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Frameworks for the major population-based policies to prevent childhood obesity

Framework for population-based policies to prevent
childhood obesity

Cost-effectiveness model of the diet component of the
Global Strategy on Diet, Physical Activity and Health

A report prepared for the World Health Organization
Forum and Technical Meeting on Population-based
Prevention Strategies for Childhood Obesity
Geneva, December 2009



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List of Abbreviations

ANGELO	Analysis Grid for Elements Linked to Obesity
ACE	Assessing Cost-Effectiveness
BMI	Body Mass Index
CATCH	Coordination Approach to Child Health
CBA	Cost-Benefit Analysis
CEA	Cost-Effectiveness Analysis
CUA	Cost-Utility Analysis
DALY	Disability Adjusted Life Years
DPAS	Global Strategy on Diet, Physical Activity and Health
EPODE	Ensemble Prévenons l'Obésité Des Enfants
HFSS	High Fat, Salt and Sugar
ICER	Incremental Cost Effectiveness Ratio
IOTF	International Obesity Task Force
LFA	Logical Framework Analysis
NCD	Noncommunicable Disease
NGO	Nongovernmental Organizations
PAST	Problem and Solution Tree
QALY	Quality Adjusted Life Years
SES	Socio-Economic Status
SMART	Specific, Measureable, Achievable, Relevant, Time-bound
SSOP	Sentinel Site for Obesity Prevention
WHA	World Health Assembly
WHO	World Health Organisation
YLL	Years of life lost

Executive Summary

This report has been prepared for the World Health Organisation (WHO) Forum and Technical Meeting on Population Prevention Strategies for Childhood Obesity 2009. It provides a framework for identifying the major population-based policies to prevent childhood obesity and a model for assessing the cost-effectiveness of the diet component of the Global Strategy on Diet, Physical Activity and Health (DPAS).

The DPAS framework (developed by WHO in 2004) has been modified and presented in this report to specifically consider obesity prevention. The report considers the roles and responsibilities of four major stakeholder groups: international organisations, governments, the private sector, and civil society. National governments are shown to have the central role as leaders and drivers of many policy interventions. However, all other stakeholders have important complementary roles.

The modified DPAS identifies that multiple instruments can be used to achieve policy objectives, including government spending and taxes, laws and regulations, advocacy, and service and program delivery. Three complementary approaches are considered:

1. Socio-ecological (upstream) approach – considers policies which aim to influence the underlying determinants of health in society and the food and physical activity environments. Interventions in this approach occur in sectors such as finance, transport, infrastructure, food processing and marketing sectors.
2. Lifestyle (midstream) approach – considers policies which aim to directly influence diet and physical activity behaviour by targeting individuals within a particular setting (e.g., households, schools).
3. Health Services (downstream) approach – considers policies which support health services and medical interventions.

In addition to economic, health and social outcomes, the original DPAS framework has been modified to also include ‘environmental’ outcomes. The modified DPAS framework also identifies the important role of monitoring, evaluation and research – these activities provide an essential means of measuring and understanding the effect and impact of obesity prevention actions.

The report presents a series of analysis grids as a means of systematically and comprehensively identifying policy intervention areas across relevant sectors and settings. The grids consider the sector (for socio-ecological/upstream approaches) or setting (for midstream/downstream approaches) in which particular policies apply and the stakeholder that is responsible for administering that policy.

The determinants of obesity are complex and varied and therefore solutions, by necessity, must be multi-faceted. Furthermore, the most relevant, appropriate and feasible policies will vary by region and country. In order to avoid ‘ad hoc’ decision-making, a clear priority setting process should be followed once an initial list of interventions has been established for a particular region or country. Three frameworks are proposed as possible methods for priority-setting: The STEPwise approach, Problem/solution trees, and the ANGELO (Analysis Grid for Elements Linked to Obesity) Process.

STEPwise was developed specifically for use in lower to middle income countries with limited funding/resources. It considers the feasibility, affordability and expected impact of interventions in a series of steps that can be tailored to the resources available in a particular region or country. The Problem/Solution trees process involves starting with a particular problem and building up the layers or 'roots' that attempt to explain *why* the problem is occurring (the factors or determinants). A solution tree can then be developed which identifies solutions or possible policy interventions to address the problems identified. Prioritisation occurs by assessing the feasibility, effectiveness and wider social impacts of each policy intervention. The ANGELO Process evolved as a priority-setting method for use in community-based obesity prevention action. It is an evidence- and practice-based process which follows health promotion principles and action areas, with priority setting included as part of a due process assessment by stakeholders.

The ACE (Assessing Cost-Effectiveness) methodology is presented as the preferred framework for assessing the cost-effectiveness of the diet component of the DPAS. The ACE process compares the relative costs and benefits of two or more courses of policy action. It was developed in Australia in 2000 and has successfully been applied to assess the cost-effectiveness of a wide-range of chronic disease interventions. The methodology embraces a high level of technical rigour in both economics and epidemiology, but also includes 'due process' (by way of involving all relevant stakeholders in a working group) at all stages of decision-making.

The key characteristics of the ACE approach are:

- Involving stakeholders throughout the entire process
- Clearly specifying a rationale for intervention selection
- Using a common setting, context and comparator for all interventions
- Using country specific data (wherever possible) for health system costs and demographic/epidemiological parameters
- Using best available data to develop incremental cost-effectiveness ratios based on economic/epidemiological modelling techniques
- Reporting incremental cost-effectiveness ratios, total cost and disability adjusted life years (DALYs) as a range (reflecting the uncertainty of cost, process, outcome and value estimates)
- Placing the technical analysis in a broader decision-making framework by considering 'second stage filters' e.g., strength of evidence, feasibility, sustainability, acceptability, capacity to reduce inequalities, side effects

The first step in assessing the cost effectiveness of food-based policy interventions is to define the logic pathway by which policy change can lead to changes in population diet and subsequent health outcomes. The potential impact of a particular policy can then be modelled in a step-wise fashion using the best-available evidence.

Considerations for the cost modelling of population interventions include: perspective (e.g. societal, government, health system); stage of intervention (include start up or just steady state); costs and cost offsets of each major stakeholder; consistency (to allow direct comparisons between interventions); choice of comparator (e.g. current practice).

The frameworks presented in this report can be used to assist countries in implementing action for obesity prevention.

1. Background

1.1. *Global Strategy on Diet, Physical Activity and Health*

The Global Strategy on Diet, Physical Activity and Health (DPAS) was developed by the World Health Organization (WHO) in 2004 to address the increasing prevalence and burden of noncommunicable diseases (NCDs) (1). DPAS was developed following the 2002 World Health Assembly (WHA) and endorsed in May 2004 by the 57th WHA (resolution WHA57.17).

The strategy focuses exclusively on improving global diet and physical activity patterns, two of the main risk factors for NCDs. There has been a rapid shift in global food and physical activity trends. Food has become more energy dense, high in fat, sugar and salt with reduced nutrient value, while lifestyles have become more sedentary (1).

The prevalence of risk factors associated with NCDs were initially higher in higher income countries and the more socio-economically advantaged populations. However, the prevalence and burden of NCDs is now shifting towards lower income countries and less advantaged populations (1). DPAS calls for priority to be given to the socially, economically and politically disadvantaged, and also to address the poor diet and physical activity behaviours of children and adolescents which is of particular concern (1).

The WHO growth standards for infants and preschool children builds on the WHO definition of health which states ‘health’ is not only the absence of disease or infirmity but also a state of complete physical, social well-being, and therefore includes the adoption of healthful behaviours (1). DPAS outlines several recommendations relevant to the prevention of childhood obesity. The importance of a ‘life-course’ perspective is emphasized, i.e. starting with maternal health, early infant and childhood health. DPAS recommends schools should adopt healthy diet and physical activity programs and policies and that relevant stakeholders address responsible marketing of food and beverages to children.

Four main objectives are addressed by DPAS: firstly, to encourage the implementation of public health action and preventative intervention to reduce the risk factors which result from poor diet and physical activity; second, to increase recognition of the implications of poor diet and inadequate physical activity levels and knowledge of preventative measures; third, to promote policies and action plans at all levels to address diet and physical activity behaviours and finally to encourage monitoring, evaluation and further research (1).

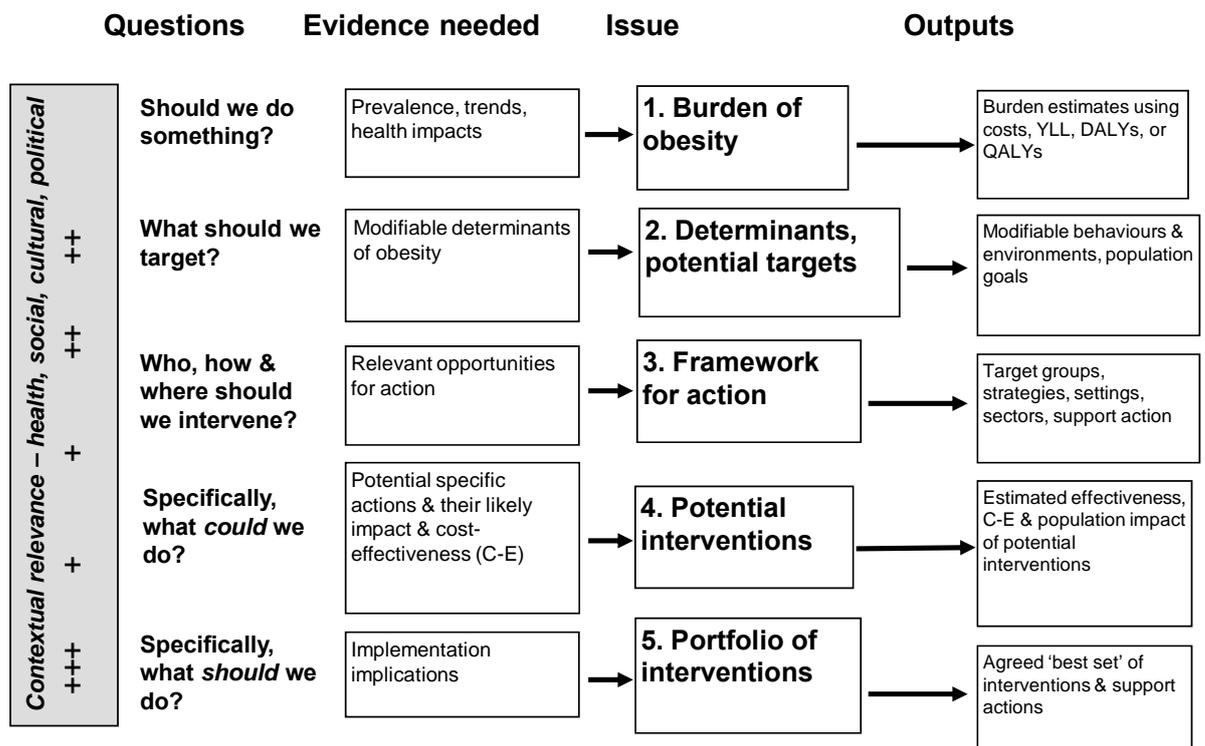
1.2. *Evidence for obesity prevention*

1.2.1 Evidence Framework

The International Obesity Task Force (IOTF) has published a framework for an evidence-based approach to obesity prevention (Figure 1). This framework identifies

the key issues and the different types of evidence needed to address them (2). Some of the issues are very contextual such as the burden for a particular population (issue 1), the main determinants of unhealthy weight in that population (issue 2) and, especially, the final decisions about what should be done (issue 5). Other issues tend to be somewhat more universal such as the framework of settings and strategies for action (issue 3) and the range of possible interventions (issue 4). For example, Tonga, Texas, and Taiwan will all have very different burdens of obesity, but there will be a degree of commonality in the driving forces across those populations, such as dependence on cars, availability and promotion of energy dense foods and drinks, and availability of labour saving devices. There will probably be more commonalities in the broad strategic plans to reduce childhood obesity because all would involve schools and pre-school settings, address healthy eating and physical activity, and identify social marketing, policies, curriculum, programs, and environmental changes as the key strategies. The possible range of specific interventions is also somewhat universal but the process of determining a final portfolio of actions is highly contextual so the selection of actions that might work well in Tonga may not apply at all in Texas or Taiwan.

Figure 1: International Obesity Taskforce Evidence Framework for Obesity Prevention



There is good evidence to address issues 1 and 2 and many governments can readily achieve a broad framework for action (issue 3) which includes all the main implementation areas (i.e. appropriate settings and sectors) and support actions (e.g. monitoring, capacity building, research, and social marketing). While the evidence on

the determinants of obesity is very strong in most areas, the majority is focused on the more proximal biological and behavioural determinants rather than the more distal, but very powerful, social and environmental determinants. One poorly researched but very obvious set of determinants are the socio-cultural attitudes, beliefs, values and perceptions that may explain the very large differences in obesity prevalence rates seen across different cultures. These socio-cultural determinants may help to explain why some rich and poor countries have obesity prevalence rates in women of less than 5% (e.g. India, China, Yemen, Ethiopia, Japan, and Korea) and rich and poor countries have prevalence rates greater than 40% (e.g. Samoa, Tonga, Qatar, and Saudi Arabia) (3).

Issues 4 and 5 in the IOTF framework, however, are much more challenging – what are the concrete programs, policies, and actions that *could* be initiated and, of those, which ones *should* be done to provide the best investments for reducing obesity? It is here that the lack of effectiveness evidence is proving to be a barrier to action. And even the few programs with evidence of success (such as the one in Singapore (4)), are not necessarily transferable to other cultures and countries. It is the evidence around issues 4 and 5 that this report mainly addresses and the process of moving from a long list of possible actions (issue 4) to a shorter achievable list of promising actions (issue 5) is the main focus of the priority setting approaches described.

1.2.2 Practice-based evidence

Evidence is not sufficient by itself to guide appropriate decision making (5) and true evidence-based policy making is probably quite rare (6). Therefore, getting the process right and engaging decision-makers from the start moves towards ‘practice-based evidence’ (6) which is more relevant than the classical ‘evidence-based practice’. An obesity prevention plan based only on the limited published trials available would be patchy and probably ineffective.

Therefore, achieving a broad portfolio of promising interventions for obesity prevention requires both an assessment of the likely impact of those interventions (as far as can be estimated from the available evidence) and a process by which to engage the key stakeholders in all decisions. Working with the key stakeholders to derive a plan of action increases the relevance, ownership, the likelihood of the recommendations being implemented but, as always, political considerations, funding limitations, and extraneous events play a major role in what finally gets supported.

1.3. Purpose and structure of the report

The 61st World Health Assembly endorsed the 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of NCDs in May 2008. An objective of this plan was to ‘promote interventions to reduce the main shared modifiable risk factors for NCDs: tobacco use, unhealthy diets, physical inactivity and harmful use of alcohol’ (7). It recommends that WHO uses existing strategies such as the DPAS, to provide countries with technical support to implement action and improve existing strategies for addressing NCD risk factors (7). This report has been written in

preparation for the 2009 WHO Forum and Technical Meeting on Population-based Prevention Strategies for Childhood Obesity.

The purpose of this report is:

- To provide a framework and process upon which to develop childhood obesity policy options across all settings and sectors
- To assist stakeholders in conducting a systematic approach to identify all relevant childhood obesity prevention policy options and provide models to effectively prioritise such policies
- Provide a model for assessing the cost-effectiveness of policy options which consider the diet component of DPAS

It is important to consider the context for which these frameworks are applied and recognise that the frameworks and models must be adapted to the country, region or area to which it is being applied. The intention is not to provide a single policy solution to address the prevention of childhood obesity, rather to provide a systematic process for identifying all options and a system to enable the selection of appropriate interventions.

Policy development often occurs in a non-systematic, ad hoc manner and is heavily influenced by political considerations and lobbying from vested interest groups. Nevertheless, there are aspirations to make policy processes more systematic, evidence-based and stakeholder-informed. Figure 2 shows a schema of the key stages of a systematic policy process and how the information and frameworks outlined in this report fit into that 'ideal' process. The Modified DPAS Framework provides the overview to scope the sectors and sectors involved in food and physical activity and identify the potential policy areas for action. In Part 2 of the report, three processes (STEPwise, Problem/Solution Tree, ANGELO) which have been used in various situations are described as possible options for specifying possible interventions for preventing childhood obesity and prioritising them into a portfolio of the most promising interventions. The ACE Process (Assessing Cost-Effectiveness) is described in Part 3 of the report as the preferred approach for assessing the cost-effectiveness of potential food policy interventions for DPAS. All processes apply 'due process' by working with stakeholders and there are varying levels of technical analyses to inform the process.

It is important to note that the outcome for all these processes is a well-justified, well-evidenced set of recommendations, from key stakeholders, to the political decision-makers. Taking those decisions and implementing the policy actions is the jurisdiction of governments. Governments should be involved in all the other processes but the ultimate choice of policy options and their level of implementation is under their control.

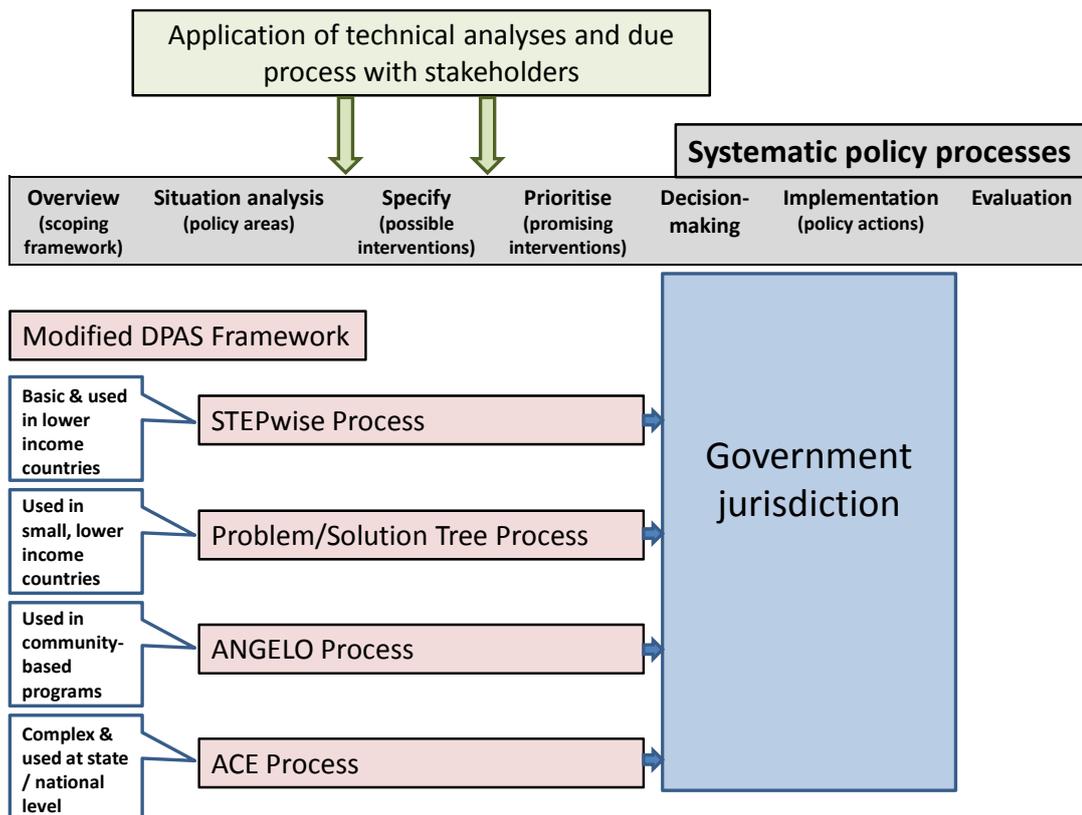


Figure 2: Schema for a systematic approach to policy processes and some associated analytical and process frameworks

2. Childhood Obesity Policy Framework

2.1. Childhood Obesity

In many countries globally, overweight and obesity are increasing at an alarming rate. Surveys conducted in the 1990's show that overweight was increasing by between 0.5% and 1% every year (8). This rising rate will inevitably place a huge burden on health services due to the increasing rates of NCDs such as type II diabetes, cardiovascular diseases, hypertension and some cancers associated with excess weight gain. Worldwide, the rate of overweight and obesity among school-age children is 10%, however in the Americas the prevalence is just over 30%, while Sub-Saharan Africa has a prevalence of 2% (8).

In high-income countries, obesity is higher in children from lower socio-economic status (SES) backgrounds. For example, in the USA the overweight rate in children from low SES families was 29%, compared to 21% in children from high SES families (8). In lower income countries, however, the trend is usually the reverse, with

children from low SES backgrounds having a lower rate of obesity when compared to children from high SES backgrounds.

Children who live in rural areas of lower income countries have a markedly lower prevalence of overweight compared to children who live in urban areas. In Brazil, children in urban areas have an overweight prevalence of nearly 20%, a figure which is double the overweight prevalence of children from rural areas (8).

2.2. Relevant stakeholders

DPAS stipulates that a combined, collaborative approach is required to effectively address and change diet and physical activity habits (1). To ensure effective strategies are implemented, it is essential that all relevant stakeholders are engaged - from the local to global level and from both the public and private sectors. The frameworks within this report are directed towards all relevant stakeholders, each of whom is responsible and should be accountable for the implementation of policies which best apply to their sector or setting, or are best administered by their sector or setting. The stakeholder groups considered are: international organisations including WHO, governments, the private sector, and civil society and nongovernmental organisations. The nature, role and resources of each stakeholder are discussed below.

