family (78%)</p>	<p>Orlistat is currently not available under the PBS. The sustainability of the intervention is highly dependent upon the “ability to pay” of individual patients</p>	<p>Although the XENDOS study provides conclusive evidence on the long-term (4 years) safety profile in adults, there is as yet no definitive long-term risk-benefit profile in adolescents.</p> <p>The potential for abuse (excessive intake) is likely to be minimal due to the low gastrointestinal tolerability of orlistat. However, there remains a potential for misuse by non-overweight individuals.</p> <p>Positive: Parents may be more aware of the obesity issue</p> <p>Negative: over-emphasis on the curative paradigm</p>
<p>“Limited” evidence of effectiveness</p>	<p>Major issues</p>	<p>May be unacceptance amongst stakeholders</p>	<p>Feasible</p>	<p>Significant concern</p>	<p>Further evidence or expert opinions are needed</p>
<p>Policy considerations: The proposed intervention with orlistat is relatively cost-effective in producing weight loss in adolescents aged 12 to 16 years over a one-year period. The result is more favourable than previous published studies in adults, reflecting our assumption about maintenance of BMI loss over the remaining life of the adolescents. Whilst it may offer potential benefits under current assumptions, other decision points such as the strength of evidence, equity, acceptability, feasibility and sustainability must also be considered.</p>					

Intervention 5- Family-based GP-mediated intervention targeting overweight and moderately obese children

The intervention

The intervention is modelled on the LEAP (Live, Eat and Play) Study, a randomised controlled trial conducted by the Centre for Community Child Health (CCCH) at the Royal Children's Hospital in Victoria in 2002-03. It consists of:

- Recruitment through the Divisions of General Practice of participating GPs by letter and information/recruitment evenings;
- Delivery of three 2.5 hour training sessions for participating GPs by a psychiatrist experienced in solution-focused family therapy;
- Identification (from amongst their own patients) and recruitment by the GP of eligible overweight or moderately obese children and their parents;
- Four individual consultations per patient (and parents) with the GP (1st: >40 minutes, then three shorter 20 - 40 minute visits over a 12 week period);
- The use of brief solution-focused techniques that aim to identify and modify behavioural determinants of the child/family's physical activity and nutrition.

Key assumptions:

- The mean reduction in BMI due to the intervention would be maintained over the life of the child (Protocol assumption).
- The recruitment of GPs and children to the intervention generally reflects the levels achieved in the LEAP pilot program.
- Overweight children who meet the eligibility criteria are identified by individual GPs from amongst their own patients and opportunistically recruited.
- Costs associated with resultant changes in participant behaviours are not included (eg. change in dietary intake, increased physical behaviours) are not included.
- Intervention set-up and research and development for training and printed materials are not included.
- Benefits to parents or the wider family are not included.

Cost-effectiveness results (with 95% uncertainty interval)

Gross cost per DALY saved	\$32,000 (15,000, infinity)
Net cost per DALY saved (with cost-offsets)	\$24,000 (6,000, infinity)
Overall result:	Cost-effective

Second stage filter analysis

Strength of evidence	Equity	Acceptability	Feasibility	Sustainability	Side-effects
<p>Level II evidence of effectiveness;</p> <ul style="list-style-type: none"> • One small RCT. • Results not statistically significant. <p>Larger Australian RCT in progress run by CCCH</p> <p>Need to extend evidence to areas (such as nurse provision, appropriateness for NESB/indigenous groups) outside of that trialled</p>	<p>Moderate equity concerns:</p> <ul style="list-style-type: none"> • Access to GPs in rural/ remote areas, access to GP who bulk bills • Access of GPs in remote areas to training • Appropriateness to NESB & indigenous families • Exclusion of very obese children an issue if a more intensive intervention not available; is a lack of services for obese children (long waiting lists) 	<p>Possible issues:</p> <ul style="list-style-type: none"> • Parent & child concern about being labelled overweight. • Parent reluctance to accept there is a problem. • Burden on families in attending and complying. • Positively received by GPs in the trial. 	<p>Possible issues:</p> <ul style="list-style-type: none"> • Ensuring an adequate workforce of trained GPs, psychiatrists to conduct intervention. • Ensuring an adequate supply of dieticians, physical activity facilities etc. for those who seek to change their behaviour • May be dependent on achieving a structural change for a MBS payment • 	<p>Likely issues:</p> <ul style="list-style-type: none"> • Responsibility for ongoing training of new GPs, updating of manuals etc. • Impact of the sudden removal of funding • Potential for a practice nurse or other allied professional to deliver the intervention. This may impact (positively or negatively) on its effectiveness 	<p>Positive:</p> <ul style="list-style-type: none"> • Potential positive impact on weight of parents & other family members • Improvement in other non-weight health indicators • Expanded GP training • Identification of morbidly obese <p>Negative:</p> <ul style="list-style-type: none"> • Potential stigmatisation and bullying, although LEAP results suggest no such negative impacts • Potential to increase eating disorders in other family members
<p>Limited evidence of effectiveness at present. Results of larger RCT underway will be important</p>	<p>Some moderate concerns</p>	<p>Minor concerns</p>	<p>Not a major issue</p>	<p>Issues which require resolution to ensure sustainability</p>	<p>Some possible issues.</p>
<p>Policy considerations: This intervention is cost-effective under current assumptions, and any comprehensive package of interventions directed at childhood obesity should logically include an intervention targeted at children who are already in the overweight category. The program is currently being tested in a larger RCT by the CCCH, which should result in some more definitive effectiveness data. A key question is the long-term sustainability of the small incremental weight loss reported. The intervention's cost-effectiveness credentials are further improved by the removal of an outlier (in terms of benefit) or the recruitment of a larger number of GPs through the use of incentive payments.</p>					

