

# ACE-PREVENTION PAMPHLETS

## PAMPHLET C: KEY ASSUMPTIONS UNDERLYING THE ECONOMIC ANALYSIS

### 1. INTRODUCTION

To aid priority setting in prevention, the Assessing Cost-Effectiveness in Prevention Project (ACE-Prevention) applies standardised evaluation methods to assess the cost-effectiveness of 100 to 150 preventive interventions, taking a health sector perspective. This information is intended to help decision makers move resources from less efficient current practices to more efficient preventive action resulting in greater health gain for the same outlay.

This briefing paper is one of several designed to communicate the methods and results of the ACE-Prevention project. The purpose of this pamphlet is to make explicit key assumptions associated with the application of economic evaluation methods in ACE-Prevention, so that potential users of the results can judge the suitability of these assumptions for their decision context and use, or adjust the results accordingly.

In the economic literature these key assumptions are divided into those concerning the 'study frame' and others pertaining to the 'study design'. Taken together, study frame and study design define and describe the economic evaluation undertaken, including the approach to data collection and analysis. Greater detail is available in a protocol document on our web site.

### 2. STUDY FRAME

The decision context and objectives of ACE-Prevention are described in Pamphlets A and B. Other key elements of study frame are described below:

**Study perspective:** A 'health sector perspective' is adopted, with costs to government (both Commonwealth and State/Territory) and the private sector clearly identified. When non-health sector impacts are important to an intervention (either on the cost or outcome side), we flag the impact and undertake sensitivity analysis to assess the significance of adopting a broader perspective.

**Target group:** The target group is the Australian population in our reference year (2003), who are potential recipients of the intervention. This can be either:

- i) the whole population, such as for population-wide health promotion campaigns; or
- ii) a subpopulation, based on characteristics such as age, sex, risk factor profile or disease.

**Study boundaries:** Spill-over effects ripple out from every intervention and the question is how far to follow them. Key **exclusions** from the primary analysis are:

- i) production gains and losses and other non-health sector impacts;
- ii) quality of life impacts other than those on intervention participants (e.g. family and carers); and
- iii) all-of-life effects (i.e. unrelated ongoing health care costs of people who are alive because of the intervention).

**Time Horizon:** The time horizon for modelling the implementation of interventions is based on how the interventions would be applied in real life. For instance, the duration of nicotine-replacement for smoking cessation (recommended for up to three months of use) is very different from that of anti-retroviral drugs in the treatment of HIV/AIDS which need to be taken over a lifetime in order to continue to reap benefits. The time horizon for tracking the associated costs/cost savings and consequences extends over the lifetime of the target population through to death or 100 years of age.

**Defining the intervention:** In modelling interventions we fully specify all activities (i.e. who does what, to whom, when & where?), and assume that all interventions are fully implemented (i.e. in 'steady-state' operation). Our focus is: "What is the cost-effectiveness of interventions when they achieve their full potential as per the evidence on effectiveness?"

**Defining the comparator:** We usually specify both 'current practice' and 'do nothing' as the comparator. With 'current practice' as the comparator, we address the research question: "What is the cost-effectiveness of replacing existing practice for dealing with the health problem with the new intervention?" This relates most closely to short term policy decision making: With 'do nothing' as the comparator, the research question relates more to long-term policy decision making, that is: "What is the most efficient approach to dealing with this health problem?"; "How far removed from this ideal is current practice?"

### 3. STUDY DESIGN

#### **Models:**

We use mathematical models to predict the costs and benefits that are relevant to an intervention by combining available information, often from disparate sources, on disease epidemiology, effectiveness and costs. In predicting population-level costs and consequences of health interventions, there are a variety of modelling techniques available. Analyses in this project rely on the principles of Markov models, multistate life tables and microsimulation. The first two types of models predict in discrete steps over time the difference in health risks, costs and outcomes for the average individual in the target population between the comparator scenario and an intervention scenario. We use microsimulation methods if there is considerable variation in the target populations in terms of their response to the intervention and there are datasets that quantify that variation.

#### **Measurement of costs:**

To assist in identification of relevant costs, interventions and their comparators are described in concrete and well-defined steps that generally include:

- i) an 'event pathway'; and
- ii) a 'patient flowchart'.

The 'event pathway' will generally include the following elements:

- i) ongoing recruitment (+/- training of providers);
- ii) key intervention elements (e.g. advice, consultations, care, change in legislation or regulations, etc);
- iii) monitoring, evaluation and support elements; and
- iv) downstream effects.

The 'patient flowchart' describes how we get from the target population to those who actually participate in the activities.

**Costs included:** Our choice of a 'health sector perspective' means we take into account costs to the health system, patients and families involved in the delivery of the intervention. This includes the costs associated with each step of the intervention pathway: We present results both with and without time and travel costs.

**Costs excluded:** As interventions are assessed in 'steady state' operation, we assume that trained personnel are available to deliver the intervention and that all necessary infrastructure is available. Given this, we exclude the following costs:

- i) costs associated with the research, development and maintenance of materials to be used in the intervention;
- ii) costs associated with training the trainer;
- iii) costs associated with the development and education of an adequate provider workforce;
- iv) production gains and losses other than time cost of participation;
- v) time costs of children; and
- vi) monitoring and evaluation above more than a routine level.

**Valuation of costs:** Unit cost data for all resources associated with an intervention are collated largely based on the PBAC Manual of Resource Items and Their Associated Costs and the Medicare Schedule, measured in real prices for the reference year (2003). In costing staff employed by an intervention, a factor of 1.6 is applied to the base salary to cover: salary on-costs and a loading to cover administrative assistance, office space and utility services. We cost staff who are already employed by an organisation and have access to office space, equipment, etc as part of that position with a factor of 1.3 to cover the salary oncost component only.