2.2.1. International Organizations

It is the role of all international organisations associated with the food system or physical activity environments to promote and support strategies which address public health.

International organizations which have appropriate jurisdiction such as the World Trade Organisation, the World Bank or the European Union need to ensure that public health protection is considered and incorporated into all international agreements, for example, agricultural trade, health and environmental agreements, and international standards/codes. The direct, indirect or unintended impact that agreements may have on public health is often not considered when forming agreements.

The role of WHO and other United Nations bodies such as UNICEF is to promote a coordinated approach between all relevant international agencies. This will ensure an integrated approach to addressing unhealthy diet and inadequate physical activity levels. Furthermore, these bodies should also support national governments globally, provide funding for development and offer leadership and advocacy.

Obesity is a global problem. All relevant international organisations should therefore be engaged and responsible for considering public health protection.

2.2.2. Government

The role of government is pivotal in achieving a comprehensive approach to the prevention of childhood obesity. It is the responsibility of governments to take action in four main areas: leadership, regulatory policy, funding, and advocacy (9).

Governments must show clear leadership in obesity prevention and take action to steer all relevant stakeholders towards the implementation of obesity prevention strategies. All levels of government must be engaged and a coordinated approach should be taken across all tiers of government and all ministerial departments, for example, health, infrastructure and industries, agriculture, climate change, communications and treasury.

Regulations and laws can be powerful instruments with which to achieve outcomes. Governments should review existing legislation and change or implement laws and regulations to protect and promote public health. Changes in the social, economic and physical environment need to occur to reduce obesity. ‘Hard’ policy approaches are the most powerful drivers for change (10) and include instruments such as fiscal tools (e.g., taxes or subsidies), laws, legally-binding policy and regulations (10). In comparison, ‘soft’ approaches include health education, health promotion programs or social marketing tools (9). Successful obesity prevention may occur when governments become willing to use the ‘hard’ policy instruments that may be needed to reverse the obesity epidemic (9). Conversely, governments and industry may reach mutual agreements whereby laws and regulations are not imposed if industries agree to ‘self-regulate’ their practices in order to meet objectives (11). However, this approach relies on government willingness to provide stakeholders with specific targets in order to meet the set objectives.

Increased and continual funding is essential to create healthier food and physical activity environments (9). It is the responsibility of the government to ensure the provision of this funding to allow for changes in the obesogenic environment, such as funding for infrastructure change. Furthermore, it is imperative that financial support is provided for research institutions, the provision of programs, for monitoring population health and for the evaluation of strategies.

Governments also have a large advocacy role. They must ensure a collaborative approach across multiple sectors and engage all interested stakeholders. It is their responsibility to advocate to their citizens, the private sector, civil society, international organisations and other governments who have influence over these policy actions. Furthermore, in governments with multi-tiered structures (e.g. local, regional and national) each level of government must advocate to the other levels to ensure the implementation of coordinated, efficient and effective strategies. DPAS suggests that effective and agreeable strategies will result if governments consult with all relevant stakeholders when developing and implementing policy (1).

2.2.3. Private Sector

The private sector is a highly influential arena and can often act as a barrier to healthy diet and physical activity behaviours. Conversely, the private sector has the potential to act as an important promoter of healthy patterns. It is therefore essential to engage the industries which directly affect or impact upon the diet and physical activity of a population. These include such players as the food industry, media/communication industry, car and transport industry, entertainment industry and consumer retailers.

The private sector must become responsible for considering the protection of public health and show initiative in changing and implementing policy to create healthy food or physical activity opportunities. WHO recommends a cooperative partnership be formed between the private sector and other stakeholders (1). This will facilitate a coordinated approach and ensure consistency of public messages.

The media has been included within the private sector, however it is recognised that policy areas related to media may fall across multiple stakeholders, i.e., the private sector, government and nongovernmental organizations. Public health needs to be considered in all media activities and industries must become accountable for the implementation of responsible marketing.

Additionally, all private organisations and businesses should be promoting healthy eating and physical activity to their employees and the community in general.

2.2.4. Civil Society and nongovernmental organizations

These bodies include groups such as unions, civil society groups, scientific organisations and public interest organisations. Fundamentally, these organisations help to protect public interests and can have an influential role when working with governments and the private sector by acting as a voice for the 'people'. The role of civil society and nongovernmental organizations (NGOs) is largely one of advocacy, i.e., 'arguing the case'. They should advocate for the creation and maintenance of healthy diet and physical activity environments and for the provision of programs and policies to address obesity. They also play an important role in reporting and campaigning on performance of other stakeholders.

Additionally, civil society and NGOs can implement strategies to promote healthy eating, increased physical activity levels and healthy body weight. This can occur through programs, social marketing and education.

The financial capacity of this stakeholder is limited often due to relatively small budgets in comparison to governments and the private sector. These bodies can also contribute to research, evaluation and monitoring (e.g., supporting research programs at universities).

2.3. Contextual definitions - Policy

Several concepts relating to the term ‘policy’ are used extensively throughout this report. These concepts have been defined to ensure reader interpretation and understanding:

Strategic policy direction is used here to describe an overall statement of intent which guides the government in childhood obesity prevention action.

Policy tool or instrument refers to the methods used to achieve the objectives of a policy (11), for example, taxes, health promotion programs, laws and regulations or advocacy.

Policy area is a term used here to refer to a broad area in which a policy could be applied, for example, school food or broadcast advertising.

Policy interventions are the specific actions implemented in order to achieve set objectives, and in this report we include all intervention options under this term including programs, social marketing, education, events, and so on as well as legislation, regulation, rules and other enforceable policies. For example, in relation to fruit intake at school (a policy area), the policy interventions could include curriculum activities, policies about fruit in the canteen, fruit-related events, and social marketing campaigns.

2.4. Overview of policy framework

2.4.1. WHO framework for the implementation of DPAS

WHO developed a framework to assist Member States in assessing the implementation of DPAS (figure 3) (12). The framework proposed that national governments should demonstrate leadership and facilitate collaborative action in the implementation of policies and programs to promote a supportive environment. This environment will facilitate a positive change in diet and physical activity behaviours. Short, immediate and long term health, social and economic outcomes should be measured to assess changes in status. The model stipulated that monitoring, evaluation and surveillance of the strategy should occur continually throughout the process.

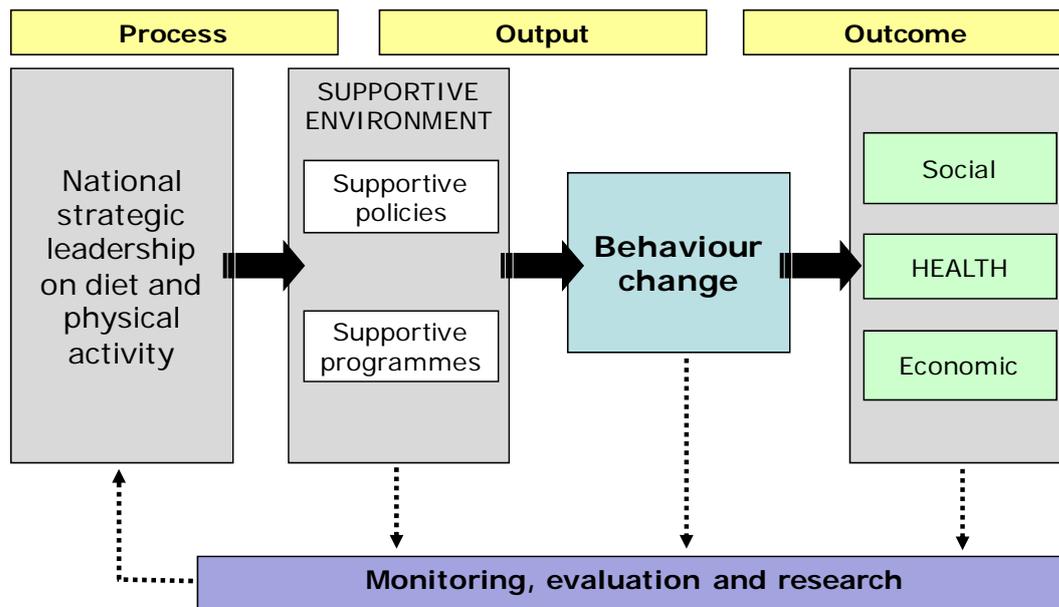


Figure 3: WHO DPAS Implementation Framework (12)

2.4.2. Modified DPAS – Obesity prevention specific

The schematic model developed by WHO for monitoring the implementation of DPAS has been modified to specifically address obesity prevention (figure 4). This model was modified to allow for a comprehensive and systematic analysis of potential obesity prevention policy areas in multiple sectors and settings (13).

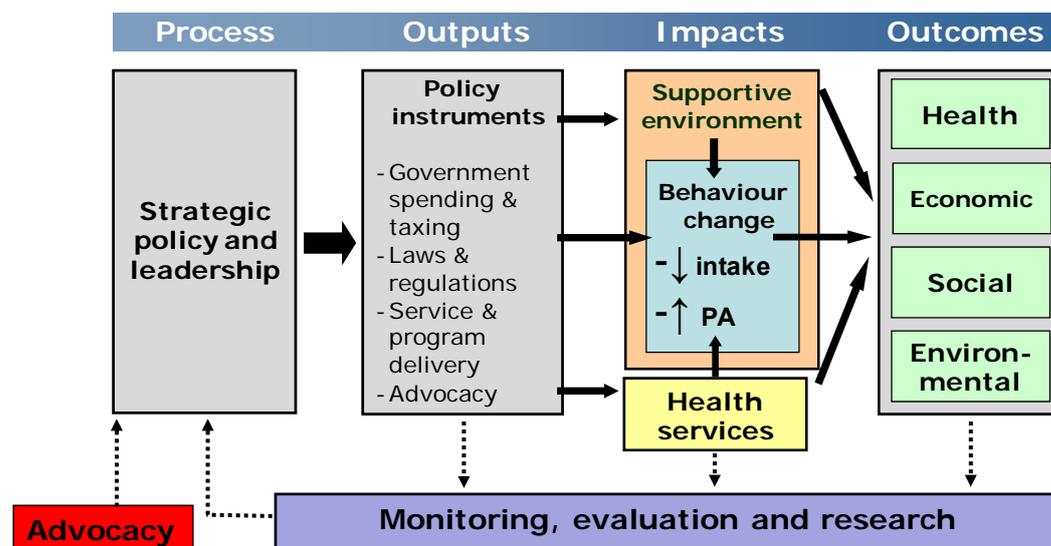


Figure 4: Modified DPAS Framework specifically considering obesity: schema for policy development, implementation and evaluation (Source: (13). Adapted from (12))

The DPAS Implementation Framework has been modified in four ways. The Modified DPAS Framework was constructed with national governments as the leaders and drivers of many of the policy changes, as illustrated in the ‘Process’ component of the model. The first modification made acknowledges the importance of advocacy. In doing so, the modified framework emphasises that the government plays a central role in the implementation of the obesity prevention strategies, however acknowledges that the other stakeholders play very important complementary roles. As discussed in section 2.2, advocacy, particularly by civil society and NGOs, is important to encourage governments to take action and make childhood obesity prevention a strategic priority.

The second modification identifies that multiple instruments can be used by governments to achieve policy objectives. These instruments include: service and program delivery, advocacy, laws and regulations and government spending and taxes. As previously mentioned (section 2.2.2) ‘hard’ or ‘soft’ policy instruments can be used, for example, laws or fiscal tools versus health promotion programs or social marketing techniques. Relevance, effectiveness, acceptability, feasibility and equity are some of the factors which may be considered when selecting instruments (11).

As illustrated in figure 5, the Modified DPAS Framework specifies which area (environments, behaviours, or services) the policy instrument is intending to impact. It recognises that some policies are directly aimed at influencing the environment around us, while others directly target an individual’s diet or physical activity behaviour and finally other policies may be directed towards supporting health services. This modification therefore allows the delineation between three public health promotion approaches: upstream or socio-ecological, midstream or behavioural and downstream health services approaches. These approaches are discussed in detail in the following section.

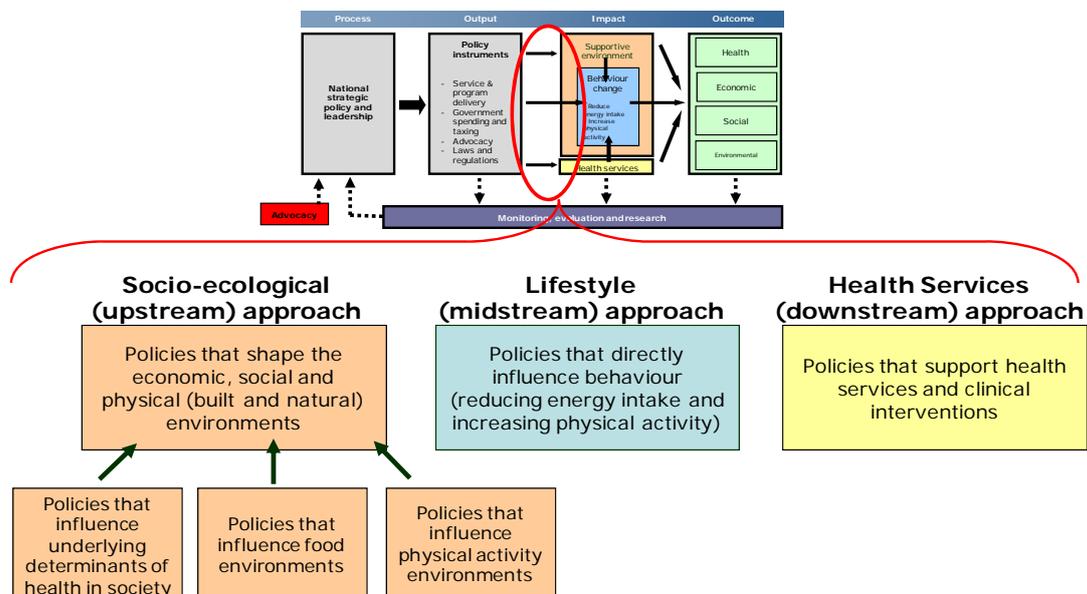


Figure 5: Expanded version of the Modified DPAS Framework illustrating the breakdown into upstream, midstream and downstream obesity prevention policy approaches (13)

The final modification can be seen in the ‘Outcome’ section of the framework. Environmental outcomes have been included, in addition to health, social and economic outcomes. This was included to recognise the relationship between lifestyle behaviours and the changing environment (14) and also to acknowledge the study of ‘New’ nutritional sciences, i.e., “food systems...and their interactions within and between all relevant biological, social and environmental systems” (15 p697). For example, adopting more active transport patterns will have a positive effect on health as well as reduce the pollution from cars and ease city congestion. Also consuming more plant-based diets will result in improved nutritional health as well as improved land use and reduced greenhouse gas emissions from farm animals.

Monitoring, evaluation and research remain within the Modified DPAS Framework. These components are imperative within the framework as they provide a means of measuring and understanding the effect and impact of obesity prevention actions. It is essential they are considered at each stage of the process, especially in light of the limited evidence-base for obesity prevention policy options.

2.5. Analysis grids of sectors and settings

As previously outlined, three public health promotion approaches are considered within the structure of the modified DPAS: an ‘upstream’ or socio-ecological approach, a ‘midstream’ lifestyle behaviour approach and a ‘downstream’ health services approach.

Socio-ecological or upstream approaches indirectly affect our diet and physical activity behaviours by shaping the broad economic, social and physical environment in which we live (13). This approach aims to foster healthy behaviours by making them the easy or preferred choice. In the context of obesity, this approach considers three main influences: the underlying determinants of population health, the food system and the physical activity environment (refer to figure 5). Policies which use this approach are found within sectors, for example, the transport sector or marketing sector.

Conversely, midstream approaches aim to influence diet and physical activity behaviour by directly targeting the individual (13). These approaches are used in settings, as opposed to sectors, for example, childcare centres, households, churches or villages.

Downstream approaches are directed towards supporting health services and medical interventions. With respect to the prevention of childhood obesity, these approaches occur predominately in the primary care setting.

For each of the three public health approaches, analysis grids can be used to identify all relevant policy areas for obesity prevention. Use of the grids facilitates a systematic approach in identifying all options and can be used to create a comprehensive list within every setting or sector. This approach minimises the risk of unstructured or unplanned approaches and ensures all gaps, weaknesses and opportunities are identified (16). Policy options are classified across two dimensions:

the sector or setting that the policy area best applies and the stakeholder who is primarily responsible for administering the policy (16).

It should be noted that analysis grids have been used to present examples of possible policy areas across relevant sectors and settings and that the examples given do not represent a complete list of all options. There is a lack of evidence on the effectiveness of obesity prevention policy interventions, therefore the examples presented do not necessarily represent ‘best-practice’ or indeed have supporting evidence. Examples of childhood obesity prevention policy interventions being implemented in various countries or areas around the world are outlined in the subsequent sections of this report. Furthermore, in scanning the analysis grids presented in this report, it is important to recognise the implication of boxes which remain largely ‘empty’ and consider where the grids are heavily populated. The grids clearly illustrate the crucial role of governments in obesity prevention strategies. They are largely responsible for taking action to implement policies within all three of the public health approaches. This is because governments usually have the jurisdiction and capacity to implement the change or alter policies, whereas other players do not have that agency.

2.5.1. Socio-ecological – Underlying determinants

Economic, social and political circumstances determine the way in which people live. Health inequalities exist due to a “combination of poor social policies and programs, unfair economic arrangements, and bad politics” (17 p1). Obesity is more prevalent (in wealthier countries) in individuals and communities from lower SES backgrounds and those who are politically disadvantaged (17). Thus, the burden of disease from obesity is disproportionate in disadvantaged populations.

As mentioned, socio-ecological public health approaches are broad-based and aim to shape the environment in which we live (13). These policy options are driven by a responsibility to uphold social justice and achieve social equity by reducing inequalities such as poverty. Public health is therefore an important driver for change. These policies aim to impact upon the underlying determinants of health in general, therefore their effects will go beyond just obesity. The policy instruments used are likely to be ‘hard’ in nature, i.e., fiscal or regulatory instruments. Therefore, the responsibility largely lies with government and international bodies with jurisdiction to influence policies. As seen in table 1, the analysis grid considers policy options across six sectors: finance, commerce and trade, education, employment, social affairs and ‘other’ sectors.

It is mostly national governments, and some international organisations, who have jurisdiction over potential policies addressing the underlying determinants of health, therefore examples are seen mostly within the columns considering these two stakeholders. Civil society and NGOs do not have jurisdiction in this area therefore the column which considers these stakeholders is largely blank. They can however be strong advocates for the implementation of policies to address the underlying determinants of health.

Table 1: Analysis grid presenting examples of policy areas which influence the underlying determinants of population health

SECTOR	STAKEHOLDER			
	WHO and International Organisations	National governments	Private sector	Civil society and non-government organisations
Finance	<ul style="list-style-type: none"> • Co-ordinated debt relief • Co-ordinated aid activities • Health equity impact assessments on multi-national economic agreements • International tax cooperation 	<ul style="list-style-type: none"> • Strengthened revenue through domestic taxation 	<ul style="list-style-type: none"> • Wage and salary rates paid • Employer-supported benefits (e.g., sick leave, health cover) 	
Commerce and trade	<ul style="list-style-type: none"> • Fair international trade agreements • Regulation of goods and services with a major impact on health (e.g. tobacco, alcohol, food) 	<ul style="list-style-type: none"> • Support for local agriculture • Regulation of goods and services with a major impact on health (e.g. tobacco, alcohol, food) 	<ul style="list-style-type: none"> • Location of operations 	
Education	<ul style="list-style-type: none"> • Interagency policy coherence related to early child development 	<ul style="list-style-type: none"> • Compulsory primary and secondary education • National school curricula • Investment in school infrastructure and education facilities 	<ul style="list-style-type: none"> • Educational and vocational training opportunities 	

Employment	<ul style="list-style-type: none"> • Core labour standards • Fair employment and decent working conditions 	<ul style="list-style-type: none"> • Fair employment and decent working conditions • Gender pay-equity • Family-friendly working conditions • Living wages 	<ul style="list-style-type: none"> • Child labour eradication • Compliance with labour codes and occupational health and safety standards
Health		<ul style="list-style-type: none"> • Universal access to health care • Strong primary health care sector • Development of national health workforce • Health impact assessments of policies from other sectors 	<ul style="list-style-type: none"> • Health cover for employees
Social affairs and other sectors	<ul style="list-style-type: none"> • Health equity surveillance systems 	<ul style="list-style-type: none"> • Health equity in policy responses to climate change and environmental degradation • Gender equity • Universal birth register • Availability of affordable housing • Investment in rural development • Urban slum upgrading • Universal access to telecommunications 	

2.5.2. Socio-ecological – Food system

The obesogenic food system driving an ever higher energy intake is considered to be the major driver of the obesity epidemic (18,19) as opposed to reduced energy expenditure. Therefore, it is the most important area in which to enact policy, as interventions will have a direct effect on reducing the obesogenicity of the environment. The food system is typically targeted by obesity prevention policies with the aim of modifying the environment so that making more healthy food choices is the ‘easy option’ (16).