Intervention 6- Multi-faceted school-based intervention without active physical education:

The intervention

The Tamir intervention is also based on the KYB program (see Manios intervention) but adapted for grade 1 Israeli children and did not include an active physical activity program. The regular teachers delivered the intervention over a two-year period and this consisted of 15 to 20 hours of teaching on health and nutrition, and physical activity per academic year for 2 years. As with the Manios intervention, parental involvement was strongly encouraged through school events and educational booklets. However there was no additional physical exercise as with the Manios intervention.

Key assumptions:

- The mean reduction in BMI due to the intervention is maintained over the life of the child (Protocol assumption).
- That the intervention would be implemented in grade 1 children in Australian schools and would be a two year program terminating in grade 2.
- That the mean reduction in BMI due to the intervention would be maintained over the life of the child.
- That uptake by schools would not differ according to the type of school (Catholic, independent, or government and that on average 50% of schools would take up the intervention
- The intervention is a curriculum-based comprehensive approach delivered by the regular classroom teachers.

Cost-effectiveness results (with 95% uncertainty interval)

Gross cost per DALY saved	All children: \$14,000 (\$6,000, dominated) Girls: \$21,000 Boys: \$42,000
Net cost per DALY saved (with cost-offsets)	All children: \$6,000. Range: 14.7% chance of being dominant to a 5.3% chance of being dominated. Girls: \$13,000 Boys: \$40,000
Overall results:	Cost-effective

Second stage filter analysis

Strength of evidence	Equity	Acceptability	Feasibility	Sustainability	Side-effects
<p>Limited evidence of effectiveness:</p> <ul style="list-style-type: none"> • One non-randomised controlled trial that showed statistically significant reduction in BMI in girls but not boys over two years • Variations of KYB studies have been trialled across the world with mixed results 	<p>Potential to increase inequity due to:</p> <ul style="list-style-type: none"> • Lower SES schools may have lower uptake • Location of schools in remote areas • Appropriateness to non-English speaking or indigenous? • Intervention is less effective in boys compared to girls (gender inequality) 	<p>Issues that may arise:</p> <ul style="list-style-type: none"> • Uptake by schools may be low due to financial and time commitment • Schools may already have incorporated nutrition and PA education into their curriculum and see little reason to change programs • Gender inequality in effectiveness may be unacceptable 	<p>Issues that may arise:</p> <ul style="list-style-type: none"> • Will require large financial and time commitment by Department of Education and individual schools 	<p>Issues likely to arise:</p> <ul style="list-style-type: none"> • Ongoing funding required • Whether mean reduction in BMI is maintained beyond two years is unknown 	<p>Positive:</p> <ul style="list-style-type: none"> • Reduction in prevalence of cardiovascular disease risk factors other than obesity <p>Negative: None recognised</p>
Any implementation should be carefully evaluated	Significant concerns	Significant concerns	Significant concerns	Concerns that are common to all interventions	Significant wider positive benefits
<p>Policy considerations: The intervention is cost-effective in reducing unhealthy weight gain in children aged 6 to 8 years over a two-year period. Key decision points are: equity, acceptability, feasibility and sustainability. A significant effort would be required to ensure an adequate uptake of the program by schools, particularly in lower SES areas.</p>					

Intervention 7- Laparoscopic adjustable gastric banding for severely obese adolescents

The intervention

The Laparoscopic adjustable gastric banding (LAGB) intervention is for severely obese adolescents, aged 14-19 years with BMI \geq 35. It involves the laparoscopic surgical placement of a silicone prosthesis under general anaesthesia around the upper part of the stomach to produce a small stomach pouch. The main mechanism of action involves food gathering in the smaller pouch, which distends and gives a sensation of fullness with much smaller food portions and therefore decreases the appetite and calorie intake of the adolescent, resulting in weight loss. The intervention involves recruitment, pre-surgery consultations and investigations, surgery, and post surgery follow up and investigations. Currently LAGB is largely only available through private health insurance, and the intervention has been modeled on this basis.