**Time costs:** Time costs can be divided into two broad categories:

- i) time costs that are an integral part of providing the health service itself; (such as travelling time, waiting time, treatment time) and
- ii) time costs that are a consequence of providing the intervention (such as time of parents in taking children to an intervention activity).

There is no set method of valuing time. We adopt the simplest method using the hourly wage rate as a proxy for the value of time, combined with a common convention of valuing leisure time at 25% of the wage rate. Our approach adopts a weighting for workforce participation and age/sex composition, which yields an average hourly time cost of \$17.44, that we apply to all time costs in adults.

**Cost of non-adherence:** We assume that any non-adherers incur (part of) the intervention costs but receive no benefit.

**Cost offsets:** If an intervention prevents future disease or treats current disease so that future complications are avoided, the projected health care costs in the eligible population are likely to be lower following the intervention. The difference in projected health care costs between the intervention and comparator situation are identified as cost offsets.

**Discounting:** We apply a 3% discount rate to both costs and benefits. In sensitivity analysis we test the impact of other discount rates.

### **Measurement of benefits:**

We measure the "size of the health gain" associated with each intervention in 'health-adjusted life years' where we value the loss of health due to non-fatal health states with the appropriate disability weight(s) used to estimate Disability-Adjusted Life Years (DALYs) in burden of disease (BoD) studies. When we present our results we equate these health-adjusted life years gained to "DALYs averted by the intervention". However, there are important differences between DALYs calculated in BoD studies and ACE-Prevention DALYs averted. First, in a BoD study, health status of a population is estimated in a particular year. It is therefore, a cross-sectional measure. Economic evaluation methods always have a time dimension. Health gain is calculated as the difference in mortality and morbidity outcomes between a comparator and the intervention option over a defined period of time (the 'time horizon').

Second, in BoD studies the DALY is constructed as a 'health gap' measure, i.e. an ideal is set ("everyone ought to live into old age free of disease") and contrasted with the current health status of a population. Thus, Years of Life Lost (YLL), the mortality component of the DALY, are calculated as the difference between age at death and a 'standard' life expectancy at that age for each death. It is best to view these conversions of counts of deaths into YLL as a weighting of deaths by age. Young deaths accrue more YLL than old deaths. In economic analyses, we do not use the standard life table to give a value to loss of life. Instead, we keep track of a target population over time and count the years of life lived in intervention and comparator scenarios assuming 'realistic' mortality risks as people age. This includes an adjustment for expected levels of disability by age and sex for conditions not immediately affected by the intervention of interest. In other words, extra years of life gained from a preventive intervention are counted as less than full years taking into account the probability that the person would suffer from osteoarthritis, dementia, hip fracture or any other condition as they age. We do this in order to measure realistic health gains, rather than hypothetical health gains assessed against perfect health.

## ACE–PREVENTION PAMPHLETS

**Effectiveness and safety of interventions in ACE-Prevention:** We seek data on the effectiveness and potential side-effects of interventions by systematic review of relevant intervention trials and subsequent follow-up studies. We synthesise the outcome measure by meta-analysis. Trials of risk factor modifying interventions often only report an impact on exposure to the risk factor. That means we need to extrapolate to disease outcomes using available data on the relationship between risk factor and disease outcomes from observational studies. We then identify potential effect modification of the intervention under routine health service conditions in Australia, often by assuming a lower adherence to an intervention than was observed under trial conditions.

**Extrapolating treatment effects over time:** In modelling health outcomes, ACE researchers have to confront the issue that trials measure outcomes over a limited time period while our interest is in the true impact on disease outcomes and costs. One option is to limit the modelling to the duration of the trial, but this does not adequately reflect reality. The alternative is to make assumptions about the impact beyond the duration of the available trials (i.e. to assume either a continued impact over time; a lessening of the impact over a period beyond the known impact time from trials; or the abrupt disappearance of the impact). The assumption we take depends on:

- i) the intervention in question;
- ii) discussions with our technical experts; and
- iii) what the most plausible way of modelling is.

Often, however, there is no clear choice and the solution we adopt is to present results as discrete scenarios using different choices as a sensitivity analysis. For instance, we assume an annual decay of the impact of GP mediated physical activity interventions of 50% and vary this between 25% and 75% in a sensitivity analysis as three distinct scenarios.

For more information on this topic area, please visit: [www.sph.uq.edu.au/bodce-ace-prevention](http://www.sph.uq.edu.au/bodce-ace-prevention)

### PAMPHLETS IN THIS SERIES

#### Methods:

- A. The ACE-Prevention project
- B. ACE approach to priority setting
- C. Key assumptions underlying the economic analysis
- D. Interpretation of ACE-Prevention cost-effectiveness results
- E. Indigenous Health Service Delivery

#### Overall results

1. League table
2. Combined effects

#### Indigenous population results

1. Cardiovascular disease prevention
2. Diabetes prevention
3. Screening and early treatment of chronic kidney disease

#### General population results

1. Adult depression
2. Alcohol
3. Blood pressure and cholesterol lowering
4. Cannabis
5. Cervical cancer screening, Sunsmart and PSA screening
6. Childhood mental disorders
7. Fruit and vegetables
8. HIV
9. Obesity
10. Osteoporosis
11. Physical activity
12. Pre diabetes screening
13. Psychosis
14. Renal replacement therapy, Screening and early treatment of chronic kidney disease
15. Salt
16. Suicide prevention
17. Tobacco