Again, ‘hard’ instruments will be mostly used for these interventions, for example, subsidies and taxes on food products or legislation on the marketing of unhealthy foods. In addition to improving the nutritional status of the population, changes in the food system are also driven by the need to adapt to climate change e.g., to reduce food miles.

Action needs to be taken by all stakeholders; all levels of government, international organisations and crucially, the private industry. All sub-components of the food system must be considered in order to systematically map relevant policy options. These sectors include primary production, food processing, distribution, marketing, retail and the catering/food service (16) (Table 2).

As seen in the analysis grid, the obesogenic food supply can be influenced across all sectors, by all stakeholders and from local to international levels. Despite this, the government has many of the policy instruments with which to influence the food system. As part of their advocacy role, civil society and NGOs can run criteria based endorsement schemes whereby products are supported or given endorsement if certain criteria are met, e.g. a heart foundation giving a tick of approval.

Table 2: Analysis grid presenting examples of policy areas which influence the food system

SECTOR	STAKEHOLDER			
	WHO and International Organisations	Government	Private sector	Civil Society and non-government organisations
Primary production	<ul style="list-style-type: none"> • Primary production subsidies and taxes 	<ul style="list-style-type: none"> • Primary production subsidies and taxes • Land-use management • Community gardens 		<ul style="list-style-type: none"> • Criteria based endorsement systems
Food processing		<ul style="list-style-type: none"> • Product composition standards • Food safety 	<ul style="list-style-type: none"> • Product composition standards 	<ul style="list-style-type: none"> • Criteria based endorsement systems
Distribution	<ul style="list-style-type: none"> • Trade arrangements 	<ul style="list-style-type: none"> • Trade arrangements • Food transport • Importation restrictions, subsidies and taxes • Quarantine 		
Marketing	<ul style="list-style-type: none"> • International codes on restrictions on marketing of unhealthy food 	<ul style="list-style-type: none"> • Nutrient content disclosures in marketing material • Consumer protection (e.g., misleading advertising) • Restrictions on marketing of unhealthy food • Promotion of marketing of healthy food • Marketing practices in schools 	<ul style="list-style-type: none"> • Restrictions on marketing of unhealthy food • Promotion of marketing of healthy food 	<ul style="list-style-type: none"> • Criteria based endorsement systems

Retail	<ul style="list-style-type: none"> • Nutrition labelling • Health claims on food products 	<ul style="list-style-type: none"> • Products sold in schools • Land-use management • Density of local fresh food retailers • Density of fast food outlets • Nutrition labelling • Health claims on food products • Incentive system for welfare recipients to buy healthy food • Food taxes / subsidies 	<ul style="list-style-type: none"> • Product placement in stores 	<ul style="list-style-type: none"> • Criteria based endorsement systems
<hr/>				
Catering/food service		<ul style="list-style-type: none"> • Policies on healthy food services in government departments and funded agencies (including schools, hospital, recreation facilities) • Nutrition information in restaurants • Food safety 	<ul style="list-style-type: none"> • School food policies • Food procurement policies 	<ul style="list-style-type: none"> • Food procurement policies • Criteria based endorsement systems

Food supply policy example 1: Food policies in Scandinavia

Norway, Finland and Sweden are three examples of Nordic countries that have adopted formal nutrition policies. In 1976, Norway issued its first white paper, with Finland and Sweden implementing their formal nutrition action plans in 1989 and 1995 respectively, after prior years of research and recommendations (20). The transferable dietary intervention strategies in these countries include the Norwegian 'Spis med glede' (Enjoy Eating) campaign, the 'key hole' symbol labelling of foods in Sweden, the North Karelia Project of Finland (discussed below) and the mass catering strategy of Finland and Sweden (which includes fresh vegetables in cooked foods for lunches in schools and the workplace).

In 1972 the North Karelia Project, Finland, was launched in response to the need for effective action on the exceptionally high coronary heart disease mortality rates in East Finland. With cooperation of local and national authorities and experts (including WHO), the comprehensive intervention was implemented, which aimed to reduce the risk of cardiovascular disease by changing behaviour (including diet and smoking) (21). As part of the North Karelia Project, the East Berry and Vegetable project aimed at supporting vegetable and berry consumption and production began in 1985 with collaboration between berry farmers, berry industry, commercial sectors and health authorities (20). Coronary heart disease mortality had a significantly greater decline in North Karelia than all of Finland in the 1970's which was helped with the increase in the availability of healthy choices from the East Berry and Vegetable project (20). The experiences learned from the original project period (1972-77) have been actively incorporated into national action plans and have highlighted the success of coordinated community based interventions.

Food supply policy example 2: Trans fats

Denmark was the first country to implement stringent laws restricting the trans fat content in foods. In 2003, the Danish Nutrition Council conferred with scientists that there was a substantial harmful effect of trans fats on health, with no positive effect whatsoever, and that they could be eliminated from food without adverse effect on taste, price or availability of foods (22). It was then legislated in 2003 that a limit of 2% of trans fats and oils content be allowed for food destined for human consumption (23). Other countries and states have since implemented restrictions on trans fats in food, including New York, California, Philadelphia, Canada and Switzerland, with many companies implementing voluntary changes to their food compositions and preparation techniques (e.g. McDonalds, Tesco, Sainsbury, Marks and Spencer, Kraft, Kellogg's) (24).

Food supply policy example 3: Food marketing to children

Television advertising to children under 12 years has not been permitted in Sweden since commercial television began over a decade ago although television channels broadcast into Sweden have diluted the impact of the ban in Sweden. Norway, Quebec and now the UK also have significant restrictions on television advertising to children (25, 26). In the UK, a nutrient profiling model has been developed by the UK Food Standards Agency to categorise foods on the basis of nutrient content. The simple scoring system identifies foods high in fat, salt or sugar while recognising the contribution of fruit, vegetables, cereals, meat and dairy-based products to a balanced diet (27). In order to help tighten controls on the advertising to children of high fat, salt and sugar foods (HFSS), the model was given to the independent regulator and competition authority for the UK, Office of Communications (OfCom) (27). Ofcom, has since implemented tougher regulations that limit TV advertising of HFSS food and drink products to children including the ban of television adverts for HFSS food before, during and after television programming aimed at children under 16 years. It is also estimated that a drop of 34 percent in the amount of HFSS food advertising seen by children aged 4-15y occurred in the year prior to July, 2008 (27). In January 2009, the final phase of the restrictions will take effect and all advertising of HFSS will be banned from children's channels. A set of principles (the Sydney Principles) has also been developed to guide actions on restricting food and beverage marketing of all forms to children under 16 years and there is a growing call for an international enforceable code to implement such regulations (28).

Food supply policy example 4: Healthy food service policies

The state of Queensland, Australia introduced healthy food service policies ('A Better Choice') in September 2008 (29). The Better Choice initiative is centred around creating environments that make healthy food and drink choices easier by improving the range, availability and promotion of health foods and drinks. The strategy focuses on foods and drinks prepared, supplied or purchased by staff, visitors or the public in facilities owned and/or operated by Queensland Health (e.g. hospitals, community health centres or clinics and rehabilitation centres) and is working towards increasing the healthier options available to at least 80 percent of the total food and drinks displayed in these centres. All commonly supplied food and drinks have been classified into three categories according to their nutritional value: Green (Best choices), Amber (Choose carefully) and Red (Limit). Foods are correspondingly labelled making the decision for consumers to select a healthier food or drink easier. It is also recommended that 'green' food and drink choices be at reduced prices where possible and these options to be placed in prominent areas (29).

Food supply policy example 5: Front of pack labelling

The Heart Foundations in Australia and New Zealand have been running a nutrition signpost program ('Pick the Tick') for nearly 20 years. It not only assists shoppers make healthier food choices but it also encourages food manufactures to produce healthier foods to meet the Tick nutrient criteria. A panel of nutrition experts research, approve, and set the nutrient standards for over 50 food types. To earn the right to display the Tick, each product is independently tested and assessed whether it meets the standards and continues to meet the standards as regular random testing is carried out. Other nutrition signposting programs (such as Sweden's Green Keyhole program (20) are also in operation. More recently, traffic light labelling on the front of food packaging have emerged in supermarkets in the UK following recommendations from the Food Standards Agency. These labels show 'at a glance' information about the nutrient value of the food being purchased. The labels consist of three colours (green, amber and red) and also contain information about the number of grams of fat, saturated fat, sugars and salt of the product. For instance, a product with the word 'sugars' highlighted in green is low in sugar and will also have the number of grams per serve indicated on the front of the pack.

Food supply policy example 6: Food Industry

In recent years, several global food manufacturers and producers have responded to global pressure to provide healthier food and drink options for consumers through their corporate responsibility charter. For instance, in some countries the global giant McDonald's, now offers a fruit and/or vegetable option for 'Happy meals', displays nutritional information on product packaging and has strengthened their Global Children's Marketing Guidelines. These guidelines stipulate the importance of communicating a nutritionally balanced food choice, physical activity, nutrition information to parents and families to support informed food choices and make food, such as fruit and vegetables, appear fun to eat in their marketing strategies (30).

Nestle has adopted a new strategy to offer products that have a greater nutrition value through the product testing process called 60/40+ (31). This strategy works by having 60 percent of consumers approve the product in taste tests while bringing a nutritional plus. For example, in India Nestle launched the *Maggi Dal Atta Noodles*, one of the country's most popular snacks. These noodles offer protein and dietary fibre through the atta (whole wheat flower) and vegetables, with reduced salt content making it a healthier snack for the population. In addition, Nestle is seeking to remove trans fatty acids, or reduce fat, sugar and salt content of foods through recipe innovation in response to rising obesity rates (31).

2.5.3. Socio-ecological – Physical activity environments

Physical activity environments are targeted by obesity prevention policy with the aim of modifying the environment so that being more physically active becomes the ‘easy choice’ (16). Again, policy options which will impact upon the physical activity environments are predominately ‘hard’ in nature. A significant amount of funding is required to implement changes in infrastructure, for example, the built environment, transport system and recreational spaces. It is important to recognise that the drivers for change in infrastructure are factors such as traffic congestion and greenhouse emissions. The potential benefit to population health is likely to be a contributory factor for driving change in the built environment rather than the major driver.

The analysis grid below maps examples of potential physical activity policy areas for each stakeholder and the sector which predominately controls the relevant environment. The sectors considered are: infrastructure and planning, education, transport and sport and recreation (Table 3).

Again, policy areas are dominated by government jurisdiction, however the private sector also plays an important role within the physical activity environment. It is also worth considering that with multi-tiered government systems, many physical activity policy areas may be at local and regional levels rather than national.

Table 3: Analysis grid presenting policy areas which influence the physical activity environment

SECTOR	STAKEHOLDER			
	WHO and International Organisations	Government	Private sector	Civil Society and non-government organisations
Infrastructure and planning		<ul style="list-style-type: none"> • Urban planning • Roads • Land use management (zoning) • Walking environment • Cycling environment 	<ul style="list-style-type: none"> • Residential and urban development 	
Education		<ul style="list-style-type: none"> • Physical education in schools • Facilities for physical activity in schools • School policies on physical education, physical activity and sport • School travel policies 	<ul style="list-style-type: none"> • Physical education in private schools • Facilities for physical activity in private schools • School policies on physical education, physical activity and sport • School travel policies in private schools 	
Transport	<ul style="list-style-type: none"> • Trade arrangements on motor vehicles 	<ul style="list-style-type: none"> • Taxation policies on cars • Taxation incentives for using public transport • Public transport • Traffic control • Parking restrictions • School travel policies • Urban bicycle loan schemes • Import restrictions on cars 	<ul style="list-style-type: none"> • School travel policies in private schools • Private mass transit • Incentives for using mass transit 	

Sport and recreation

- Public liability
 - Access of general community to school sport facilities
 - Facilities for physical activity – built structures and open spaces
 - Facilities for physical activity and sport
-

Physical activity environment policy example 1: Bogotá

Bogotá, the capital city of Colombia, is considered a world leader in the promotion of active transport and regular physical activity. Ciclovía is one of the initiatives in Bogotá, which sees certain streets and main avenues closed to cars on Sundays and holidays from 7am until 2pm, which promotes physical activity including cycling and walking. The initiative began in 1974, when residents protested at the lack of recreational opportunities and traffic congestion and the initiative had to overcome opposition from businesses and a lack of institutional commitment from the city. By 2005, around 10 percent of Bogotá's residents (approximately 400,000) were participating in the Ciclovía every Sunday (32). In addition to the closing of roads to cars in Bogotá, a number of initiatives have occurred across the city including a 300km bicycle network known as the Ciclorutas, the expansion of square meters of green space per inhabitant from 2.5 to 4.5m², annual car-free days and the creation of special bus only lanes to help reduce traffic congestion and inadvertently increase physical activity of users as they have to walk to bus stops which are approximately 500m apart (32).

Physical activity environment policy example 2: Active transport, Zurich

Zurich, Switzerland is regarded by many as the model approach to urban transport because of its comprehensive transportation policy which promotes public transportation instead of car usage. Beginning in the 1970s, transport systems were created that could detect public transport vehicles at traffic lights (via sensors) to let through these vehicles. The well known 'S-Bahn Zurich' suburban railroad network was completed in 1990, which has allowed for a larger network of trains departing from Zurich main station to be created. Restrictions on residential parking in the inner city were enforced with parking on sidewalks forbidden and time limits of one hour for parking were introduced. These changes to the public transportation system in Zurich have led to many new passengers using the service. For example in 2002, over 2/3 of passengers who entered the city for work or other reasons (total population approximately 37,000) did so via the suburban rail network (33).

2.5.4. Lifestyle behaviour

‘Midstream’ approaches contain most of the ‘soft’ policy approaches in obesity prevention, in that there are no regulations or laws which stipulate what people should eat or how much physical activity they must do. Rather, this approach directly targets people’s behaviours and aims to motivate them to maintain healthy diets and active lives (16). Midstream behavioural approaches are largely program-based or use social marketing techniques, however may be supported by organisational policies, such as a healthy school food service.

As midstream behavioural approaches target the individual directly, these approaches occur in settings as opposed to sectors, for example, childcare centres, schools or a church group. The key settings which should be considered in relation to childhood obesity prevention are: early childcare settings, education (e.g. preschools, schools), community and recreational facilities, households and ‘other’ settings (e.g. churches, islands or villages). An analysis grid has not been used for presenting ‘midstream’ policy areas as all stakeholders, across all settings, are able to implement interventions within the same policy areas (Table 4). These areas are typically campaigns and programs which promote healthy eating and physically active lifestyles, healthy food and physical activity policies within specific settings (e.g. school food) and social marketing interventions. In addition, policy relating to breastfeeding is an important consideration.

Interventions can occur across a wide range of settings, therefore coordination and collaboration with all relevant partners may be an important consideration, for example, a whole-of-community approach.

Table 4: Example of settings and policy areas for behavioural approaches

Major childhood settings	Major policy interventions
<ul style="list-style-type: none">• Early childcare settings• Education (e.g. preschools, primary and secondary schools)• Community and recreational facilities• Households• Other settings (e.g. churches, islands, villages)	<ul style="list-style-type: none">• Policies in settings on food service and promoting healthy eating and physical activity• Campaigns and social marketing• Programs promoting healthy diet and physical activity• Education and information

Behavioural approach example 1: Schools in the United States

The Co-ordinated Approach to Child Health (CATCH) program in the United States began as a research project in the late 1980s and early 1990s and then evolved into a broader, scaled up program which involves a whole school approach and covers four main areas: Classroom Curriculum, Physical Education, School Nutrition and the Family Environment to improve the health and wellness of children (34,35). The program provides schools with information on how to create nutritionally beneficial lunches for students, classroom activities that teach students about healthy eating and regular physical activity, and involves parents, through family fun nights and wellness days. The program also provides a framework for increasing the amount of time students' spend being physically active in physical education lessons and strategies to increase the amount of moderate-vigorous physical activity children engage in. The effectiveness of the CATCH program has been evaluated on several occasions. Studies have shown that the CATCH program was able to reduce the fat content of school lunches, increase moderate-vigorous physical activity levels in school physical education and improve eating and physical activity habits of participants three years post their involvement in the intervention (36). Since the initial trial of CATCH in 4 states (California, Louisiana, Minnesota, and Texas) between 1991-1994, improved versions of the CATCH program has been adopted in thousands of schools and communities across the United States and is presently expanding to schools throughout Canada in after school programs (35).

Behavioural approach example 2: Schools in China

In Beijing, China, a three year school-based nutrition education and physical activity intervention involving children and their parents has achieved promising results (37). Two primary schools in urban Beijing were involved in the intervention for three years and involved a range of strategies including educational materials to parents, classroom lessons on childhood obesity for students, a physical activity component and lectures to parents once a semester at the school on the health consequences of overweight and obesity, the food pyramid and elements of a healthy lifestyle (regular physical activity, balanced diet, reducing television and computer use) (37). Parents of overweight and obese children also had an additional meeting with the research team once a semester and a 'traffic light' food item list was given to all parents. The physical activity component invited all overweight and obese children, along with children who failed routine school physical education tests, to run for 20 minutes after class. Evaluation of the intervention revealed that overweight and obesity prevalence was significantly lower in the intervention schools compared to the control schools, (overweight 9.8% vs 14.4%; obese 7.9% vs 13.3%) after the three year period (37). In addition, remission of obesity was significantly higher in intervention than control schools. Although this study singled out students who were overweight or obese, which is perhaps not best practice, this study has proven success which could potentially be adopted in similar regions, cities, if not low and middle-income countries.

Behavioural approach example 3: Physical activity promotion

The Agita Sao Paulo program was launched in Brazil in 1996 to promote regular physical activity among the 37 million inhabitants of the state of Sao Paulo (38). Since its launch, the program has been implemented throughout Brazil and other countries in Latin America (39). The message of the program is to encourage people to adopt an active lifestyle of at least 30 minutes of moderate to vigorous physical activity, most days of the week and targets three main populations: students, workers and the elderly. The mega-events organised by the program involve large numbers of participants and link to many on-going activities with institutional partners. What makes this program special is the multisectorial approach and broad use of partnerships and inclusion principles. In addition, the strong social marketing campaign that used local culture to disseminate the message helped avoid messages that may exclude any social group. The free and extensive media coverage also made the Sao Paulo project successful in promoting regular physical activity.

In 2001, the Centers for Disease Control and Prevention in the USA developed a national media campaign to change children's health behaviours. The VERB campaign, a multiethnic campaign aimed at increasing and maintaining physical activity among tweens (9-13 years), was developed (40). Social marketing frameworks were applied to national advertising strategies that included paid advertising (television, radio, print, schools and the internet) and the development of partnerships to reach the distinct tween audience. The goal of the campaign was to improve knowledge, attitudes and beliefs about tweens regular physical activity participation, increase parental influence, support and encouragement of tweens and to facilitate opportunities and awareness of opportunities for tween participation in physical activity. Self-report evaluation of the campaign indicated that children who reported seeing VERB messages reported more physical activity and had a more positive attitude to the benefits of physical activity than children who were unaware of VERB (41). Unfortunately the program funding was not continued.

2.5.5. Health Services

Downstream approaches are directed towards supporting health services and medical interventions and largely aim to manage existing overweight and obesity and work with families to prevent children who are overweight or obese in becoming overweight or obese adults.

As with the other public health approaches, ‘downstream’ policy options can be mapped according to the sector in which they apply and the stakeholder responsible for implementing the policy (13). As seen in table 5, the sectors considered are the different levels of the healthcare system: primary care, secondary care, tertiary care and therapeutic goods.

Childhood obesity prevention policies which use a downstream approach predominately occur in the primary care setting, for example, individual-based behaviour change interventions for overweight or obese children. In addition, in countries with significant undernutrition, services often provide feeding programs to reduce the burden of undernutrition and these services are also considered here.

At the primary care level of obesity prevention, the health care provider is the first point of consultation for all patients. Therefore they are well positioned to have an impact on childhood obesity and are accustomed to addressing health behaviours and are able to guide families about obesity preventative behaviours (42). In high and upper middle-income countries primary care providers include local general practitioners, primary care nurses, pharmacists and other community health professionals such as dietitians.

There is limited evidence available addressing primary care based intervention in addressing childhood obesity (42). Many interventions occurring in primary care settings are not evaluated, which may be due to the nature of working within these settings. Perceived barriers to childhood obesity prevention in primary care include lack of time and resources as well as a lack of practical effective approaches (43). There are also concerns that clinician-patient relationships could be affected by discussing a sensitive issue such as weight (43). Another barrier perceived by primary health care professionals was lack of parental involvement, which can threaten the success of interventions (44).

Most evidence of the effectiveness of obesity management programs comes from tertiary weight management centres (45,46), and they have found that involvement of the parents and family is critical. Also management programs for overweight children and their families may be more successful if motivational interviewing is incorporated into the approach (47). Motivational interviewing is a patient-centred style of counselling relying on approaches such as reflective listening, shared decision-making and agenda setting (42). Multiple component behaviour weight control intervention with support systems through telephone and mail based contact also seem to be effective in adolescent weight management (48).