Key assumptions:

- The mean reduction in BMI due to the intervention is maintained over the life of the child (Protocol assumption).
- The target population calculation is based on 70% of eligible adolescents seeking referral for LAGB surgery, and of these adolescents, 50% being referred for a surgical consultation by their GP.
- 'Current practice' for management of severe obesity in adolescents in Australia constitutes 'do nothing'.
- The mean reduction in BMI at 3 years post LAGB surgery is maintained over the life of the adolescent.
- From 4 years onwards post surgery, costs accrue annually until 80 years of age at the rate of 50% of the costs in Year 3. The life of the lap band is assumed to be 25 years, and replacement costs are factored in.
- The practices of the Centre for Obesity Research and Education (CORE) surgeons and the associated evaluation based on 28 adolescents is representative of practices and outcomes as would be experienced by the entire target population in Australia.
- An adequate workforce of trained and willing surgeons is available to meet the demand of offering LAGB to the entire eligible population.

Cost-effectiveness results (with 95% uncertainty interval)

Gross cost per DALY saved	\$10,000 (\$9,000; \$12,000)
Net cost per DALY saved (with cost-offsets)	\$4,000 (\$3,000; \$6,000)
Net cost per DALY saved excluding parent time cost	\$2,000
Overall result:	Cost-effective

Second stage filter analysis

Equity	Strength of evidence	Acceptability	Feasibility	Sustainability	Side-effects
<p>Moderate equity concerns:</p> <ul style="list-style-type: none"> • Inequitable access because currently not freely available through public health system. Therefore access limited by ability to pay for surgery or private health insurance • Decreased access in remote/rural areas, but access improving. 	<p>Level IV evidence of effectiveness:</p> <ul style="list-style-type: none"> • 5 case series studies in adolescents • 3 systematic reviews in adults • CORE data on 28 adolescents • Current Melbourne based RCT in adolescents • Strong program logic. 	<p>Possible issues:</p> <ul style="list-style-type: none"> • Parents and adolescents concerns of having surgery and changing diet for lifetime. However no other successful option available for majority of obese adolescents • General community may be opposed to 'quick fix' and expensive solution to preventable condition • Health professionals may be opposed to medical treatment for a preventable problem. • Lack of equity and high cost 	<p>Possible issues:</p> <ul style="list-style-type: none"> • Availability of surgeons qualified to perform LAGB procedure • Impact of increased demand by obese adults, especially if LAGB available through the public health system • Expensive intervention, with a substantial initial investment required before downstream cost offsets and DALYs saved can be realised. 	<p>Possible issues:</p> <ul style="list-style-type: none"> • Attitude towards and knowledge of LAGB by GPs (gate keepers to public healthcare system) and associated impact on the number of people who access this intervention • Limited by availability of qualified surgeons • High cost to State Government if made publicly available may impact on its sustainability 	<p>Positive:</p> <ul style="list-style-type: none"> • Participants likely to have improved psychosocial functioning and self-esteem • Participants are likely to be more productive members of society <p>Negative:</p> <ul style="list-style-type: none"> • Strict diet required and some participants have poor tolerability of certain foods • Participants may experience vomiting and reflux post surgery • Pain and inconvenience associated with complications
Equity filter supports increased access through public health system.	'Sufficient' evidence of effectiveness	Major concerns	Moderate concerns	Some possible concerns	Some minor negative side effects, and some wider positive effects
<p>Policy Considerations: A comprehensive package of interventions should include interventions targeted at adolescents who are already obese. Although there is only Level IV evidence in adolescents, there is Level I evidence in results, very large changes in BMI between pre- and post-intervention in adolescent case-series and strong program logic, which warrants the classification of this intervention as having 'sufficient' evidence of effectiveness in severely obese adolescents. Evidence suggests that there are no conventional, successful, long term weight loss options for severely obese adolescents and therefore without this intervention, these adolescents are likely to have their obesity track into adulthood and therefore suffer the physical, psychosocial and financial consequences. This intervention is cost effective. Whilst the intervention costs are high, the cost-offsets are substantial. Increased public access to this intervention is supported by equity considerations, however, there are considerable acceptability, feasibility and sustainability issues that need to be considered.</p>					

Intervention 8- A school-based health promotion program to reduce TV viewing.

The intervention

The school-based health promotion program to reduce TV viewing intervention was based on Bandura's social cognitive theory and trialled in grade 3 and 4 children in a randomised controlled trial in the U.S.A. Regular classroom teachers delivered the intervention over six months in a total of approximately 18 hours of class time as follows:

- 18 classes of 30 to 50 mins conducted early in the academic year
- A television turnoff challenge for 10 days in which video games and videos as well as TV was forbidden
- Encouragement to follow a 7-hour a week TV budget thereafter aided by an electronic television time manager (TV allowance, Mindmaster, Inc, Miami, Fla)
- Additional lessons about intelligent TV viewing
- Final lessons in becoming an advocate for reducing media use
- Educational newsletters for the parents with strategies for limiting TV use

Key assumptions:

- The mean reduction in BMI due to the intervention is maintained over the life of the child (Protocol assumption).
- That the intervention would be implemented in grade 3 children only.
- That the mean reduction in BMI due to the intervention would be maintained over the life of the child.
- That uptake by schools would not differ according to the type of school (catholic, independent, or government and that on average 50% of schools would take up the intervention
- The intervention is a curriculum-based comprehensive approach delivered by the regular classroom teachers.

Cost-effectiveness results (with 95% uncertainty interval)

Gross cost per DALY saved	\$3,000 (\$1,500, \$7,000)
Net cost per DALY saved (with cost-offsets)	Dominant (i.e. median cost saving of \$44M) Range: large chance of being dominant [98.9%]
Overall result:	Cost- effective and cost-saving

Second Stage Filter Analysis

Strength of evidence	Equity	Acceptability	Feasibility	Sustainability	Side-effects
<p>Inconclusive evidence of effectiveness:</p> <ul style="list-style-type: none"> One RCT (Robinson 1999) that showed statistically significant reduction in BMI over one school year One RCT where reduction in TV viewing accounted for the reduction in BMI in a multi-faceted school-based intervention Many observational studies showing statistically significant associations between TV viewing and unhealthy weight but clinical significance debated 	<p>Potential to increase inequity:</p> <ul style="list-style-type: none"> Lower SES schools may have lower uptake Location of schools in remote areas Appropriateness to non-English speaking or indigenous? <p>Potential to decrease inequity:</p> <ul style="list-style-type: none"> TV viewing and prevalence of obesity are both greater among lower SES groups. Therefore impact may be greater at lower SES schools 	<p>Issues that may arise:</p> <ul style="list-style-type: none"> Uptake by schools may be low due to financial and time commitment Uptake may be further compromised by preference for comprehensive approaches to topics 	<p>Issues that may arise:</p> <ul style="list-style-type: none"> Will require large financial and time commitment by Department of Education and individual schools 	<p>Issues likely to arise:</p> <ul style="list-style-type: none"> Ongoing funding required Whether mean reduction in BMI is maintained beyond 3 years is unknown 	<p>Positive:</p> <ul style="list-style-type: none"> Improvement in physical fitness if child replaces TV viewing time with physical activity Improvement in social relationships due to increased socialisation Improvement in academic performance if TV viewing replaced by academic pursuits e.g. homework <p>Negative:</p> <ul style="list-style-type: none"> Increased truancy if TV viewing not replaced by more socially acceptable pursuits Stress to parents
<p>Concerns:</p> <ul style="list-style-type: none"> One larger RCT by Robinson (1999-2002) that was never published. Attempts to contact author have failed One Australian RCT, not yet published, but shown to have no effect on TV viewing or BMI 					
Significant concerns about reproducibility of results.	Some concerns	<u><i>Significant concerns</i></u>	Significant concerns	Concerns that are common to all interventions	Significant wider positive benefits
<p>Policy considerations: The intervention is cost-effective in reducing unhealthy weight gain in children aged 8 to 9 years over one academic school year. Key decision points are: strength of the evidence, equity, acceptability, feasibility and sustainability. A significant effort would be required to ensure an adequate uptake of the program by schools, particularly in lower SES areas.</p>					

Intervention 9- Multi-faceted school-based intervention with additional active physical exercise:

The intervention

This multi-faceted school-based intervention is based on the “Know Your Body” (KYB) program developed by the American Health Foundation with the aim of reducing risk factors for cardiovascular disease through educational learning. The program was subsequently commercialised and publishing rights sold to the Kendall Hunt Publishing Company (U.S.A). The Manios intervention is a modification of the KYB program that incorporates an active physical exercise component in addition to the education components. The intervention was trialled on grade 1 children in a controlled (but not randomised) intervention trial in Greece. Regular classroom teachers delivered the intervention over a three-year period as follows:

Educational components

- 13 to 17 hours of teaching on nutrition and health per academic year
- 4 to 6 hours of teaching on physical fitness and activity per academic year
- parental involvement with annual school meetings and information booklets

Physical exercise components:

- 2 x 45 min practical physical exercise classes per week per academic year

Key assumptions:

- The mean reduction in BMI due to the intervention is maintained over the life of the child (Protocol assumption).
- That this intervention will be implemented in Australian children commencing in grade 1 and terminating at the end of grade 3.
- That the mean reduction in BMI due to the intervention would be maintained over the life of the child.
- That uptake by schools would not differ according to the type of school (catholic, independent, or government and that on average 50% of schools would take up the intervention
- The intervention is a curriculum-based comprehensive approach delivered by the regular classroom teachers.