Table 5: Analysis grid presenting examples of policy areas for clinical intervention and health services

HEALTH SECTOR COMPONENT	STAKEHOLDER			
	WHO and International Organisations	Government	Private sector	Civil Society and non-government organisations
Primary care	<ul style="list-style-type: none"> • Primary care partnerships • Undernutrition child feeding programs 	<ul style="list-style-type: none"> • Healthy lifestyle counselling • Dietetic services • Professional training (workplace development) • Subsidies for healthy lifestyle counselling • Undernutrition child feeding programs 	<ul style="list-style-type: none"> • Primary care partnerships • Professional training (workplace development) 	<ul style="list-style-type: none"> • Primary care partnerships
Secondary care		<ul style="list-style-type: none"> • Dietetic services • Professional training (workplace development) 	<ul style="list-style-type: none"> • Professional training (workplace development) 	
Tertiary care		<ul style="list-style-type: none"> • Dietetic services • Hospital waiting lists for treatment by specialists • Subsidies for treatment by specialists 		
Therapeutic goods		<ul style="list-style-type: none"> • Subsidies for weight-loss medication 		

Health Services example: Feeding programs in countries in nutrition transition

Supplementary feeding programs are common in countries where childhood undernutrition is common (49). These programs have made major contributions to reducing the undernutrition and its associated mortality and morbidity. There is, however, potential for such programs to exacerbate the risks of some children becoming overweight later in life (50). The evidence is now clear that both a low birth weight and a high birth weight are risk factors for later unhealthy weight gain in children and that rapid weight gain in early childhood may exacerbate this risk (50, 51).

In a descriptive study by Uauy and Kain (2002) they stated that in developing countries there is usually a high prevalence of underweight children. Many feeding programs are not carefully targeted towards just underweight children and are provided to all children, therefore helping generate a significantly higher number of overweight and obese children. They also state that providing food to prevent malnutrition without considering obesity may do more harm than good. Another issue raised is that a lot of underweight children are stunted and therefore malnourished children have low weight and length-for-age, but will have normal weight-for-length/height, meaning they are stunted but not wasted (49). These children when given additional food will gain more weight-for-age than length-for-age (49).

Uauy and Kain (2002) continue to show this association by exploring the changes in anthropometry before and after receiving food program benefits in infants and young children in Chile as well as targeting strategies as a way to promote growth while preventing obesity. Results showed that targeting strategies were inadequate. Children modified their weight-for-age and weight-for-height, while their length-for-age remained unchanged (49). Careful targeting of feeding program and measuring of height as well as weight are important strategies to adopt so that the risks of later overweight are not increased.

2.6 Frameworks and processes for prioritisation

It is important to recognise that no single solution exists with respect to obesity prevention. The determinants of obesity are complex and varied (52) and therefore solutions by necessity, must be multi-faceted. Depending on the area, region or country, some actions or policy options will be more important, appropriate and feasible than others. Hence, it is imperative that decisions regarding policy options and priority areas are made 'locally'. Potential policy areas must be carefully analysed and local, regional or country-specific factors considered, for example, historical, political, cultural, social and economic factors or constraints, existing and available resources and existing policies and systems. Economic (cost-effectiveness) and health impact should be modelled for potential policies (16).

Clear priority-setting processes are imperative to avoid 'ad hoc' decision-making. A collaborative approach which engages all relevant stakeholders should be taken to identify priority areas and short-list most viable policy areas. This process is vital to ensure stakeholder and policy 'buy-in'.

2.6.1 Basic components of priority setting

There are many criteria which can be considered in the priority setting process. Examples of the criteria are seen in the box below. In reality, fewer criteria will be used due to the impractical constraints associated with considering all factors.

Examples of criteria which can be considered when priority setting:

Population impact
Effectiveness
Cost-effectiveness
Affordability
Relevance
Strength of the evidence base
Effects on equity
Other positive or negative effects
Sustainability
Acceptability to stakeholders (political, cultural, social)
Feasibility (e.g., resources required, workforce available)

Three different approaches to priority-setting are detailed in the following sections. Each approach uses a different set of criteria in the priority setting process. The STEPwise approach considers feasibility, impact and affordability and was developed for use mainly in low and middle-income countries with limited resources and funding. The problem/solution tree model uses relevance, feasibility, acceptability and effectiveness, whereas the ANGELO framework considers importance (taking into account both relevance and impact) and feasibility.

The final section of this report discusses the ACE (assessing cost-effectiveness) model. This is a rigorous approach which considers many factors within a two step process. The first step is a technical analysis which considers quantitative criteria, such as population impact, effectiveness and cost-effectiveness/affordability. The second step of the ACE model considers second stage filters or the qualitative factors, such as acceptability.

2.6.2 Priority setting model 1 – STEPwise approach

The stepwise approach for preventing chronic diseases (53) was developed to assist ministries of health – particularly in low and middle-income countries – in their efforts to develop unified policy action for chronic disease prevention across sectors, and ensure that actions at all levels and sectors of government are mutually supportive. Most importantly, the approach aims to assist governments in prioritising interventions to address the specific population needs given the availability of human and financial resources. It is designed to be flexible and practical in balancing diverse needs and priorities while implementing evidence-based interventions (53).

2.6.2.1 Prioritisation principles

The stepwise approach relies on the national level of government providing the overarching policy for chronic disease prevention, with specific actions falling across sectors. Central to the approach is the recognition that most countries do not have the resources to immediately do everything implied by the overall policy. Consequently, activities that are immediately feasible and likely to have the greatest impact for the investment are selected for implementation first. Interventions that are feasible to implement in the medium term, once there has been a realistic reallocation of resources, are implemented next. Desirable interventions that require resources beyond the current levels are scheduled for implementation last.

2.6.2.2 Details of the approach

Figure 6 outlines the key steps of the stepwise approach, which includes three main planning steps and three main implementation steps.

The first planning step is to assess the current risk factor profile and burden of chronic diseases of a country or sub-population. The distribution of risk factors among the population is the key information required by countries in their planning of prevention and control programmes, and can be assessed using WHO's stepwise surveillance approach (54). In regards to efforts to prevent childhood obesity, this implies that governments should not look at risk factors for obesity in isolation but should rather consider a broad range of chronic disease risk factors e.g. fruit and vegetable consumption and alcohol intake. This information must then be synthesised and disseminated in a way that successfully argues the case for the adoption of relevant policies.

The second planning step is to formulate and adopt a chronic disease policy that sets out the vision for prevention and control of the major chronic diseases and provides

the basis for action in the next 5–10 years. Depending on the configuration of each country's governance, complementary policies also can be developed at the state, province, district, or municipal levels. The policy developed at this stage is akin to the first step of the Modified DPAS framework (Section 2.4.2): 'Strategic policy and leadership'.

The third planning step is to identify the most effective means of implementing the adopted policies. It is at this stage that the analysis grids (presented in Section 2.5 above) could prove useful as an initial scanning tool to identify a comprehensive range of policy areas for specific action.

The stepwise approach then requires that a range of interventions are implemented in a stepwise manner, depending on their feasibility and likely impact in the local conditions, and taking into account potential constraints and barriers to action. This step involves consultation, coordination and cooperation with all government partners, civil society, and the private sector.

Planning is followed by a series of implementation steps: core, expanded, and desirable. The chosen combination of interventions for core implementation forms the starting point and the foundation for further action. Each country must consider a range of factors in deciding the package of interventions that constitute the first, core implementation step, including capacity for implementation, likely impact, acceptability, and political support. The philosophy is that selecting a smaller number of activities and doing them well is likely to have more effect than tackling a large number haphazardly. The approach recommends that countries should try to ensure that any new activities complement those already underway locally, provincially, or nationally (53).

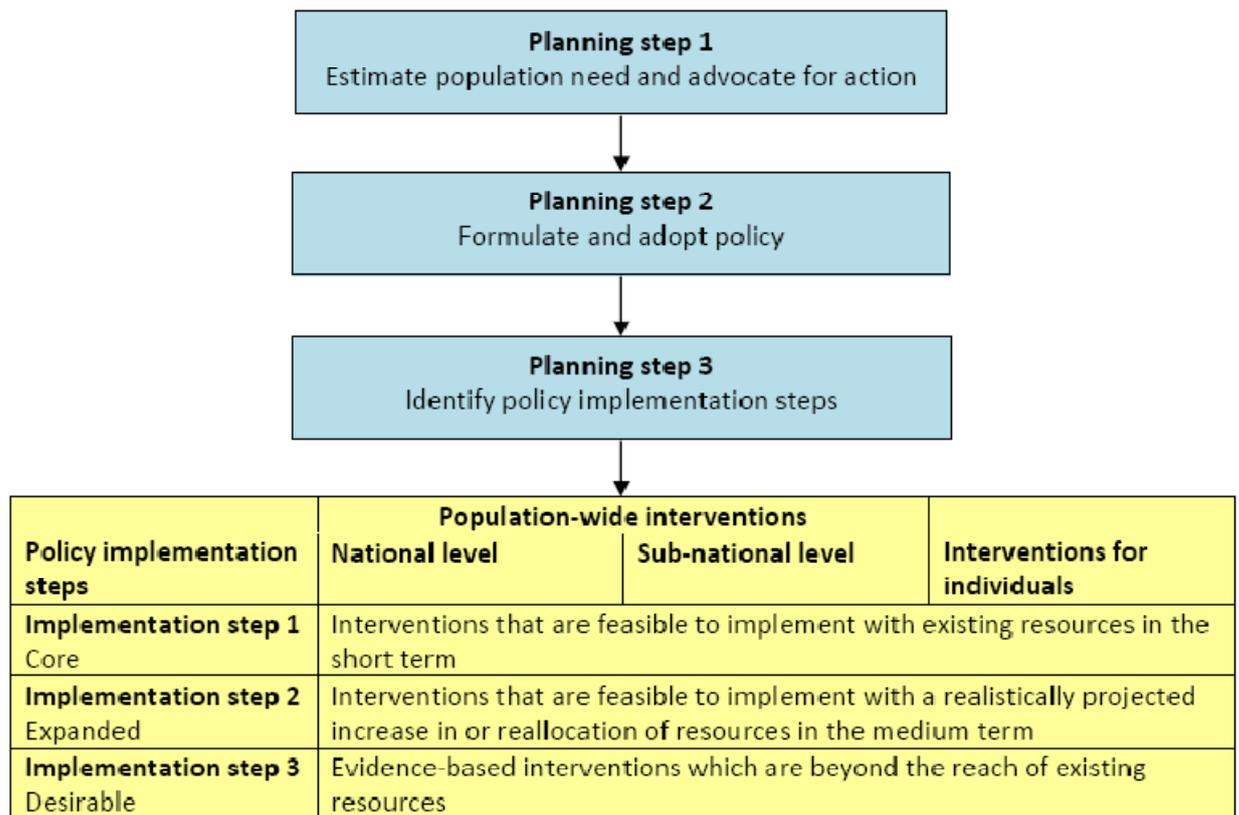


Figure 6: WHO stepwise approach for preventing chronic diseases. Source: (53)

2.6.2.3 Successful adopters of the stepwise approach

A number of countries, such as Vietnam and Tonga, have successfully used the stepwise approach for policy formulation and implementation (53). These countries demonstrate that the stepwise approach has general applicability to solving chronic disease problems without sacrificing specificity for any given country. While there cannot be a universal prescription for implementation, the strength of the stepwise approach is that it allows each country to consider a range of factors in priority setting.

2.6.3 Priority setting model 2 – Problem/solution trees

In order to identify what policy interventions are relevant for a country or area to pursue, there is a need to understand the key issues which are affecting diets and physical activity levels. Once consideration of the local options has been completed, this will naturally lead onto a process of prioritisation.

A participatory approach can be extremely valuable in revealing the most critical issues. A common method used in international development is the Logical Framework Analysis (LFA) (and the similar objective oriented project planning (55), which have become key tools for a number of major international and bilateral donor

agencies (56,57,58). It involves steps of situation analysis, strategy analysis, project planning and implementation. The main tools for identifying areas for action are problem and solution trees (PASTs).

Problem trees can help to “determine the root causes of the main problem” (59), identify the effects and also the possible solutions (58). Problem trees intend to capture only the most significant issues and as such are extremely useful in strategic planning.

The process of developing a problem tree, involves a workshop-style setting involving a mixture of stakeholders. The process begins with a starting problem, such as schoolchildren being inactive or adults eating insufficient fruit. It explores, using the prompt of ‘why’, why the situation occurs, and then what underlies these, and so on. This builds up levels or layers of underlying factors or determinants (represented as roots). The process can continue until the analysis reaches a point where solutions become apparent, or when a certain number of levels, commonly three, have been detailed. The impacts of the problem, such as poor growth, early death etc. are also identified (represented as branches and leaves).

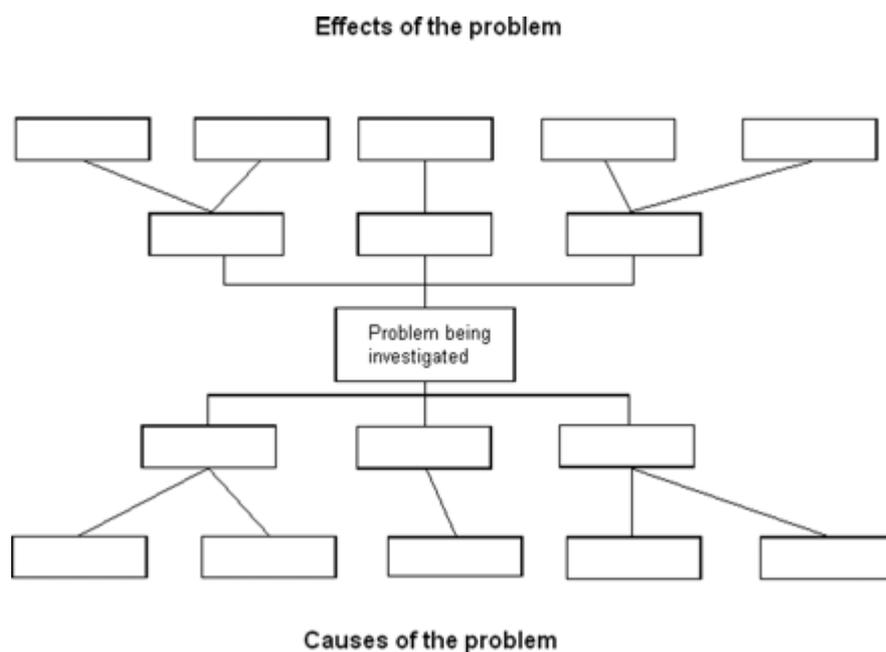


Figure 7: Classic problem tree (60)

Once the problem tree has been completed, the solution or objective tree can be developed from it. The “objective tree uses exactly the same structure as the problem tree, but with the problem statements (negatives) turned into objective statements (positives)” (58). Most simply this is done by reversing the problem factor, so, for example, low intake of iron-rich foods is turned into high-intake. An entire solution tree which has the same number of solutions as there were problems is developed, not just focusing on one area (61), so all the possibilities are included.

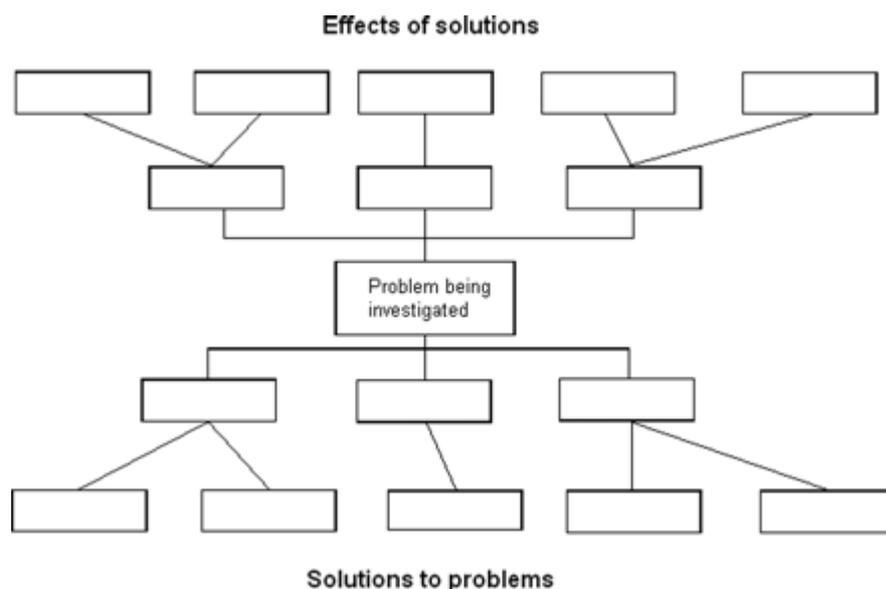


Figure 8: Classic solution tree (60)

This approach has been used in a number of Pacific Island Countries to assist with identifying policy interventions to improve the food environment related to NCDs (Fiji), and to identify all types of potential interventions to improve fruit and vegetable intake (Samoa, Solomon Islands and Tuvalu) (60).

The problem and solution tree process was slightly modified to tailor it for use with diets, and increase its specificity. These were:

- narrowing the starting problem, and developing multiple trees (e.g. develop 4 problem trees starting with: i) fruit intake in children, ii) fruit intake in adults, iii) vegetable intake in children, and iv) vegetable intake in adults, instead of population level low fruit and vegetable intake) providing the starting layer, as shown below.
- focussing only on the causes of the problem and not the effects, only the lower half of figure 7. The impacts are generally known for the effects of obesity and NCDs on health and development, and can be easily provided for reference.
- Not developing a full solution tree. Instead placing solutions adjacent to problem factors on the original problem tree, creating a combined tree.

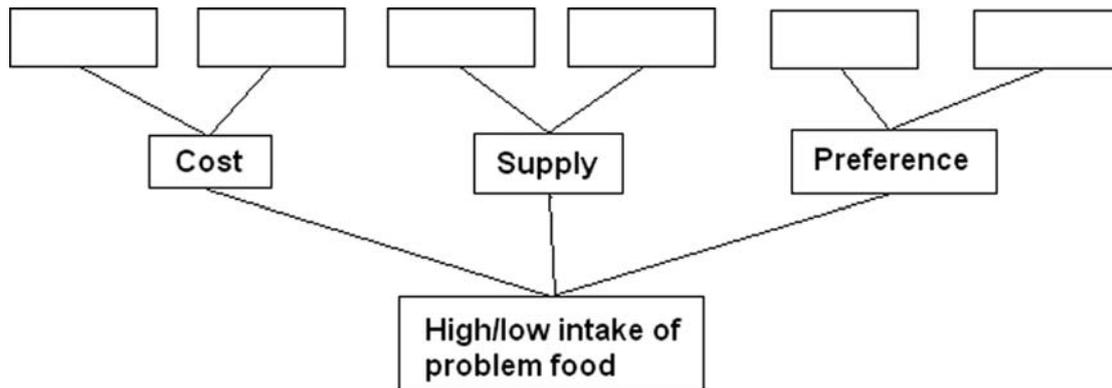


Figure 9: Starting layer for the modified problem tree (60)

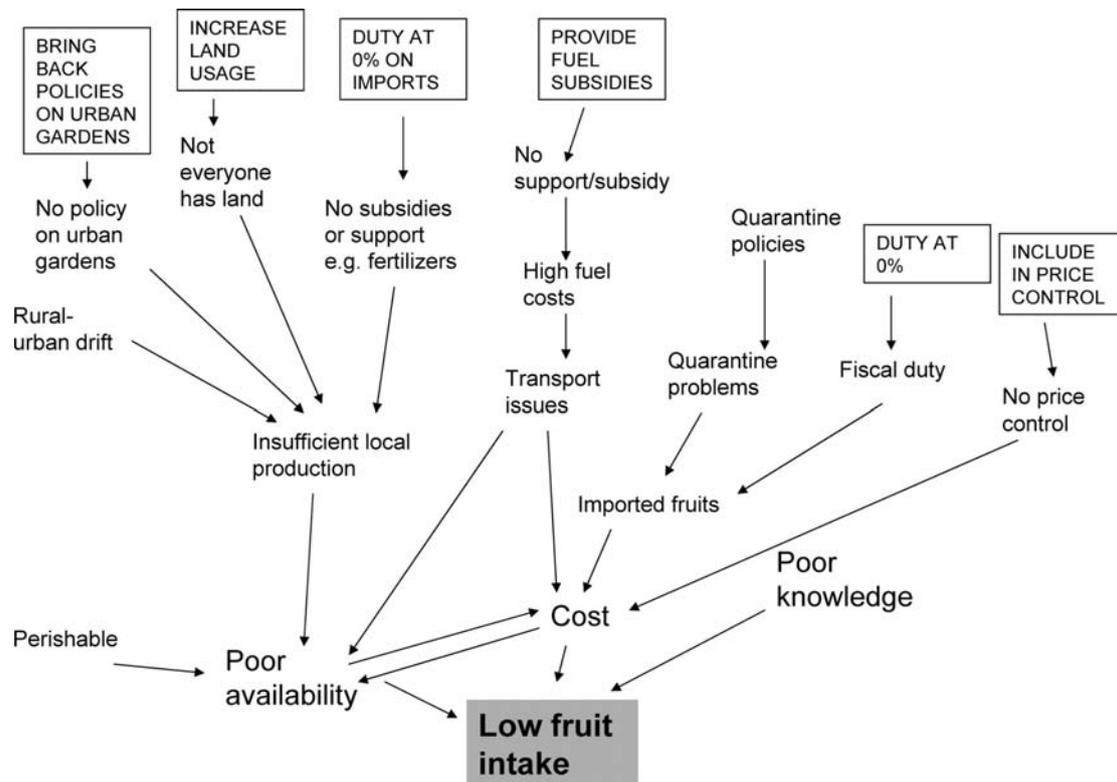


Figure 10: Example of a combined problem and solution tree (60)

2.6.3.1 Outcomes of problem and solution tree

Undertaking this process produces a clear outline of the main factors influencing the key dietary or physical activity problem behaviours. It can be used to identify just

policy intervention solutions (and their associated problems), or more general actions. The participatory process is likely to pinpoint the more critical and influential factors involved in poor diets and physical activity levels, and as such is a useful way of identifying which policy changes are likely to be most relevant for that community.

2.6.3.2 Further prioritisation

In order to assess which of the policy options would be the most promising, some prioritisation criteria are needed. The key criteria used in this approach have been: feasibility, effectiveness and other impacts (62):

- Stakeholder perceptions of effectiveness were combined (where possible) with modelled effectiveness analyses. A lack of data for modelling is often a barrier to deriving good effectiveness estimates, but stakeholders are generally able to categorise potential interventions onto ‘definite’, ‘probable’ or ‘speculative’ (62).
- Stakeholder assessment of feasibility has been divided into several components: technical feasibility, cost-related feasibility, political acceptability, cultural and community acceptability, and trade-related legal feasibility (an important barrier for change in some countries). Stakeholders applied a weighting system to these five factors so that a scoring system could be used to compare the various policy options (62).
- Assessment of the wider social impacts of proposed policies change was made using an environmental or social impact assessment method. There are several shortened versions of the more time-consuming impact assessment systems which can be used for this stakeholder process (62).

By applying the above criteria, the varying levels of ‘promise’ for the policy options become apparent to stakeholders and consensus on the most promising portfolio of interventions is achieved quite readily. These recommendations would then be presented to those who have jurisdiction over their implementation. For Fiji and Tonga, a list of 20-30 most promising, specified policy options are being finalised for each country for presentation to their respective governments.

2.6.4 Priority setting model 3 – The ANGELO process

2.6.4.1 The ANGELO Framework for analysing environments

The ANGELO Framework (Analysis Grid for Elements Linked to Obesity) was first developed for use as a practical tool for categorising and scanning the environment for potential environmental barriers to healthy eating and physical activity (63). The basic framework is a 2x4 grid which divides obesogenic environments two sizes – micro (settings) and macro (sectors) – and four types – physical, economic, policy and socio-cultural (63). The physical environment (what is or isn’t available?) includes the natural and built environments but also physical access to opportunities such as organised sport, professional training or fruit and vegetables. The economic environment (what are the financial factors?) includes both the costs of products or services and the ability to pay (e.g. household income or school budget). The policy

environment (what are the rules?) includes the spectrum from laws and regulations to household or school rules. The socio-cultural environment (what are the values, beliefs, attitudes, perceptions and expectations?) encompasses many aspects around food such as hospitality, food status and food meanings as well as cultural values on physical activity and perceptions of body size.

2.6.4.2 The ANGELO Process for creating a community action plan

The ANGELO *framework* evolved into an ANGELO *process* so that it could be used for priority setting for obesity prevention action in communities (64), and it has been used across several whole-of-community obesity prevention projects for children and adolescents in Australia, New Zealand, Fiji, and Tonga (64,65). The ANGELO Process is evidence- and practice-based (5,66). It follows the principles and action areas of health promotion (67) and the processes of priority setting where ‘technical assessments’ (evidence from the literature, local evidence and experience, specific analyses or targeted research) are included in a due process (engagement with the key stakeholders, joint and transparent decision-making) so that agreed priorities are reached (68). The overview of the process is shown in Figure 11.

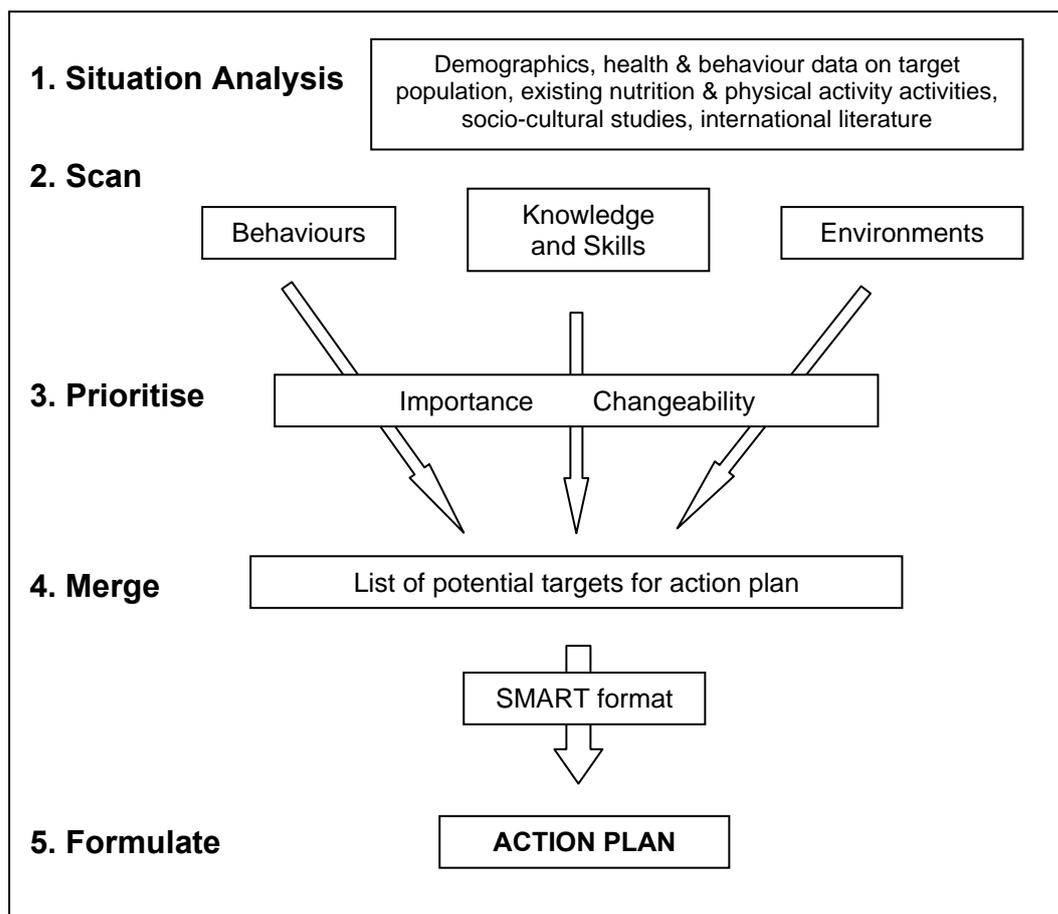


Figure 11: The ANGELO Process to identify priority elements for inclusion into an agreed action plan. SMART stands for Specific, Measurable, Achievable, Relevant, and Timed (as attributes of good objectives)

The situation analysis needs to identify the important characteristics about the community, the culture, the problem areas and the existing activities so that these contextual factors can be incorporated into the action plan and its implementation. For populations with strong socio-cultural influences on food, physical activity and body size perceptions, specific studies may be needed to characterise these factors and this was carried out using qualitative interviews for the Pacific populations involved in community interventions (64). The ANGELO worksheets list potential behaviours to target (about 20-25 specific behaviours), knowledge and skills gaps to address (about 10-20 gaps) and environmental barriers to overcome (about 20-30 barriers per setting) and these need to be verified with community members (64). The situation analysis also includes summarising the evidence from the literature about the effectiveness of obesity intervention programs (69,70) to present to stakeholders.

The remainder of the ANGELO process, as it has been used to date, has used a 2-day stakeholder workshop with stakeholders to finalize and prioritise the ANGELO elements and develop a draft action plan. Participants were representatives from key stakeholder organisations and included adolescents when they have been the target group for the program. The prioritisation process (stage three) involved a scoring process that used a five-point scale where potential elements were scored for importance (what is the relevance and impact of this in our situation?) and changeability (how easy or hard is this element to change in our situation?). Rating scores for importance and changeability were multiplied to give the top ranked elements which were then incorporated into the action plan.

2.6.4.3 Drafting the action plan

The merge (stage four) pulled together the highest ranked behavioural, knowledge, skill and environmental elements in the key settings (about 6-8 for each) as top targets for action. These were discussed by participants, and in the final step, the agreed priority elements were moulded into a structured action plan (stage five). The behaviours were generally used to create the objectives and the associated knowledge gaps and environmental barriers were used to identify the strategies. When formulating the action plan, guidance was provided by the facilitator around developing an overall aim or goal (a statement that explains the projects and states the target group; measured as the project's outcome); writing SMART [Specific, Measurable, Achievable, Relevant, Time-bound, (71)] objectives and developing strategies.

For the whole-of-community projects which have used this process, 8-10 objectives were developed for each action plan. Three of these were common across all plans: building community capacity (workforce development, leadership, partnerships/relationships, organisational development, resources), communicating the project messages (social marketing) and evaluating the project. The latter two usually required their own sub-plans. Four or five objectives stemmed from the priority behavioural elements obtained from the ANGELO process. The final one or two objectives in each action plan allowed for innovative or exploratory interventions where the community want to try something new and untested. In Fiji for example, assessing the potential for churches to be health promoting settings was included as an exploratory objective. The knowledge and skill gaps and the list of environmental

barriers were scored and ranked in the same way as behaviours and then used to inform strategies of action for the behavioural objectives. Strategies typically consisted of social marketing, policy or program actions.

Once agreement was reached on the draft action plan at the end of each workshop, each plan was further refined by taking it back to the community and seeking input from other stakeholders who were unable to participate in the workshop. Also, timelines, processes and accountability by project coordinators were assigned to the action plan as it evolved. Evaluation measures were assigned once baseline data was analysed. The action plan was designed to be a ‘living’ document, which guided implementation and evolved through several versions (up to 15) during the life of the project.

2.7 Advocacy

To effect the changes that are required for good public health, advocacy is an essential tool in any strategy. WHO defines advocacy as “[a] combination of individual and social actions designed to gain political commitment, policy support, social acceptance and systems support for a particular goal or program” (72). Advocacy is used to promote change at the societal level, rather than the individual or behavioural level (73). A lack of action for obesity prevention results from the complexity of the issues surrounding the problem. Advocacy is required to promote policy change, due to the challenges that arise with prevention.

Advocacy is an important instrument in setting the agenda of governments, shaping the debate by using the media, and by advancing the policy position. Careful planning is required to ensure the advocacy is effective, and support is often necessary from other organisations and external funding agencies. The main strategies of public health advocacy involve building coalitions and networks, political lobbying, and media advocacy (74).

Components of an effective advocacy campaign include (75):

- Clear policy goals
- Solid research base for action
- Values linked to fairness, equity and social justice
- Broad-based community participation
- Using the mass media to set the public agenda and frame issues appropriately
- Using political and legislative process to create change

Advocacy example 1: Parents Jury

The parents jury is a national online network of parents, grandparents and guardians who are passionate about improving the food and physical activity environments of Australian children (76). Formed in 2004 and co-ordinated, administered and funded by Diabetes Australia Victoria, The Cancer Council of Victoria, the Australian and New Zealand Obesity Society and VicHealth, this collective lobby group of over 3000 members has a strong voice and coordinated approach in the community. Through educational resources, media releases, interviews, advocacy, research, encouragement and support of members, the collective views of the parents' jury are distributed. In 2008 alone, several campaigns were launched and included the **Healthy school fundraising campaign** (encouraging schools to raise needed funds from selling health foods and goods instead of traditional unhealthy, high fat, high sugar, junk food options), **Back to school with healthy food** (encouraging schools to promote healthy food and drink, including the school canteen or tuck shop), the **Improved food labelling systems campaign** (calling for single, clear front of pack labelling system that is easily read and interpreted) and the **Activity friendly communities campaign** (encouraging families to be active in as many ways as possible everyday).

Advocacy example 2: Center for Science in the Public Interest

The Center for Science in the Public Interest (CSPI) has been a strong advocate for the American public regarding nutrition and health, food safety, alcohol policy and sound science since 1971 (77). Founded by executive director Michael Jacobson and two other scientists, the CSPI has sought to educate the public, advocate to governments for policies that are consistent with scientific evidence. The CSPI has over 900,000 subscribers to its Nutrition Action Health letter and through 36 years of advocacy has had an array of accomplishments. In relation to childhood obesity a successful CSPI advocacy story was the removal of high-calorie soft drinks from schools and the ending of misleading ads and labels of several major food companies after the threat of court action by CSPI. Presently, CSPI is working on getting junk foods out of schools nationwide, the adoption of accurate and honest labelling on food packages and nutrition labelling on chain restaurants' menus and menu boards.

2.8 *Monitoring, Evaluation and Research*

2.8.1 Monitoring and Evaluation

Monitoring and evaluation are systematic processes which should be conducted continuously throughout all stages of the implementation process (Figure 4). Essentially they function as a continual feedback mechanism (13).

Monitoring (often also referred to as surveillance) is used to gauge the population distributions and trends for key indicators of health. It can also be used to assess the progress and implementation of population-level interventions thus allowing for immediate correction (78). Information gained from monitoring population trends can be used for several purposes including: defining the extent and characteristics of the problem, indicating priority areas or sub-groups for obesity prevention policy and guiding strategic directions (79).

Evaluation is a systematic means of measuring and understanding the effect and impact of interventions on specified outcomes (78). Monitoring and evaluation are complementary processes and must be considered at each stage to ensure continuous feedback (78).

Monitoring and evaluation must be included within budget for strategy implementation and WHO recommends that these processes be planned and executed by a multi-sectoral group of monitoring and evaluation experts (12). Any existing relevant monitoring and evaluation activities should be identified, including the agencies responsible for these activities (69). This process then allows any existing and relevant data to be used as part of the evaluation process.

It is essential to identify appropriate indicators with which to measure change in outputs and outcomes. Process evaluation considers ‘how’ the intervention has been executed and therefore measures ‘progress in the process of change’ (12 p10). Conversely, an output indicator refers to ‘outputs’ that are produced or occur as a result of the processes (12), for example, a decrease in advertisements promoting unhealthy food or the introduction of a law or regulation. Outcome indicators measure the overall outcomes of the intervention, for example, a reduction in the prevalence of obese children (long-term indicator).

Example of monitoring: Arkansas, USA

The state of Arkansas, USA, became a national leader in the fight against childhood obesity in 2003 with the passing of Act 1220. This act mandated several policy changes in the state and created the Child Health Advisory Committee to coordinate the efforts to combat childhood obesity and related illnesses. There were a range of new laws outlined in the act, for example the prohibition of student access to food and beverage vending machines in school, physical activity and education requirements in schools and the development of local parent advisory committees for all schools (80). Perhaps the most important change was the mandatory annual body mass index (BMI) screening for every public school student with the results to be sent home to parents in a confidential report. If the BMI screening determined that a child was overweight or at risk of overweight, using the Centres for Disease Control and Prevention's age-sex-specific classifications, then the report also recommends the family to contact their local health care provider to discuss options available for managing their child's weight concern. Over the five years of the program (2003-2008), childhood obesity has not increased, which is excellent progress since Arkansas was ranked as the 14th heaviest state for adult obesity in the nation in 2002 (81). However, it is not certain how the plateau in childhood obesity compares with other US states. This annual monitoring program provides a rich source of state-wide data to inform policy makers, governments, schools and the wider community of their progress in the fight against overweight and obesity in Arkansas.

2.8.2 Research

The obesity research effort over the last 20 years has escalated enormously – mainly in the areas of genes, metabolism and management (see figure 12). Public health research in the areas of prevention, or even research on the main environmental, economic and cultural drivers of the epidemic has also grown but from an extremely low base to one which is still well below the individual-centred research. In addition, 'problem-oriented' research ('what is to blame?') far outweighs 'solution-oriented' research ('what works and does not work to reduce it?') (82). Policy makers are far more interested in the population drivers of obesity than individual drivers and in possible solutions rather than the size of the problem and its mechanisms. A re-orientation of research funding to fill these important knowledge gaps will be needed using directed funding approaches rather than the pure investigator-driven models of research funding.

Medline journal article numbers referenced with 'Obesity' and other key MeSH headings

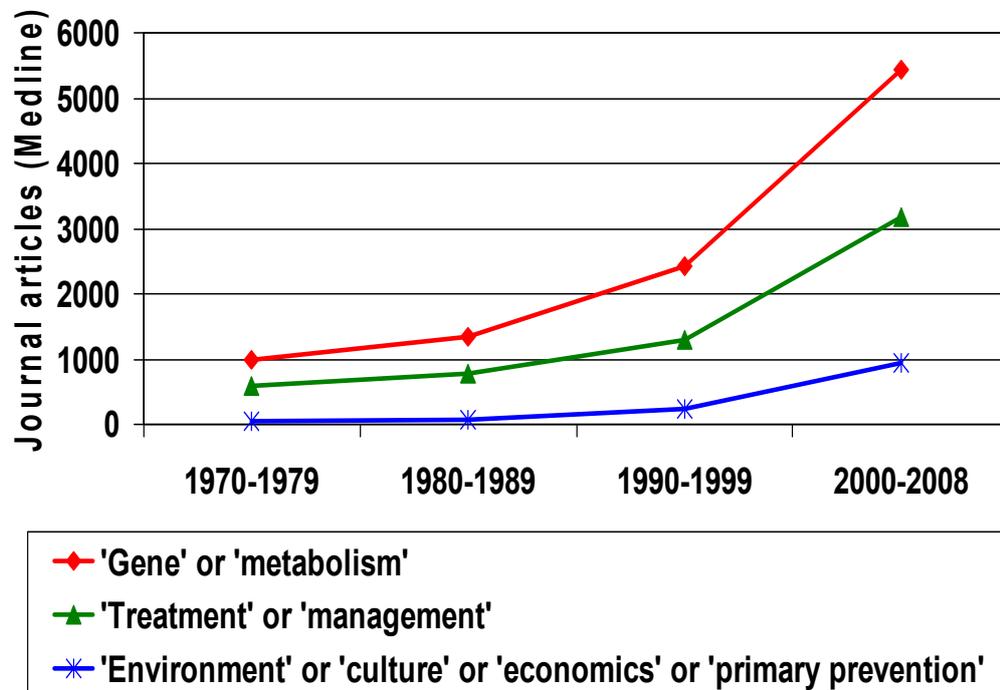


Figure 12: The changes in the number of published articles in different areas of research on obesity since the 1970s

2.9 Other enabling action areas

In addition to specific obesity prevention actions taken at the sector or setting level, other resources or systems can be used or will be required for the successful implementation of policy actions (79).

2.9.1 Workforce capacity

The success of obesity prevention strategies will depend on more than just the planning and development of an intervention. When considering particularly downstream and midstream public health promotion approaches, an adequately sized and appropriately skilled workforce is essential for the success of the strategy (79).

An appropriate workforce will consist of essential workers directly involved with physical activity or diet (including dietitians, nutritionists, physical activity workers and health promotion practitioners), however could also include a wide range of other professions who have the capacity and potential to influence obesity prevention success (79). This workforce could be developed from community health workers,

general practitioners, maternal and child health nurses, school teachers, physiotherapists and medical specialists (79).

Workforce development should occur in response to the priorities placed on that system or organisation (83) to ensure that workers have the skills and commitment to achieve organisational objectives (83). Opportunities for workforce development include the transfer of knowledge and skills between workers or academic institutions (79) and professional development initiatives (83).

2.9.2 Social Marketing

Social marketing can be defined as ‘the application of commercial marketing technologies to the analysis, planning, execution, and evaluation of programs designed to influence the voluntary behaviour of target audiences in order to improve their personal welfare and that of their society’ (84). Social marketing is classically applied as a mid-stream approach where the messages are conveyed to the target population to motivate behaviour changes such as being more physically active. However, if the environment is not supportive of the healthier behaviour patterns, the social marketing messages can be a ‘difficult sell’. Social marketing can also be directed at policy makers as the target audience so that it contributes to the development of policy and environmental change as well as behavioural change.

Creating effective communication messages involves a two-step process: ‘getting the right message’ and ‘getting the message right’ (85). When trying to change behaviours relating to childhood obesity, we first have to decide what is the right message to communicate. The second step in creating effective communication messages, ‘getting the message right’, involves decisions about how to execute it; how to present the message in a way that attracts attention, is believable, relevant, and able to be understood (86).

The traditional ‘4 Ps’ of marketing need to be considered when designing a social marketing campaign (87): Product (the core product could be healthy food or the benefit of eating the healthy food, the branding of the campaign is also an important aspect of ‘product’), Place (making the healthy choices available), Price (minimising the time, effort and cost of the healthy behaviours) and Promotion (how you are going to communicate the benefits and incorporate incentives). Evidence needs to support any of the strategies that are used in the social marketing campaign.