Results (with 95% uncertainty interval)

Gross cost per DALY saved	\$7,000 (\$5,000, \$9,000)
Net cost per DALY saved (with cost-offsets)	Dominant (i.e. median cost saving of 14M) Range: large chance of being dominant [95.6%]
Overall result:	Cost-effective and cost-saving

Second Stage Filter Analysis

Strength of evidence	Equity	Acceptability	Feasibility	Sustainability	Side-effects
<p>Limited evidence of effectiveness:</p> <ul style="list-style-type: none"> One non-randomised controlled trial that showed statistically significant reduction in BMI in both boys and girls over three years Variations of KYB studies have been trialled across the world with mixed results 	<p><i>Potential to increase inequity:</i></p> <ul style="list-style-type: none"> Lower SES schools may have lower uptake Location of schools in remote areas Appropriateness to non-English speaking or indigenous? <p><i>Potential to decrease inequity:</i></p> <ul style="list-style-type: none"> Schools where parents place high value on educational goals may see active PE component as threat to academic pursuits 	<p><i>Issues that may arise:</i></p> <ul style="list-style-type: none"> Uptake by schools may be low due to financial and time commitment Schools may already have incorporated nutrition and PA education into their curriculum and see little reason to change programs Requirement for 2x 45 min PE sessions per week may conflict with current timetables, particularly at schools where educational goals are valued more highly Requirement for specialist PE teacher in schools that do not usually employ one could be a problem 	<p><i>Issues that may arise:</i></p> <ul style="list-style-type: none"> Requires large financial / time commitment by schools and Department of Education 	<p><i>Issues likely to arise:</i></p> <ul style="list-style-type: none"> Ongoing funding required Whether mean reduction in BMI is maintained beyond 3 years is unknown 	<p>Positive:</p> <ul style="list-style-type: none"> Reduction in prevalence of cardiovascular disease risk factors other than obesity Improvement in physical fitness <p>Negative: None recognised</p>
<p>Any implementation should be carefully evaluated</p>	<p>Significant concerns</p>	<p>Significant concerns</p>	<p>Significant concerns</p>	<p>Concerns that are common to all interventions</p>	<p>Significant wider positive benefits</p>
<p>Policy considerations: The intervention is cost-effective in reducing unhealthy weight gain in children aged 6 to 9 years over a three-year period. Key decision points are: equity, acceptability, feasibility and sustainability. A significant effort would be required to ensure an adequate uptake of the program by schools, particularly in lower SES areas.</p>					

Intervention 10- A school-based focused nutrition education intervention to reduce the consumption of sweetened carbonated beverages

The intervention

The school-based focused nutrition education intervention to reduce the consumption of sweetened carbonated beverages is a program specifically targeted at children aged 7 to 11 years. It was trialled in a randomised controlled trial in the United Kingdom. The intervention consists of four one-hour educational sessions over the course of the school year (one session per school term) delivered by the study investigator with the assistance of the regular teachers. The four one-hour sessions consists of:

Session 1: Information on achieving good health and promotion of drinking water. The children sampled fruit and a tooth was immersed in a sweetened carbonated beverage to show the effects on dentition.

Session 2 & 3: The children were given a copy of the song entitled 'ditch the fizz' and challenged to participate in a music competition to produce a song or rap with a healthy message.

Session 4: Art presentations and participation in a classroom quiz based on a popular TV quiz show. The children were also encouraged to access the study website www.b-dec.com.

Key assumptions:

- The mean reduction in BMI due to the intervention is maintained over the life of the child (Protocol assumption).
- That the mean reduction in BMI due to the intervention would be maintained over the life of the child.
- That each child would receive the intervention once in their lifetime and hence only one fifth of the schools would need to be visited each year to allow the initial cohort to pass through to secondary school.
- That uptake by schools would not differ according to the type of school (catholic, independent, or government and that on average 50% of schools would take up the intervention
- We assume that the program would be coordinated and funded by the Australian government.
- We assume that field presenters that are external to the school deliver the program.