2.9.3 Whole of community

Diet and physical activity behaviours are influenced by the environment in which we live. Obesity prevention strategies are fundamentally based on changing or influencing these behaviours and therefore must consider environmental factors such as cultural, social, economic and community influences. Furthermore, a broad environmental approach is an important consideration for the sustainability of interventions, as is community capacity building (88). Evidence suggests that single-setting or single-strategy childhood obesity prevention approaches have limited success (89,90) and that multi-setting or multi-strategy approaches may be more

effective (88,91,92). Whole of community approaches are typically multi-strategy, multi-setting interventions which aim to build community capacity (including programs, knowledge and skills) (88). This approach is based on building partnerships between relevant community stakeholders, for example, health, education and local government agencies and the community itself.

Whole-of-community interventions example 1: EPODE

EPODE (Ensemble Prévenons l'Obésité Des Enfants) is an innovative and integrated program that was developed in France in order to facilitate the adoption of a healthier lifestyle for children in everyday life (93). An original pilot study in two French towns (Fleurbaix Laventie Ville Sante) showed reductions in childhood obesity over the 12 years of the program (94) and this provided the proof of principle to develop the EPODE program in 10 cities in 2003. These programs have now fulfilled their original commitment for five years and have all reaffirmed their commitment for another five years, indicating strong sustainability of the concept. A key aspect of EPODE is its involvement of local authorities through the local Mayors. In France, these local authorities have jurisdiction over kindergartens and primary schools, covering the primary target of children aged 3-12 years. Mayors are invited to submit an application to be an EPODE community; this involves signing a charter promising to employ a full time project manager for the program, organize specific activities each month in the city, participate in national meetings of project managers and commit at least 1 Euro per capita per annum for five years (although many authorities commit much more than this). Funding for the support functions of EPODE (coordination, social marketing, monitoring and program development) comes from a mix of public and private partnerships at the national and local levels. National private sponsors have, to date, come primarily from the food industry, insurance and distribution sectors. EPODE now extends to over 1.8 million people in 167 French cities, 20 cities in Spain and 8 cities in Belgium, with similar programs in Greece, Quebec in Canada and South Australia soon to be implemented.

Whole-of-community interventions example 2: The Sentinel Site for Obesity Prevention

The Sentinel Site for Obesity Prevention (SSOP) in the Barwon-South Western region of Victoria, Australia supports and evaluates whole-of-community demonstration projects which aim to reduce obesity in children and adolescents (88). The program is based on partnerships between the region's university (Deakin University) and local health, education and local government agencies. Three demonstration intervention projects have been implemented and are being evaluated in the region: 'Romp and Chomp' for preschool children; 'Be Active Eat Well' for primary school children, and; 'It's Your Move' for secondary school students. All use quasi-experimental designs with initial intervention durations of 3 years. The 'Be Active Eat Well' intervention, in the town of Colac, resulted in significant lower increases in body weight, waist, waist/height and BMI z-score in intervention children than comparison children (95). The capacity building approach resulted in the community creating its own solutions to promote healthy eating and physical activity (96). The intervention seemed to differentially benefit those from more disadvantaged families and all the 'safety' measurements taken showed no differences in underweight dieting, body size perceptions and self esteem between the intervention and comparison sites. Follow up measurements for sustainability are continuing.

2.9.4 Leadership and coordination

In light of the complex and diverse determinants of obesity and the varying influences that many stakeholders and sectors/settings have on the food and physical activity environments, simultaneous action is required across all different levels. Strong leadership will result in a systematic and comprehensive approach to obesity prevention. Leadership is essential to ensure that all stakeholders are working towards common aims and objectives and also to ensure coordinated and sustained action (79).

Coordination, not only between government departments but all relevant stakeholders will contribute to the effectiveness and efficiency for obesity prevention. Having a coordinating body that has representation from all major stakeholders and the high level political mandate is the ideal approach but there are very few examples of this being achieved for more than a few years.

2.10 Conclusions

Priority setting to create a set of recommended, promising policy interventions is an essential part of evidence-informed policy making. There are several described processes for priority setting. They all have the similar characteristics of undertaking some needs assessment or scanning process to generate a list of possible interventions and running a due process with stakeholders to take the relevant technical analyses into account in creating the portfolio of recommended actions.

3 Cost-effectiveness model for evaluation of the diet component of the Global Strategy on Diet, Physical Activity and Health (DPAS) implementation

3.1 Background

An important element of determining which policies to implement as part of a comprehensive policy approach to improving population nutrition is a cost-effectiveness evaluation of different policy options. Efforts to determine cost-effectiveness are best seen as part of a wider process of moving from a long list of possible actions to a smaller, more-achievable list of promising actions for implementation – that is, setting priorities.

There is a wide variety of priority setting approaches and models available. There have been several attempts to set priorities in public health systems (e.g. in the Netherlands, Sweden, Norway, New Zealand, Israel and the United Kingdom) (97). Each of these countries adopted a different approach and most continue to amend their processes as they strive to find satisfactory solutions. Furthermore, there is widespread normative advice from a range of disciplines on how to make the difficult choices on what services to provide and who to provide them to (97). In a recent review (68), existing priority setting approaches were assessed against ten criteria based on four underlying rationales - ‘economic theory’, ‘ethics’, ‘empirical evidence’ and ‘user considerations’. While other approaches were found wanting, the ACE (Assessing Cost-Effectiveness) methodology for setting priorities was found to be the most promising approach (68).

This section presents the ACE methodology for setting public health priorities using a methodology that includes technical analyses (including cost-effectiveness) and due process and is suitable to be used to determine areas for policy action.

3.1.1 Key considerations of cost effectiveness analysis

Key considerations of a model for estimating the cost effectiveness of different policy options aimed at improving population nutrition include:

- **Comparative analysis:** Cost effectiveness analysis inherently compares the relative costs and benefits of two or more courses of action (68). Accordingly, in addition to the particular intervention under consideration, it is necessary to identify an alternative to the policy intervention. Typically, ‘current practice’ is used as the comparator.
- **Selection of perspective:** It is necessary to select the perspective from which the cost effectiveness analysis is undertaken. Typical options include a societal perspective (taking into account costs and benefits to all of society), government perspective (taking into account costs and benefits to government)

and health sector perspective (taking into account costs and benefits to both government and non-government parties, but specific to the health sector).

While a relatively narrow perspective (e.g. health sector) is often chosen for practical purposes and to address the research questions relevant to particular stakeholder groups, this may create difficulties where there are significant costs to broader groups. As an example, a national government may be interested in the cost effectiveness of a potential policy decision to regulate the advertising of unhealthy foods from their own perspective. However, they may also wish to consider the potential costs to industry. This can be done by undertaking separate analyses from the different perspectives, or by undertaking a threshold analysis to determine the magnitude of costs to industry that may be necessary to move the potential intervention from cost-effective to cost-ineffective.

- **Required outputs:** The main outputs of a cost effectiveness analysis are typically: the total cost of the intervention (i.e. affordability); the potential cost offsets in the health sector (+/- broader productivity effects in the general economy); the net incremental cost of the intervention compared to current practice; the total impact (i.e. population benefits less any side effects); and the ratio of costs to benefits for comparison purposes.

3.1.2 Definitions

Cost effectiveness: There are a number of economic evaluation methods available, including cost-utility analysis (CUA), cost-effectiveness analysis (CEA) and cost-benefit analysis (CBA). CUA is an economic assessment method that measures cost in monetary units and assesses benefit in terms of quality adjusted life years (QALYs) or Disability Adjusted Life Years (DALYs). CEA measures costs in monetary units but assesses outcomes in physical units meaningful to clinicians (e.g. BMI reductions, blood pressure, etc). CBA is a similar approach but assigns a monetary value to the health benefits (including a valuation of premature deaths prevented). For the purposes of this paper, cost effectiveness is used as a generic term to cover all these approaches that compare the relative costs and benefits of two or more courses of action.

Incremental cost effectiveness ratio (ICER): As part of cost effectiveness modelling, analyses are undertaken on an incremental basis, where the incremental change in costs of the intervention (compared to the base case) are compared to the incremental change in benefits. Where ICER is used in this paper, the unit of measurement is '\$ per DALYs saved'.

Uncertainty: Uncertainty analysis, as part of cost effectiveness modelling, takes into account variation in inputs to the model (such as economic and epidemiological parameters) that impact on disease incidence and prevalence, efficacy and effectiveness of the intervention, the structure of the model (such as disease states, transition probabilities, time horizon), and unit costs (98).

Sensitivity: Sensitivity analysis is used to understand the sensitivity of results to variations in social value parameters and/or the scenario under evaluation (98). Social value parameters include issues such as the choice of discount rate and weighting the health gain for equity reasons. Variations in the scenario might include changes in the study perspective, the choice of comparators or inclusion of contentious cost impacts (such as volunteer time costs).

3.1.3 Structure of this section

This section presents the ACE methodology for estimating cost-effectiveness and setting priorities, and discusses its applicability to evaluating the food and diet intervention aspects of DPAS. An overview of the ACE approach is provided first, followed by a description of the way in which the ACE approach can be used in priority setting. A logic pathway is then presented as a tool for determining the population impact of an intervention. Key issues to consider in determining costs are outlined next. An overview of the ACE-Obesity study and some examples of the output from the study are then provided. Finally, the application of the ACE approach to the food and diet intervention aspects of DPAS is discussed.

3.2 *The ACE (Assessing Cost-Effectiveness) approach*

3.2.1 Overview

The ACE approach is a methodology for priority setting of health interventions. The ACE approach was developed in Australia in 2000 and has been successfully applied to assess a wide-range of interventions in the areas of cancer, heart disease, mental health, obesity and chronic disease prevention (refer to table 6 for more details). In each of these studies, the ACE approach has been used to evaluate the possible adoption of options to improve the efficiency of current health services and to inform policy makers about the best bundle of interventions in the particular content area (68).

The essence of the ACE approach is to answer the question: ‘Are we maximising “benefit” with the resources available?’ This can also be expressed as: ‘If resources are taken from Program X and given to Program Y, will the net benefit be higher or lower?’ If the net benefit is higher, there is an economic case for making that change (68).

Table 6: Previous ACE studies

Study	Research question	Number of interventions included
ACE-Cancer (pilot) (2000-2001)	To investigate the feasibility of including economic analysis in the national cancer strategy for Australia (99)	7
ACE-Heart Disease (2000-2003)	To determine the most cost-effective intervention options for prevention of coronary heart disease in Australia (100)	20
ACE-Mental Health (2001-2004)	To determine the most cost-effective interventions for prevention of depression, schizophrenia, anxiety and attention-deficit hyperactivity disorder (ADHD) (101)	20
ACE-Obesity (2004-2005)	To assess the most cost-effective options for preventing unhealthy weight gain in children and adolescents in Australia (102)	13
ACE-Prevention (2005-2009)	To evaluate the cost-effectiveness of interventions for the prevention of non-communicable disease for both non-indigenous and indigenous populations	150 non-indigenous 150 indigenous

3.2.2 ACE as a priority-setting approach

The ACE approach brings together the two commonly used approaches to priority setting: technical rigour and due process. It involves close attention to technical rigour in the economics and epidemiology, but also seeks to ensure due process by involving stakeholders in a working group or steering committee at all stages of the process (100).

The ACE approach is summarised in Figure 13 and Figure 14 . The key characteristics of the ACE evaluation methods are (68):

- stakeholders are involved throughout the process – not just at the end;
- the rationale for the selection of interventions is discussed and clearly specified;
- the evaluation methods are standardised, documented and open to scrutiny;
- the setting, context and comparator is common to all interventions;
- country specific data are used, wherever possible, for health system costs and demographic and epidemiological disease parameters;

- best available data is used to develop incremental cost effectiveness ratios (ICERs) based on economic/epidemiological modelling techniques;
- ICERs, total costs and DALYs are reported as a range (around point estimates) reflecting explicitly the uncertainty of cost, process, outcome and value estimates;
- The technical (quantitative) analysis is placed within a broader decision-making framework (qualitative). These additional considerations are referred to as '2nd stage filters' (refer to Box 1); and
- information is assembled by a multi-disciplinary research team, preparing briefing papers to a standardised format agreed by a Working Group of stakeholders.

Second stage "implementation filters" typically used as part of the ACE approach:

- **Strength (quantity and quality) of the evidence**
- **The feasibility of implementing the intervention**
- **The potential for sustainability of the intervention**
- **The capacity to reduce inequalities**
- **Any other positive or negative side effects**
- **Acceptability to stakeholders**

Box 1: Second stage "implementation filters"

Overview of ACE Process

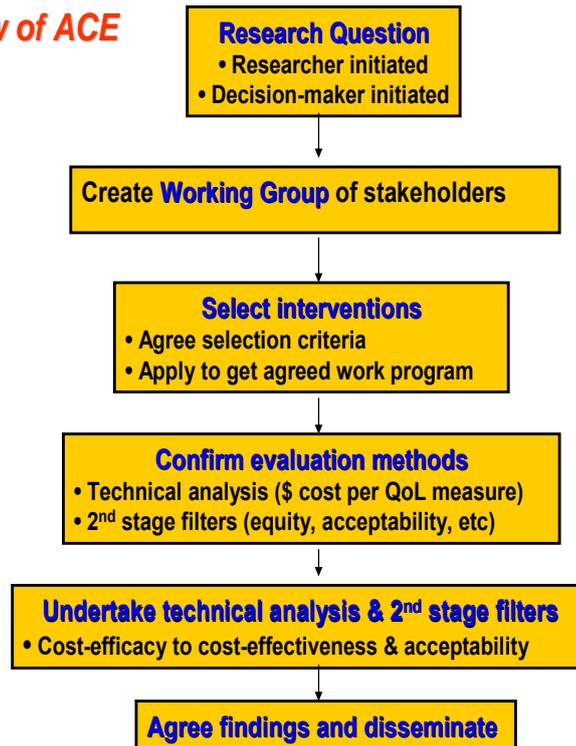


Figure 13: Overview of steps in the ACE approach to priority setting (68)

ACE Working Groups generally consist of stakeholders recruited from topic experts, practitioners, relevant community organisations and policy-makers. The Working Group in ACE studies has an important role in selecting the interventions for evaluation, as well as achieving balance between the technical analyses and due process (refer to Figure 14). On the technical side, members contribute in areas of their expertise and discuss issues of method and evidence. On the 'due process' side, members ensure stakeholder interests and views are articulated; facilitate sensible interpretation of the technical analysis; assist with 'value' judgement aspects of the 2nd stage filter analysis and help ensure transparency throughout the project; and assist in the promulgation of the results to policy makers. All stakeholders on the steering committees and advisory panels are given the opportunity to express their views and consensus decisions are sought after informed discussion (100).

Overview of 'due process'

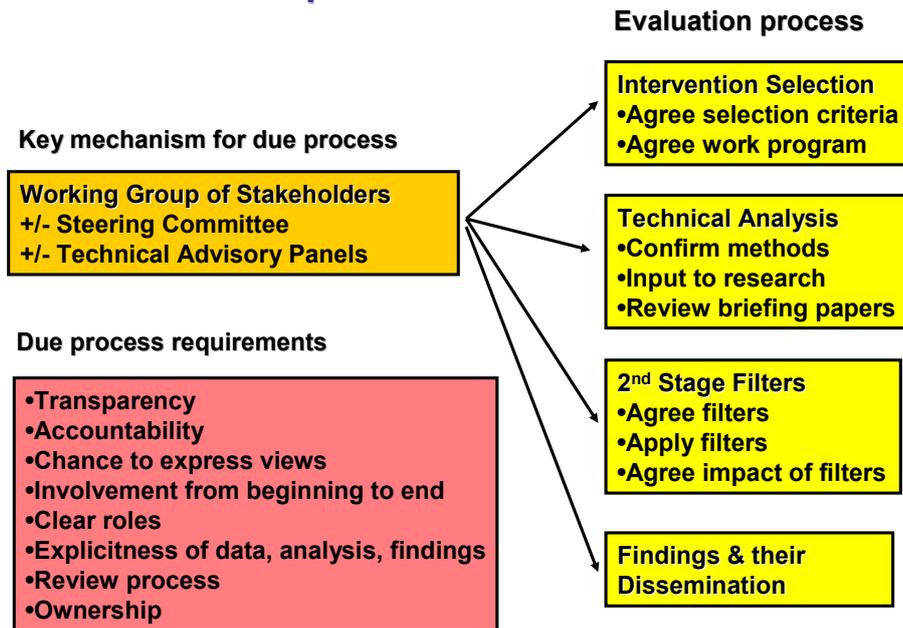


Figure 14: Overview of 'due process' in ACE approach to priority setting (68)

Throughout the ACE process, emphasis is placed on utilising **best available evidence**. For each application of the ACE approach, therefore, careful consideration has been given to clearly defining the concept of 'evidence' being applied. This was an important issue in ACE–Obesity, for example, where the level and quality of evidence available was less than for some of the other ACE studies (such as in cancer and mental health) and was broadened to include epidemiological modelling, indirect evidence and parallel evidence (102). The inclusion of extensive uncertainty and sensitivity analysis, and the incorporation of broader considerations that are less amenable to quantification (the 2nd stage filters), recognises the importance of the decision making context and the need for judgement as part of the priority setting process (98).

3.2.3 Modelling health impacts

In order to assess the potential cost-effectiveness of nutrition-based policy interventions, it is necessary to determine the potential impact of the policy interventions on population diet, weight and body mass index (BMI), and subsequently on population health outcomes. Often studies do not have health outcome information available; they only have outcomes of change in key behaviours such as foods consumed or total energy intake. Accordingly, modelling is often needed to try to estimate the potential health impact of a given intervention (103).

The assumed pathway by which changes in policy translate to changes in eating patterns through to changes in health outcomes are shown in Figure 15. Policy interventions aimed at improving population nutrition can result in changes to the

food environment (affecting eating behaviour and diet indirectly) or could directly influence eating behaviour. These food environment and eating behaviour changes can then result in changes to diet composition (e.g. fruit and vegetable intake, fish intake, fibre intake) and changes in total energy consumed (through changes in the amount and / or the energy density of food and beverages consumed). Changes in energy intake can then be translated to changes in overall energy balance, and subsequently to changes in population weight and BMI (103).

The impact of unit changes in BMI on the prevalence and incidence of specific diseases (e.g. cardiovascular disease, various cancers and Type-2 diabetes) can be estimated and modelled using global burden of disease data (104). Similarly, the health impacts of other diet-composition changes can be modelled directly (e.g. changes in fruit and vegetable consumption on risk of cardiovascular disease) or through changes in intermediate risk factors (e.g. changes in fat consumption on changes in blood lipids). This modelling is done using deterministic Markov techniques to calculate the DALYs saved owing to the interventions as the difference in future mortality and morbidity outcomes between a baseline scenario (base case) and the intervention option. Monte Carlo simulation is used to calculate uncertainty ranges around the benefits, using probability distributions around the input variables based on the range of parameter values and/or standard errors obtained from the literature.

While Figure 15 highlights the pathway by which policy interventions focused on nutrition can alter health outcomes, pathways for other policy interventions related to childhood obesity (e.g. those targeting physical activity) are included in the diagram for the sake of completeness. These are not specifically discussed here but it is noted that, in modelling the impact of nutrition-based interventions, it may be necessary to make assumptions about changes in levels of physical activity and the interaction between changes in eating and physical activity behaviours.

Impacts of policy interventions on areas outside of health (e.g. economic, social and environmental outcomes) are not identified in detail in Figure 15. It is noted that the methods for modelling these outcomes, for example, social outcomes from urban community gardens and environmental outcomes from reductions in greenhouse gases resulting from interventions to reduce animal (beef, dairy, sheep) consumption, are not well developed.

For some of the steps in the logic pathway highlighted in Figure 15, the empirical data to guide estimates are strong (for example, the link between changes in fruit and vegetable consumption and risk of cardiovascular disease and certain cancers) and in other areas weak (for example, the effect of a policy to change consumer prices on the resultant levels of consumption). Similarly, some of the assumptions made as part of the modelling process are firm because of the first law of thermodynamics (that changes in energy balance whether due to increased energy intake or decreased energy expenditure will result in changes in body weight) and others are weaker (such as assumptions regarding the energy density of replacement foods eaten if certain unhealthy foods are eliminated from the diet). Provided the assumptions are transparent and estimates of sensitivity and uncertainty are included, this modelling is feasible and can make a significant contribution to estimating the effectiveness and cost-effectiveness of interventions.

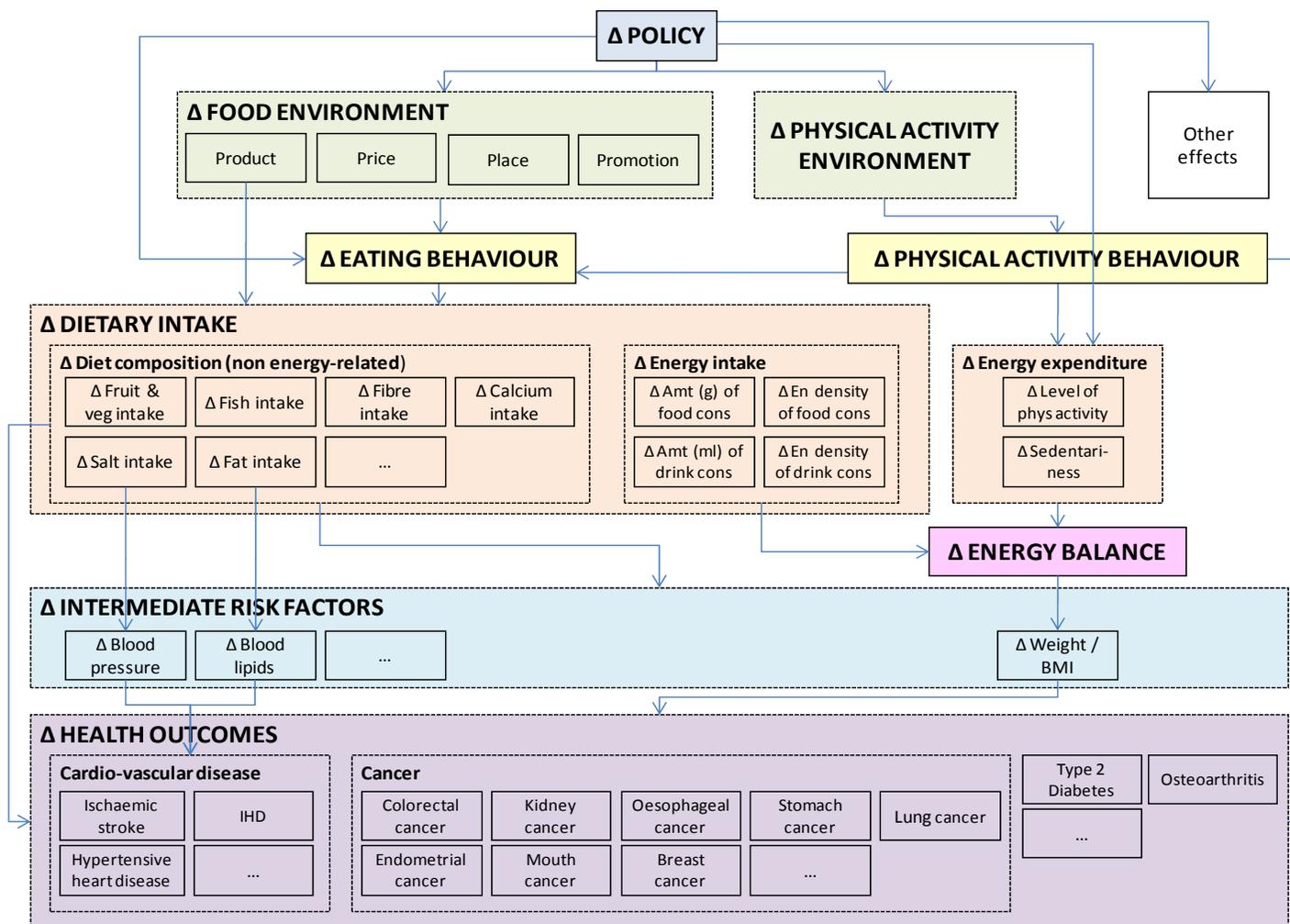


Figure 15: Logic pathway from change in food policy to change in health outcomes

3.2.4 Modelling costs

In determining the costs related to specific policy-based interventions to improve population nutrition, it is necessary to consider the following (100):

- **Perspective.** The ACE methodology typically carries out analyses from the health sector perspective, and, accordingly, only costs to the health sector are included in the primary analysis. For interventions with large non-health benefits or costs, a broader societal perspective can be adopted, with these analyses carried out separately (with ICERs reported with and without their inclusion).
- **Economic versus financial costs.** In the ACE methodology costs can be understood in terms of the fundamental economics notion of ‘opportunity cost’. This concept recognises that the use of resources in one way requires relinquishing the opportunity to use them in other ways, as well as relinquishing the benefits that the alternative uses could have yielded (68). Under the concept of opportunity cost, the true economic cost of an activity or intervention is the value of the alternative outputs (i.e. the alternative benefits) that would be derived from using the resources required in their next best use. If there is no opportunity cost involved then there is no economic cost; similarly if there is an opportunity cost involved, then the cost should be included irrespective of whether market prices are involved (e.g. donated space, volunteer time) (68).
- **Stage of intervention.** Interventions are typically considered to be in ‘steady state’ meaning that the intervention is fully implemented and operating in accordance with its efficacy potential. Accordingly, ‘learning curve’ issues are not included.
- **Stakeholder.** Costs and cost offsets to each major stakeholder (such as ‘government’ and the ‘private sector’) are kept separate in the analyses to allow commenting on the contribution of each to overall costs.
- **Consistency.** The costs and cost offsets associated with different interventions need to be considered in the same way to allow for meaningful comparisons between interventions.
- **Choice of comparator.** Costs of interventions need to be compared to a base case comparator. The comparator is typically ‘current practice’. Similarly, cost offsets relevant to the intervention and ‘current practice’ need to be modelled in a consistent way.

Once decisions on the above considerations have been made, determination of specific costs involves the following steps (98):

- Describing the intervention and comparator
- Identification of relevant costs for inclusion in the evaluation
- Measurement of resource usage
- Valuation of resource usage

In identifying the steps to include as part of the intervention, it is useful to describe the course of events with the intervention ('event-pathway') compared to that without the intervention in concrete and well-defined steps. This generally includes the following elements (100):

1. Recruitment to the intervention (e.g. training of providers);
2. Provision of the key elements of the intervention (e.g. program delivery, consultations, etc)
3. A routine level of monitoring, evaluation and support; and
4. Downstream effects

Figure 16 provides an example of an event-pathway for an intervention from the ACE-Obesity project (102). The intervention focuses on a family-based management program delivered in a primary care setting and is targeted to overweight and moderately obese children. Once the activities involved in the intervention have been identified (as in figure 16), the resources used as part of the activities would then need to be measured and valued to determine the cost of the intervention.

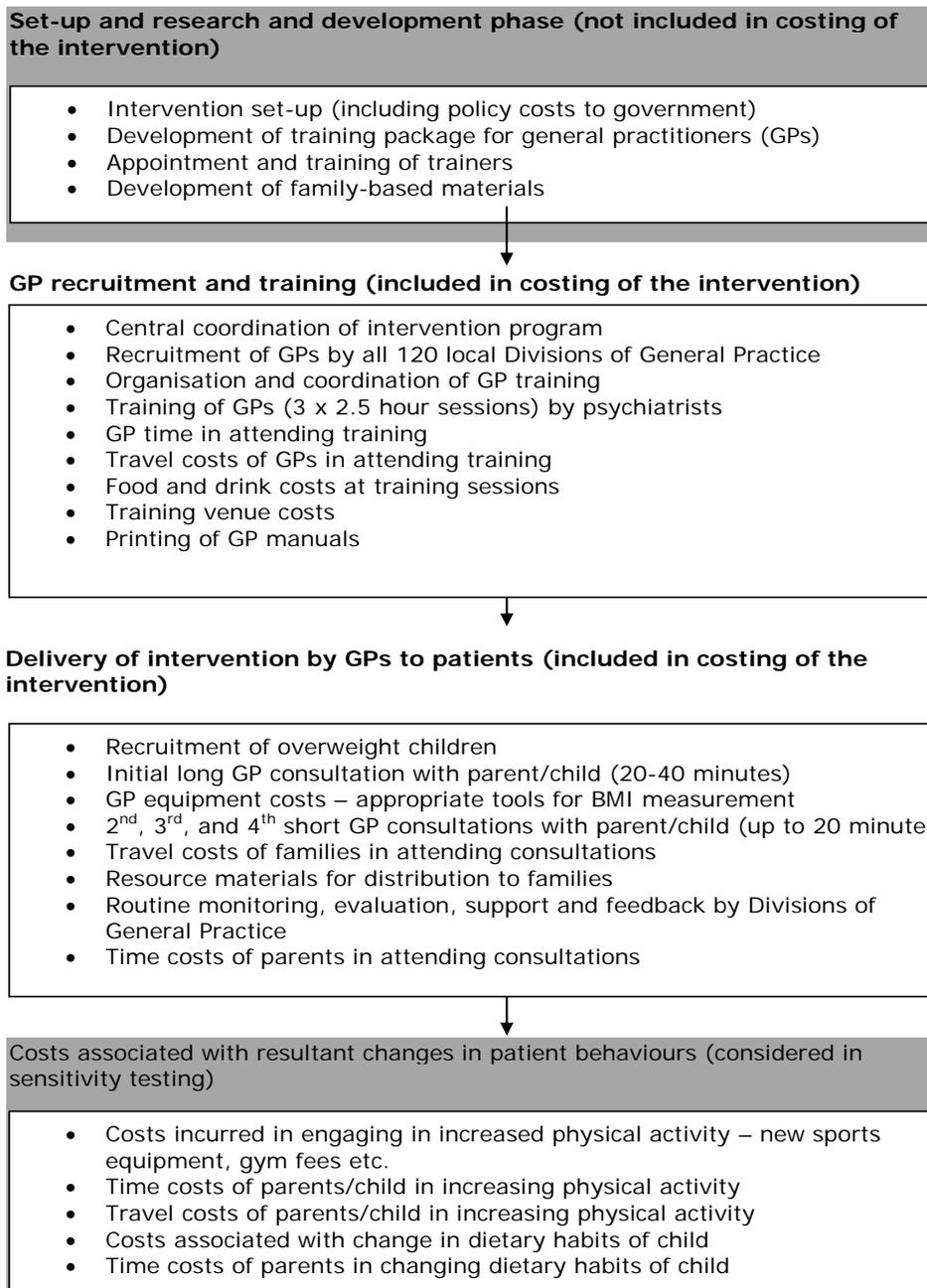


Figure 16: Example of an event-pathway for an intervention evaluated as part of ACE-Obesity

3.2.5 ACE-Obesity study

3.2.5.1 Overview

The ACE-Obesity study, conducted in Victoria, Australia, is an important example of where the ACE approach has been applied to obesity at the state/national level (102). The aim of the project was to assess the most cost-effective options for preventing unhealthy weight gain in children and adolescents in Australia and it was funded by the Victorian Department of Human Services. While this study originated in Australia, the processes and technical tools could be readily applied in other countries.

A Working Group of stakeholders and a team undertaking the technical analyses decided on the interventions to assess, and defined them in sufficient detail to allow costs, population health impact, and cost-effectiveness ratios to be assessed. The criteria used to select the interventions included:

- Relevance to current policy decision-making
- Availability of evidence of efficacy and effectiveness
- Potential impact of addressing the obesity problem
- Ability to specify the intervention in clear concrete terms
- Inclusion of a mix of interventions and settings in the list of interventions

The thirteen specific interventions assessed as part of ACE-Obesity included: programs to promote active transport to school; curriculum-based programs to reduce soft drink consumption and reduce TV viewing; multi-faceted school-based programs; various health care programs for overweight or obese children; after school activity programs; and strengthened regulations to reduce television food advertisements targeting children (102).

The estimates of cost-effectiveness, total costs, and population health gains plus the second stage filters, provided the evidence base for the decision-makers to choose a portfolio of potential interventions in which to invest (102).

3.2.5.2 Sample outputs

Sample output from the ACE-Obesity project are shown here to illustrate the type of output that can be expected from running the ACE methodology. Note that the outputs presented here are from the technical analysis only and do not take into account the results of the second stage filters.

Table 7 is an example of the cost / benefit results from the ACE-Obesity project (105). The different interventions modelled as part of the project are compared based on their potential impact (in this case, the expected reduction in BMI units per person), the size of the population targeted by each intervention and the resultant health benefits to the population overall (measured in DALYs saved). This can be compared with the costs (gross and net) of the intervention.

Table 7: Example of cost / benefit results table as output from ACE process (105)

Intervention	BMI reduction per person	Target population	DALYs saved	Gross cost	Net cost
TV advertising	0.17	2,400,000	37,000	\$0.13M	-\$300M
Family-based targeted program	1.7	5,800	2,700	\$11M	-\$4.1M
Targeted multi-faceted school-based	0.52	4,300	370	\$0.56M	-\$0.08
Fizzy drinks	0.13	119,000	1,060	\$3.3M	-\$5.2M
TV viewing	0.45	227,000	6,700	\$54.6M	-\$2.1M
Multi-faceted school-based +PE	1.1	115,000	8,000	\$40.4M	-\$28.7M
Gastric banding	13.9	4,100	12,300	\$130.0M	\$55.0M
GP intervention	0.25	9,700	511	\$6.3M	\$3.0M
Orlistat in adolescents	0.86	3,300	450	\$6.4M	\$4.0M
Multi-faceted school-based -PE	0.31	115,000	1,600	\$24.3M	\$11.2M
Active After-School	0.07	99,000	449	\$40.3M	\$36.6M
TravelSMART	0.07	268,000	50	\$13.1M	\$12.5M
Walking School Bus	0.03	16,000	30	\$22.8M	\$22.6M

Figure 17 illustrates the output from the ACE-Obesity study with respect to total costs, giving an indication of the relative affordability of the different intervention options. For each intervention, the bars represent the 95% uncertainty range around the total intervention cost, and the line on the bar represents the median value. From these results, it is evident that the surgical intervention (gastric banding) is relatively expensive, with program-based interventions less expensive and the regulatory-based intervention (regulating television advertising) costing almost nothing.

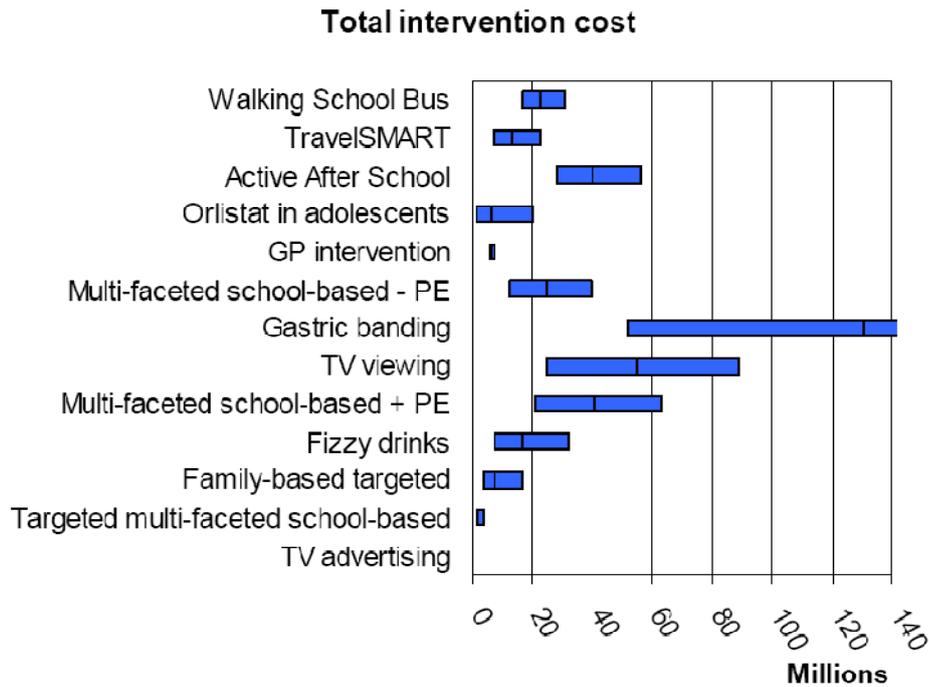


Figure 17: Example of cost comparison table as output from ACE process (105)

Figure 18 is an example of the way in which the final results of the technical analysis are presented (105). The net cost per DALY saved (i.e. the incremental cost-effectiveness following the inclusion of cost-offsets) are shown for each of the interventions. The bars represent the 95% uncertainty range around the ICER, and the line on the bar represents the median value. The dotted line represents a value of AUD50,000 per DALY saved which is a commonly accepted threshold for cost-effectiveness used in Australia – interventions with an ICER below this level are usually considered cost-effective.

Figure 19 illustrates the cost-effectiveness plane for one particular intervention. The scatter plot represents the output from the Monte Carlo simulation (uncertainty analysis), with each point representing a different combination of input parameters. The solid line represents the cost-effectiveness line (corresponding to an ICER of AUD50,000 per DALY saved which is generally considered about the benchmark figure in Australia for cost-effectiveness). Points to the right of this solid line are considered cost-effective, with points below the x-axis considered as cost-saving. Points to the left of the solid line are cost-ineffective, with points to the left of the y-axis having a negative health impact. The spread indicates the degree of certainty about whether this particular intervention will be cost-effective.

Incremental cost-effectiveness of interventions (net \$ per DALY saved)

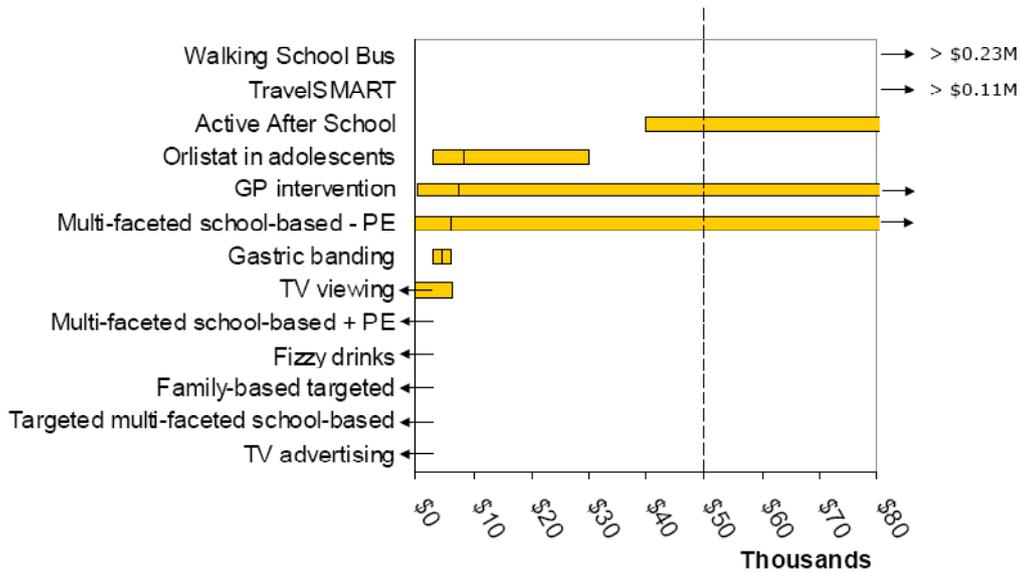


Figure 18: Example of incremental cost effectiveness ratios as output from ACE process (105)

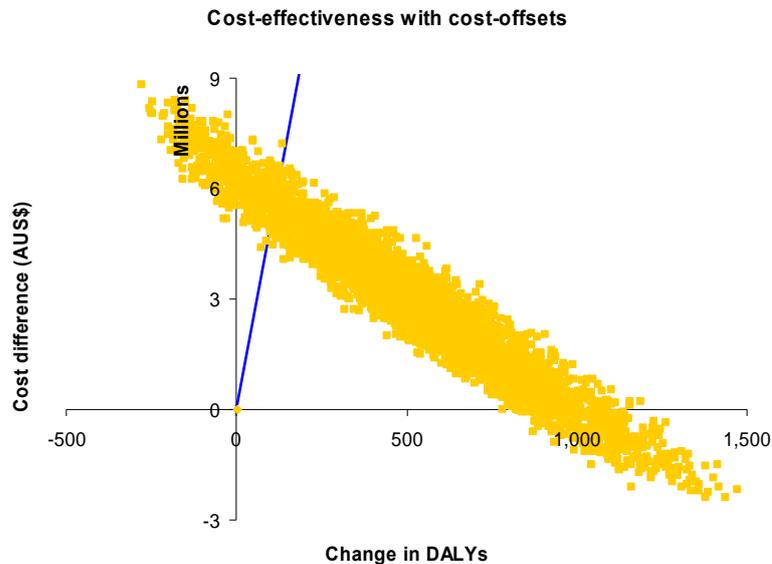


Figure 19: Example of cost-effectiveness plane as output from ACE process

3.2.6 Applying the ACE approach to nutrition-based policy interventions

As depicted in table 6 above, the ACE approach has been successfully applied in assessing the cost-effectiveness of a wide-range of interventions – including policy-related interventions – in the areas of chronic disease prevention. Furthermore, the methodology has been used specifically for priority setting in relation to childhood

obesity (ACE-Obesity study). As such, the approach can be readily applied to assessing the cost effectiveness of policy options for improving population nutrition.

The strong focus on due process and the importance placed on stakeholder views makes the ACE approach highly suited to use in low-income and middle-income countries where there is often a paucity of locally-relevant evidence and the decision making context is of particular importance.

The critical aspect of applying the ACE approach in this context is in identifying the particular interventions. It will be important for the intervention options to be specified tightly enough to estimate the impact and the cost of the intervention. Thus, it will be necessary to distinguish between the stated aims in a policy area, e.g. reducing the marketing of unhealthy food to children, and identifying a specific intervention, e.g. regulations to ban the television advertising of unhealthy foods and beverages before 9:30pm.

Some interventions, such as healthy school canteens, may not figure strongly in the technical analyses because they do not have a large impact (only about 2-3% of total energy intake for a year for a school child comes from food bought at school (106)). Nevertheless, such interventions which are highly visible and can 'lead the way' (so-called 'Lighthouse' interventions) may be included in a final portfolio of interventions because they are assumed to have much wider impacts than can be modelled (107).