Cost-effectiveness results (with 95% uncertainty interval)

Gross cost per DALY saved	\$3,000 (\$1,000; dominated)
Net cost per DALY saved (with cost-offsets)	Dominant (i.e. median cost saving \$26M + health gain of 5,000 DALYs prevented). Range: large chance of being dominant [81%] through to small chance of being dominated [7.6%].
Overall result:	Cost-effective and cost-saving

Second stage filter analysis:

Strength of evidence	Equity	Acceptability	Feasibility	Sustainability	Side-effects
<p>Limited evidence of effectiveness:</p> <ul style="list-style-type: none"> • One UK RCT that showed statistically significant decrease in prevalence of overweight and obesity but not mean BMI • 2 prospective cohort studies showing significant association of BMI and fizzy drink consumption 	<p>Potential to increase inequity due to:</p> <ul style="list-style-type: none"> • Lower SES schools may have lower uptake • Location of schools in remote areas • Higher non-attendance rate at lower SES schools • Appropriateness to non-English speaking or indigenous? 	<p>Issues that may arise:</p> <ul style="list-style-type: none"> • Uptake by schools may be low due to competing programs • Preference of schools for more comprehensive approach, integrated into the curriculum, with delivery by regular teachers • Poor acceptance by fizzy drinks manufacturers leading to lobbying the federal government against the intervention 	<p>Issues that may arise:</p> <ul style="list-style-type: none"> • Will require high level of cooperation between state and federal governments • Availability of adequate workforce • Competing programs may affect uptake by schools 	<p>Issues likely to arise:</p> <ul style="list-style-type: none"> • Ongoing funding required • Whether mean reduction in BMI and consumption of fizzy drinks is maintained beyond one year is unknown • Competing programs may affect willingness of schools to retain this intervention 	<p>Positive:</p> <ul style="list-style-type: none"> • Improvement in dentition due to reduction in dental caries • Reduction in household \$ spent on fizzy drinks <p>Negative:</p> <ul style="list-style-type: none"> • Potential to increase stigmatisation and bullying of overweight children if poorly implemented • Increase and/or exacerbate eating disorders
<p>Any implementation should be carefully evaluated</p>	<p>Significant concerns</p>	<p>Significant concerns</p>	<p>Significant concerns</p>	<p>Issues need to be addressed</p>	<p>Significant wider positive benefits</p>
<p>Policy considerations: The intervention is cost-effective in reducing unhealthy weight gain in children aged 7 to 11 years over a one-year period. Key decision points are: equity, acceptability, feasibility and sustainability. A significant effort would be required to ensure an adequate uptake of the program by schools, particularly in lower SES areas.</p>					

Intervention 11- Family-based targeted program for obese children

The intervention

The intervention is modelled on a study conducted by Flodmark et al. conducted in Sweden in 1993. It consists of:

- Promotion of the intervention through the Divisions of General Practice;
- Opportunistic recruitment of eligible overweight or moderately obese children and their parents by GPs from their own patients;
- Medical examination and dietary counselling by a paediatrician and a dietitian;
- Six family therapy sessions conducted jointly by a paediatrician and psychologist over a 14 to 18 month period. These use brief solution-focused techniques, based on the 'de Shazer' method, that aim to identify and modify behavioural determinants of the child/family's physical activity and nutrition;
- Three additional medical checks conducted through the course of the family therapy program.
- The intervention is based in the hospital setting, although it could be offered in an alternate setting.

Key assumptions:

- The mean reduction in BMI due to the intervention would be maintained over the life of the child (Protocol assumption).
- The recruitment of children to the intervention and compliance rates generally reflects the levels achieved in the Flodmark intervention.
- Obese children who meet the eligibility criteria are identified by individual GPs from amongst their own patients and opportunistically recruited.
- Benefits to parents or the wider family are not included.
- No treatment is used as the 'current practice' comparator.
- IOTF gender and age-specific obesity definitions used.
- Costs associated with changes in lifestyle are excluded.

Cost-effectiveness results (with 95% uncertainty interval)

Gross cost per DALY saved	\$4,000 (\$3,000; \$8,000)
Net cost per DALY saved (with cost-offsets)	Dominant (i.e. overall cost saving of \$4.1M + health gain of 2,700 DALYs prevented) Range: narrow with a very high chance of being dominant (83%)
Overall result:	Cost-effective and cost-saving

Second stage filter analysis

Strength of evidence	Equity	Acceptability	Feasibility	Sustainability	Side-effects
<p>Level II evidence of effectiveness:</p> <ul style="list-style-type: none"> • One small RCT • statistically significant results • supporting evidence from 3 other RCTs • NHMRC guidelines support therapy 	<p>Moderate equity concerns:</p> <ul style="list-style-type: none"> • Access to GPs in rural/ remote areas and to bulk billing GPs • Exclusion of those who do not attend GPs • Appropriateness of intervention to NESB and Indigenous families • High out-of-pocket costs to families may make intervention unaffordable for low income families. 	<p>Possible issues:</p> <p>Parent & families:</p> <ul style="list-style-type: none"> • Concern about child being labelled obese; • Reluctance to accept there is a problem; • Burden of travel time and cost involved for rural families; • Burden in attending and complying and making lifestyle adjustments. <p>For clinicians:</p> <ul style="list-style-type: none"> • Unfamiliarity with style of care, scepticism re evidence base in Australian context; • Clinical cultural boundaries against team approaches; • Current illness rather than holistic focus. <p>Policy makers:</p> <ul style="list-style-type: none"> • Debates on quality of evidence base for de Shazer limited compared with CBT/other therapies 	<p>Possible issues:</p> <ul style="list-style-type: none"> • Ensuring an adequate workforce, including psychologists and paediatricians trained in de Shazer therapy • Require new protocols and clinical pathways for GPs and paediatricians • Require professional standards for family therapy • Need for long term investment by patients and families • Varied State service infrastructure raising implementation issues. 	<p>Likely issues:</p> <ul style="list-style-type: none"> • Ongoing training and clinical incentives required • Could potentially use a broader range of professionals, eg. allied health staff • Systemic education and change management strategies required • Whether reduction in BMI is maintained past 1 year 	<p>Positive:</p> <ul style="list-style-type: none"> • Positive impact on weight of parents & other family members • Improvement in other non-weight health indicators • Expanded GP, paediatrician and therapist capacity <p>Negative:</p> <ul style="list-style-type: none"> • Potential to increase eating disorders in non-overweight members of family
Sufficient evidence of effectiveness	Some moderate concerns	Significant concerns	Major concerns	Some issues requiring resolution	Some issues
<p>Policy considerations: This intervention is cost-effective under current assumptions, and any comprehensive package of interventions directed at childhood obesity should logically include an intervention targeted at children who are already in the obese category. Key decision points are: equity, acceptability and feasibility. A key question is the long-term sustainability of the level of containment of weight gain reported.</p>					

Intervention 12- A multi-faceted school-based intervention targeted at overweight or obese children (age of 7-10 years)

The intervention

The proposed intervention based on a trial by Foster et al 1985 is to provide:

- A peer-led program of counselling and social support for overweight or obese children in grades 2 to 5, and is run over 12 weeks. Peers are responsible and well-liked older (eighth-grade) students selected by the principal and teachers. Each of the peer counsellors are trained in 3 (1 hour) sessions to weigh children, check lunch boxes for nutritious foods and to recommend changes in eating and exercise habits. Each peer counsellor works with 3 or 4 children for the whole 12 weeks. Counsellors are observed and given feedback weekly by psychologists.
- Participants meet 3 times weekly with counsellors who check for green, yellow and red foods, providing reward stickers and verbal praise for having nutritious food and not having non-nutritious foods. Stickers are placed in special workbooks in which children record their food intake and physical activity. Children are weighed weekly and rewarded with special stickers for weight loss of 0.23 kg or more.
- Participants are instructed for 15 mins each week by psychologists in behavioural techniques of record keeping, stimulus control, slowing eating, lifestyle activity and attitude change. They also attend a special weekly 15-min exercise class aimed towards non-competitive fun.
- Parents are invited to attend an introductory meeting and another in the 10th week where lessons in nutrition, physical exercise, positive reinforcement and behaviour modification are offered by psychologists.

Key assumptions:

- That the mean reduction in BMI due to the intervention would be maintained over the life of the child (Protocol assumption).
- That publicly funded psychologists employed on a part time basis would achieve the same results as the undefined medical staff/psychiatrists who conducted the trial intervention.
- That uptake by schools would not differ according to the type of school (catholic, independent, or government) and that on average 50% of combined primary/secondary schools would take up the intervention.
- That each child would receive the intervention once in their lifetime and hence only one quarter of the schools would need to be visited each year to allow the initial cohort to pass through to secondary school.
- Field staff can supervise multiple student counsellors simultaneously each week.
- That the program would be coordinated and funded by the Australian government.

Cost-effectiveness results (with 95% uncertainty interval)

Gross cost per DALY saved	\$3,000 (\$1,000, \$10,000)
Net cost per DALY saved (with cost-offsets)	Dominant (i.e. overall cost saving of \$1.3m + health gain of 360 DALYs prevented) 91% chance of being dominant
Overall result:	Cost-effective and cost-saving