In using the ACE approach to estimate the potential impact of policy-based interventions, it is worthwhile noting that the level of uncertainty in the modelling process increases with a greater number of steps in the logic pathway (refer to Figure 15) as more assumptions are needed as one progresses along the pathway. Accordingly, more distal interventions (policy-based) have more uncertainty; whereas more proximal interventions (clinical-based) have more certainty.

3.3 Conclusion

The ACE approach to estimating cost effectiveness and setting health care priorities is highly suitable for evaluating the cost effectiveness of the diet component of the Global Strategy on Diet, Physical Activity and Health (DPAS) implementation.

In considering adopting this approach globally, there are significant roles to be played at both a central co-ordination level and at a local / national level for individual states. At a central level, the protocol, general modelling methodology and pathways can be developed and shared, with training provided centrally to countries adopting the ACE approach. In addition, some of the model parameters (such as relative risks for particular diseases) can be supplied centrally. At a local / national level, local data regarding disease prevalence, eating behaviours, and culturally-specific inputs will be required in order to determine the impact of potential policy options. Furthermore, it is crucial that stakeholders from the local / national level are included in the priority setting process for their particular state, with the 2nd stage filters varying based on the particular setting.

References

1. World Health Organization. Global strategy on diet, physical activity and health [online]. [cited 2008 December]; Available from:
URL:<http://www.who.int/dietphysicalactivity/goals/en/index.html>
2. Swinburn B, Gill T, Kumanyika S. Obesity prevention: a proposed framework for translating evidence into action. *Obes Rev.* 2005 Feb;6(1):23-33.
3. International Obesity Taskforce. International Obesity TaskForce Prevalence Data [online]. [cited 2008 December]; Available from:
URL:<http://www.iotf.org/database/index.asp>
4. Toh CM, Cutter J, Chew SK. School based intervention has reduced obesity in Singapore. *BMJ.* 2002 Feb 16;324(427).
5. Green L. From research to "best practices" in other settings and populations. *Am J Health Behav.* 2001;25:165-78.
6. Marmot MG. Evidence based policy or policy based evidence? *BMJ.* 2004 Apr 17;328(7445):906-7.
7. World Health Organization. Prevention and control of noncommunicable diseases: implementation of the global strategy. Report by the Secretariat [online]. 2008 [cited 2008 December]; Available from:
URL:http://www.who.int/gb/ebwha/pdf_files/A61/A61_8-en.pdf
8. Lobstein T, Baur L, Uauy R. Obesity in children and young people: a crisis in public health. *Obes Rev.* 2004 May;5 Suppl 1:4-104.
9. Swinburn BA. Obesity prevention: the role of policies, laws and regulations.(Commentary). *Aust New Zealand Health Policy.* 2008;5:12.
10. Milio N. Nutrition and health: patterns and policy perspectives in food-rich countries. *Soc Sci Med.* 1989;29(3):413-23.
11. Bridgman P, Davis G. *The Australian policy handbook.* 3rd edition. Sydney: Allen and Unwin; 2004.
12. World Health Organization. *Global Strategy on Diet, Physical Activity and Health. A Framework to monitor and evaluate implementation.* Geneva: World Health Organization; 2006.
13. Sacks G, Swinburn B, Lawrence M. Obesity Policy Action framework and analysis grids for a comprehensive policy approach to reducing obesity. *Obes Rev.* 2008;10(1):76-86.
14. von Schirnding Y. Health and sustainable development: can we rise to the challenge? *The Lancet.* 2002;360(9333):632-7.
15. Beauman C, Cannon G, Elmadfa I, Glasauer P, Hoffmann I, Keller M, et al. The principles, definition and dimensions of the new nutrition science. *Public Health Nutr.* 2005;8(6a):695-8.
16. Sacks G, Swinburn BA, Lawrence MA. A systematic policy approach to changing the food system and physical activity environments to prevent obesity.(Review)(Report). *Aust New Zealand Health Policy.* 2008;5:13.
17. World Health Organization. *Closing the gap in a generation: Health equity through action on the social determinants of health.* Geneva: World Health Organisation; 2008.
18. Bleich SN, Cutler D, Murray C, Adams A. Why is the developed world obese? *Annu Rev Public Health.* 2008;29(1):273-95.

19. Cutler DM, Glaeser EL, Shapiro JM. Why have Americans become more obese? *J Econ Perspect*. 2003;17(3):93-118.
20. Roos G, Lean M, Anderson A. Dietary interventions in Finland, Norway and Sweden: nutrition policies and strategies. *J Hum Nutr Diet*. 2002 Apr;15(2):99-110.
21. Puska P. Communication with the population: the North Karelia Project experience. *J Hum Hypertens*. 1995 Jan;9(1):63-6.
22. Astrup A. The trans fatty acid story in Denmark. *Atheroscler Suppl*. 2006 May;7(2):43-6.
23. Stender S, Dyerberg J. Influence of trans fatty acids on health. *Ann Nutr Metab*. 2004;48(2):61-6.
24. Ban trans fats: The campaign to ban partially hydrogenated oils [online]. 2003 [cited 2008 December 22]; Available from: URL:www.bantransfats.com/index.html
25. Hawkes C. Marketing food to children: the global regulatory environment: World Health Organisation; 2004.
26. WHO Forum on the marketing of food and non-alcoholic beverages to children. Marketing of food and non-alcoholic beverages to children: a report of a WHO forum and technical meeting. Oslo, Norway: World Health Organisation; 2006.
27. The United Kingdom's Office of Communications. Changes in the nature and balance of television food advertising to children [online]. 2008 [cited 2008 December 21]; Available from: URL:<http://www.ofcom.org.uk/research/tv/reports/hfssdec08/>
28. Swinburn B, Sacks G, Lobstein T, Rigby NJ, Baur LA, Brownell KD, et al. The 'Sydney Principles' for reducing the commercial promotion of foods and beverages to children. *Public Health Nutr*. 2008;11(9):881-6.
29. Queensland Health. A Better Choice: Healthy food & drink supply strategy for Queensland Health facilities. Brisbane, Australia: Queensland Health; 2007.
30. McDonald's Corporate Responsibility. Values in Practice: About [online]. [cited 2008 December 21]; Available from: URL:<http://www.crmcdonalds.com/publish/csr/home/about/values.html>.
31. Nestle. Creating shared value- an approach to Corporate Social Responsibility. [cited 2008 December 21]; Available from: URL:<http://www.nestle.com/SharedValueCSR/Overview.htm>.
32. Parra D, Gomez L, Pratt M, Sarmiento O, Mosquera J, Triche E. Policy and built environment changes in Bogota and their importance in health promotion. *Indoor and Built Environment*. 2007;16(4):334-48.
33. Case Study: City of Zurich [online]. 2007 [cited 2008 21 December]; Available from: URL:<http://www.cardiff.ac.uk/archi/programmes/cost8/case/transport/switzerland-zurich.PDF>.
34. Coleman K. Mobilizing a low income broader community to address state mandate coordinated school health. *Am J Health Educ*. 2006;37(1):15.
35. CATCH partnership. Coordinated Approach To Child Health [online]. [cited 2009 December]; Available from: URL:<http://www.catchinfo.org/>
36. Luepker RV, Perry CL, McKinlay SM, Nader PR, Parcel GS, Stone EJ, et al. Outcomes of a field trial to improve children's dietary patterns and physical activity. The Child and Adolescent Trial for Cardiovascular Health. CATCH collaborative group. *JAMA*. 1996 Mar 13;275(10):768-76.
37. Jiang J, Xia X, Greiner T, Wu G, Lian G, Rosenqvist U. The effects of a 3-year obesity intervention in schoolchildren in Beijing. *Child Care Health Dev*. 2007 Sep;33(5):641-6.

38. Agita São Paulo program - promoting physical activity in São Paulo – Brazil [online]. [cited 2008 December]; Available from: URL:<http://www.agitasp.org.br>
39. Matsudo SM, Matsudo VR, Araujo TL, Andrade DR, Andrade EL, de Oliveira LC, et al. The Agita Sao Paulo program as a model for using physical activity to promote health. *Rev Panam Salud Publica*. 2003 Oct;14(4):265-72.
40. Centers for Disease Control and Prevention. VERB. It's what you do [online]. [cited 2008 December]; Available from: URL:<http://www.cdc.gov/YouthCampaign/>
41. Huhman ME, Potter LD, Duke JC, Judkins DR, Heitzler CD, Wong FL. Evaluation of a national physical activity intervention for children: VERB campaign, 2002-2004. *Am J Prev Med*. 2007 Jan;32(1):38-43.
42. Barlow SE, Committee E. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics*. 2007;20:S164-S92.
43. Walker O, Strong M, Atchinson R, Saunders J, Abbott J. A qualitative study of primary care clinicians' views of treating childhood obesity. *BMC Family Practice*. 2007;8(1):50.
44. Story MT, Neumark-Stzainer DR, Sherwood NE, Holt K, Sofka D, Trowbridge FL, et al. Management of child and adolescent obesity: attitudes, barriers, skills, and training needs among health care professionals. *Pediatrics*. 2002;110(1):210-4.
45. Epstein LH, Paluch RA, Consalvi A, Riordan K, Scholl T. Effects of manipulating sedentary behavior on physical activity and food intake. *J Pediatr*. 2002;140(3):334-9.
46. Golan M, Crow S. Parents are key players in the prevention and treatment of weight-related problems. *Nutr Rev*. 2004 Jan;62(1):39-50.
47. Schwartz RP, Hamre R, Dietz WH, Wasserman RC, Slora EJ, Myers EF, et al. Office-based motivational interviewing to prevent childhood obesity. *Arch Pediatr Adolesc Med*. 2007;161:495-501.
48. Saelens BE, Sallis JF, Wilfley DE, Patrick K, Cella JA, Buchta R. Behavioral weight control for overweight adolescents initiated in primary care. *Obesity*. 2002;10(1):22-32.
49. Uauy R, Kain J. The epidemiological transition: need to incorporate obesity prevention into nutrition programmes. *Public Health Nutr*. 2002;5(1a):223-9.
50. Corvalan C, Dangour AD, Uauy R. Need to address all forms of childhood malnutrition with a common agenda. *Arch Dis Child*. 2008;93:361-2.
51. Barker DJ. Adult consequences of fetal growth restriction. *Clin Obstet Gynecol*. 2006;49(2):270-83.
52. Government Office for Science. Foresight. Tackling obesities: future choices - project report [online]. 2007 [cited 2008 December]; Available from: URL:<http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/KeyInfo/Index.asp>
53. Epping-Jordan JE, Galea G, Tukuitonga C, Beaglehole R. Preventing chronic diseases: taking stepwise action. *Lancet*. 2005;366(9497):1667-71.
54. World Health Organization. STEPS:a framework for surveillance. Geneva: World Health Organization; 2003.
55. Moussa M. Applying objective oriented project planning approach for Environmental Projects Design and Management case study: environmental information strategic plan. *J Appl Sci Res*. 2006;2:1375-83.
56. Aune J. Logical Framework Approach and PRA - mutually exclusive or complementary tools for project planning? *Dev Prac*. 2000;10:687-90.

57. Dey P, Hariharan S, Brookes N. Managing healthcare quality using logical framework analysis. *Manag Serv Qual.* 2006;16:203-22.
58. AusAID. Australia's guidelines on the Logical Framework Approach [online]. 2003 [cited 2007 May]; Available from: URL:<http://www.ausaid.gov.au/ausguide/part1b.cfm>
59. ESCAP/UNDP/ADB. Achieving the Health Millennium Development Goals in Asia and the Pacific. New York: United Nations; 2007.
60. Snowdon W, Schultz J, Swinburn B. Problem and solution trees: a practical approach for identifying potential interventions to improve population nutrition. *Health Promot Int.* 2008;23:345-53.
61. Gross R, Kielmann A, Korte R, Schoeneberger H, Schultink W. Nutrition baseline surveys in communities. Jakarta: SEAMO, TROPMED & GTZ; 1997.
62. Snowdon W, Potter JL, Swinburn B, Schultz J. Prioritizing policy interventions to improve diets? Will it work, can it happen, will it do harm? Submitted for publication.
63. Swinburn B, Egger, G. and Raza, F. Dissecting obesogenic environments: the development and application of a framework for identifying and prioritizing environmental interventions for obesity. *Prev Med.* 1999;29(6 Pt 1):563-70.
64. Simmons A, Mavoa HM, Bell AC, de Courten M, Schaaf D, Schultz J, et al. Creating community action plans for obesity prevention using the ANGELO (Analysis Grids for Elements Linked to Obesity) framework. *Health Promotion Int* [serial online]. 2009 [cited 2008 December]; Available from: URL:<http://heapro.oxfordjournals.org/cgi/reprint/dap029v1?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=1&author1=simmons&andorexacttitle=and&andorexacttitleabs=and&andorexactfulltext=and&searchid=1&FIRSTINDEX=0&sortspec=relevance&resourcetype=HWCIT>
65. Schultz J, Utter J, Mathews L, Cama T, Mavoa H, Swinburn B. The Pacific OPIC Project (Obesity Prevention in Communities): action plans and interventions. *Pacific Health Dialogue.* 2007;14(2):147-53.
66. Rychetnik L, Hawe P, Waters E, Barratt A, Frommer M. A glossary for evidence based public health. *J Epidemiol Community Health.* 2004 Jul;58(7):538-45.
67. Keleher H, MacDougall C, Murphy B. Understanding health promotion. Melbourne: Oxford University Press; 2007.
68. Carter R, Vos T, Moodie M, Haby M, Magnus A, Mihalopoulos C. Priority setting in health: origins, description, and application of the Australian Assessing Cost-Effectiveness initiative. *Expert Rev Pharmacoeconomics Outcomes Res.* 2008;8(6):593-617.
69. Flynn MAT, McNeil DA, Maloff B, Mutasingwa D, Wu M, Ford C, et al. Reducing obesity and related chronic disease risk in children and youth: a synthesis of evidence with best practice recommendations. *Obes Rev.* 2006;7:7-66.
70. Doak CM, Visscher TL, Renders CM, Seidell JC. The prevention of overweight and obesity in children and adolescents: a review of interventions and programmes. *Obes Rev.* 2006 Feb;7(1):111-36.
71. Round R, Marshall B, Horton K. Planning for effective health promotion evaluation. Melbourne: Victorian Department of Human Services; 2005.
72. World Health Organization. Development communication in action. Report of the inter-agency meeting on advocacy strategies for health and development. Geneva: World Health Organization; 1995.
73. Chapman S, Ludman D. The fight for public health: principles and practice of media advocacy. London: BMJ Publishing Group; 1994.

74. Chapman S. Health advocacy and tobacco control: making smoking history. Oxford: Blackwell Publishing; 2007.
75. World Health Organization. Advocacy and public health. Module 2 [online]. [cited 2008 December]. Available from: URL:http://www.euro.who.int/document/e82092_3.pdf
76. The Parents Jury. The parents jury: your voice on food and activity [online]. 2008 [cited 2008 December]; Available from: URL:<http://www.parentsjury.org.au/>
77. Center for Science in the Public Interest. Center for Science in the Public Interest: about CSPI [online]. [2008 December 21]; Available from: URL:<http://www.cspinet.org/about/index.html>
78. World Health Organization. Integrated management of healthy settings at the district level [online]. 2002 [cited 2008 December]; Available from: URL:http://whqlibdoc.who.int/searo/2002/SEA_HSD_260.pdf.
79. New South Wales Department of Health. Best options for promoting healthy weight and preventing weight gain in NSW. Sydney: NSW Department of Health; 2005.
80. Arkansas Center for Health Improvement. Year five assessment of childhood and adolescent obesity in Arkansas (Fall 2007-Spring 2008) [online]. 2008 [cited 2008 December]: Available from: URL:<http://www.achi.net/childob.asp>
81. Justus MB, Ryan KW, Rockenbach J, Katterapalli C, Card-Higginson P. Lessons learned while implementing a legislated school policy: body mass index assessments among Arkansas's public school students. *J Sch Health*. 2007 Dec;77(10):706-13.
82. Robinson TN, Sirard JR. Preventing childhood obesity: a solution-oriented research paradigm. *Am J Prev Med*. 2005 Feb;28(2 Suppl 2):194-201.
83. New South Wales Department of Health. A framework for building capacity to improve health [online]. 2001 [cited 2008 December]; Available from: URL:http://www.health.nsw.gov.au/pubs/2001/framework_improve.html
84. Andreasen A. Marketing social change: Changing behavior to promote health, social development, and the environment. San Francisco: Jossey Bass Publishers; 1995.
85. Egger G, Donovan R, Spark R. Health and the media. Principles and practices for health promotion. Sydney: McGraw-Hill Book Company; 1993.
86. Donovan R. Public health advertising: Execution guidelines for health promotion professionals. *Health Promot J Austr*. 1991;1:40-5.
87. Sargeant A. Marketing management for nonprofit organizations. Oxford: Oxford University Press; 1999.
88. Bell AC, Simmons A, Sanigorski AM, Kremer PJ, Swinburn BA. Preventing childhood obesity: the sentinel site for obesity prevention in Victoria, Australia. *Health Promot Int*. 2008 Dec;23(4):328-36.
89. Sahota P, Rudolf MC, Dixey R, Hill AJ, Barth JH, Cade J. Evaluation of implementation and effect of primary school based intervention to reduce risk factors for obesity. *BMJ*. 2001;323(7320):1-4.
90. Sahota P, Rudolf MC, Dixey R, Hill AJ, Barth JH, Cade J. Randomised controlled trial of primary school based intervention to reduce risk factors for obesity. *BMJ*. 2001;323(7320):1029-32.
91. Robinson TN. Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA*. 1999;282(16):1561-7.

92. Gortmaker SL, Peterson K, Wiecha J, Sobol AM, Dixit S, Fox MK, et al. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch Pediatr Adolesc Med.* 1999;153(4):409-18.
93. EPODE. Ensemble Prevenons l'Obesite Des Enfants [online]. [cited 2008 December 21]; Available from: URL:<http://www.epode.fr>
94. Romon M, Lommez, A., Tafflet, M., Basdevant, A., Oppert, J., Bresson, J., Ducimetiers, P., Charles, M., Borys, J. Downward trends in childhood obesity after 12-year school-and community-based programmes. *Public Health Nutr.* 2009;12(10):1735-42.
95. Sanigorski A, Bell A, Kremer P, Cuttler R, Swinburn B. Reducing unhealthy weight gain in children and its related gradient with socio-economic status through community capacity building: results of a quasi-experimental intervention program (Be Active Eat Well). *Int J Obes.* 2008;32:1060-67.
96. Victorian Department of Human Services. Be Active Eat Well [online]. 2008 [cited 2008 December 21]; Available from: URL:http://www.goforyourlife.vic.gov.au/hav/articles.nsf/pracpages/Be_Active_Eat_Well
97. Sabik L, Lie R. Priority setting in health care: Lessons from the experiences of eight countries. *Int J Equity Health.* 2008;7(1):4.
98. Haby MM, Carter R, Mihalopoulos C, Magnus A, Sanderson K, Andrews G, et al. Assessing Cost-Effectiveness-Mental Health: introduction to the study and methods. *Aust N Z J Psychiatry.* 2004 Aug;38(8):569-78.
99. Carter R, Stone C, Vos T, Hocking J, Mihalopoulos C, Peacock S, et al. Trial of Program Budgeting and Marginal Analysis (PBMA) to assist cancer control planning in Australia. Canberra: Centre for Health Program Evaluation, University of Melbourne; 2000.
100. Carter R, Vos T. Economic evaluation protocol for the ACE-Heart Disease study. Melbourne: Program Evaluation Unit, University of Melbourne; 2002.
101. Vos T, Haby MM, Magnus A, Mihalopoulos C, Andrews G, Carter R. Assessing cost-effectiveness in mental health: helping policy-makers prioritize and plan health services. *Aust N Z J Psychiatry.* 2005;39:701-12.
102. Haby MM, Vos T, Carter R, Moodie M, Markwick A, Magnus A, et al. A new approach to assessing the health benefit from obesity interventions in children and adolescents: the assessing cost-effectiveness in obesity project. *Int J Obes.* 2006;30(10):1463-75.
103. Swinburn BA, Jolley D, Kremer PJ, Salbe AD, Ravussin E. Estimating the effects of energy imbalance on changes in body weight in children. *Am J Clin Nutr.* 2006 Apr;83(4):859-63.
104. Ezzati M, Lopez, A. D., Rodgers, A., Murray, C. J. L. (eds). Comparative quantification of health risks. Global and regional burden of disease attributable to selected major risk factors (volume 1). Geneva: World Health Organization; 2004.
105. Victorian Government Department of Human Services. ACE - Obesity: assessing cost-effectiveness of obesity interventions in children and adolescents - summary of results [online]. 2006 [cited 2008 December]. Available from: URL:http://www.health.vic.gov.au/healthpromotion/quality/ace_obesity.htm
106. Bell A, Kremer P, Magarey A, Swinburn B. Contribution of non-core foods and beverages to the energy intake and weight status of Australian children. *Eur J Clin Nutr.* 2005;59:639-45.
107. Bell AC, Swinburn B. School canteens: using ripples to create a wave of healthy eating. *MJA.* 2005;183(1):5-6.