Second stage filter analysis

Strength of evidence	Equity	Acceptability	Feasibility	Sustainability	Side-effects
<p>Limited evidence of effectiveness:</p> <ul style="list-style-type: none"> One small non-randomised controlled trial (Level III evidence) conducted in 1985 in US 	<ul style="list-style-type: none"> Rural areas may be more difficult to reach with suitable staff 	<p>Possible issues:</p> <ul style="list-style-type: none"> Parent & child concern about being labelled overweight or obese. Parent reluctance to accept there is a problem. <ul style="list-style-type: none"> Targeting of overweight or obese students not likely to be acceptable to schools Application to combined primary/secondary schools only may reduce acceptability to government. 	<p>Possible issues:</p> <ul style="list-style-type: none"> Ensuring an adequate workforce of trained psychologists, medical staff to conduct intervention. Workforce issues likely to be greater in rural areas. 	<p>Issues likely to arise:</p> <ul style="list-style-type: none"> Ongoing funding required Whether reduction in BMI is maintained beyond one year is unknown 	<p>Positive: Improved self concept</p> <p>Negative: Potential stigmatisation and alienation of the target population if not implemented carefully.</p>
Limited evidence of effectiveness.	Some concerns	Significant concerns	Significant concerns	Issues need to be addressed	Potential dangers exist
<p>Policy considerations: This intervention is very cost-effective under current assumptions, and any comprehensive package of interventions directed at childhood obesity should logically include an intervention targeted at children who are already in the overweight or obese category. A limitation of this particular intervention is that it only applies to combined primary/secondary schools. Key decision points are: equity, acceptability to schools and families, feasibility and sustainability. The intervention would need to be implemented very carefully to prevent stigmatisation of participating children.</p>					

Intervention 13- Reduction in TV Advertising of high fat and/or high sugar foods and beverages directed at children (up to the age of 14 years)

The intervention

The proposed intervention is to:

- Preclude advertising of high sugar and/or high fat foods and beverages or fast food outlets during television viewing hours where a substantial proportion (15% or greater) of children up to the age of 14 are in the viewing audience. The intervention will likely affect C, P and G programs shown between 7-8am and 3-9pm Monday to Friday and 6am to 1pm on Saturday and Sunday.
- This will require an extension of the existing regulatory framework, combined with the introduction of clearer definitions, to strengthen the monitoring and enforcement of the regulations.

Key assumptions:

- That the mean reduction in BMI due to the intervention would be maintained over the life of the child (Protocol assumption).
- Broadcasters adhere to the regulations avoiding unnecessary costs
- Core food of equal weight, cost and preparation time is substituted for non-core food removed from the diet
- The efficacy of a trial result in a holiday camp situation would be only half as effective in Australian conditions in 2001

Cost-effectiveness results (with 95% uncertainty interval)

Gross cost per DALY saved	\$3.70 (\$2.40; \$7.70)
Net cost per DALY saved (with cost-offsets)	Dominant: 100% chance of being cost-saving
Overall result:	Cost-effective and cost-saving

Second Stage Filter Analysis

Strength of evidence	Equity	Acceptability	Feasibility	Sustainability	Side-effects
Likely to be effective. Single RCT assessing food choice after reduced advertising. Supportive parallel evidence in toys, smoking, and alcohol advertising bans exists. Cross-sectional studies used for evidence of impact on BMI. Supportive ecological cross-sectional studies exist.	Likely to benefit lower SES families under current cost and time assumptions	Unacceptable to the current Federal government and advertisers. Highly acceptable to public health sector experts	Very difficult in face of government opposition	Likely to be sustainable if implemented but requires ongoing political support	Positive: Nil Negative: nil
Implementation should be accompanied by an appropriate evaluation budget.	Not an issue	Not acceptable to all stakeholders	Significant concerns	Sustainable if implemented	None determined
Policy considerations: The reduction of TV Advertising to children intervention is extremely cost-effective under current assumptions, in terms of its effect on obesity in children. However, the intervention is currently politically unacceptable. An appropriate evaluation should accompany the implementation of the intervention. Implementation in a rural setting could be an option to explore to make a more definitive assessment of the intervention's effectiveness in reducing BMI under Australian conditions.					

Summary

Key conclusions are:

- The ACE–Obesity study provides very useful information for policy-makers, despite the current limitations in evidence. To our knowledge there have been no similar attempts at determining cost-effectiveness of interventions across a wide range of obesity interventions in a comparable manner, providing guidance on efficiency, impact, and acceptability.
- Despite considerable uncertainty around key input variables, clear distinctions in cost-effectiveness between obesity interventions are apparent.
- Nevertheless, until there is greater evidence many of our estimates should be considered provisional, though strongly indicative of the relative magnitude of the health gain.
- As well as providing evidence of the health benefit likely to be achieved by various obesity interventions, the ACE-Obesity study has highlighted many information gaps that need to be addressed by further research. The most obvious is the need for new and more effective initiatives for primary prevention in particular.
- The expected gain from the current arsenal of interventions is unlikely to be sufficient to reverse the trend towards increasing levels of overweight and obesity.
- Any new or current interventions that are tested or implemented, need to be properly evaluated so that we can be confident that they actually achieve the desired impact when compared to current practice or to no intervention – be it an increase in physical activity levels, a decrease in consumption of energy dense foods and drinks and/or a slowing of the increase in BMI.