

ACE-PREVENTION PAMPHLETS

GENERAL POPULATION RESULTS PAMPHLET 3: COST-EFFECTIVENESS OF BLOOD PRESSURE AND CHOLESTEROL LOWERING INTERVENTIONS

1. MAIN MESSAGES

It is possible to increase by 36% the amount of health gain from primary cardiovascular disease prevention at one third of current levels of expenditure by:-

- adopting absolute risk as the clinical indication for prevention therapy;
- greater use of the less expensive drug therapies; and
- greater use of the effective non-drug therapies.

The polypill (three blood pressure lowering drugs at half strength, and a statin) is starting to show effectiveness in trials as predicted and would become the most cost-effective preventive drug treatment at an annual cost per patient of \$200.

2. BACKGROUND

Cardiovascular disease was the second largest cause of DALYs in 2003 in Australia. The main clinical manifestations of cardiovascular disease are heart attacks, angina (pain on the chest), heart failure and stroke. Significant gains have been made in recent decades with mortality from coronary and stroke events falling by 70% despite more obesity and less physical activity. Yet, the burden of this largely preventable chronic disease can still be reduced much further. Interventions that address nutrition, body mass index, smoking and physical activity can also contribute to reducing the burden of cardiovascular disease in Australia, but are reported on elsewhere in this project. It is important to note that Government expenditure on cardiovascular drugs represents approx 30% of the total outlay on the Pharmaceutical Benefit Scheme and that most of these drugs are blood pressure and cholesterol lowering drugs used in primary prevention and by those who have disease. This pamphlet focuses on the cost-effectiveness of blood pressure and cholesterol lowering interventions in the primary prevention of cardiovascular disease in the Australian general population and highlights policy implications.

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FOR FURTHER INFORMATION
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ACE-PREVENTION](http://WWW.SPH.UQ.EDU.AU/BODCE-ACE-PREVENTION)

3. INTERVENTIONS

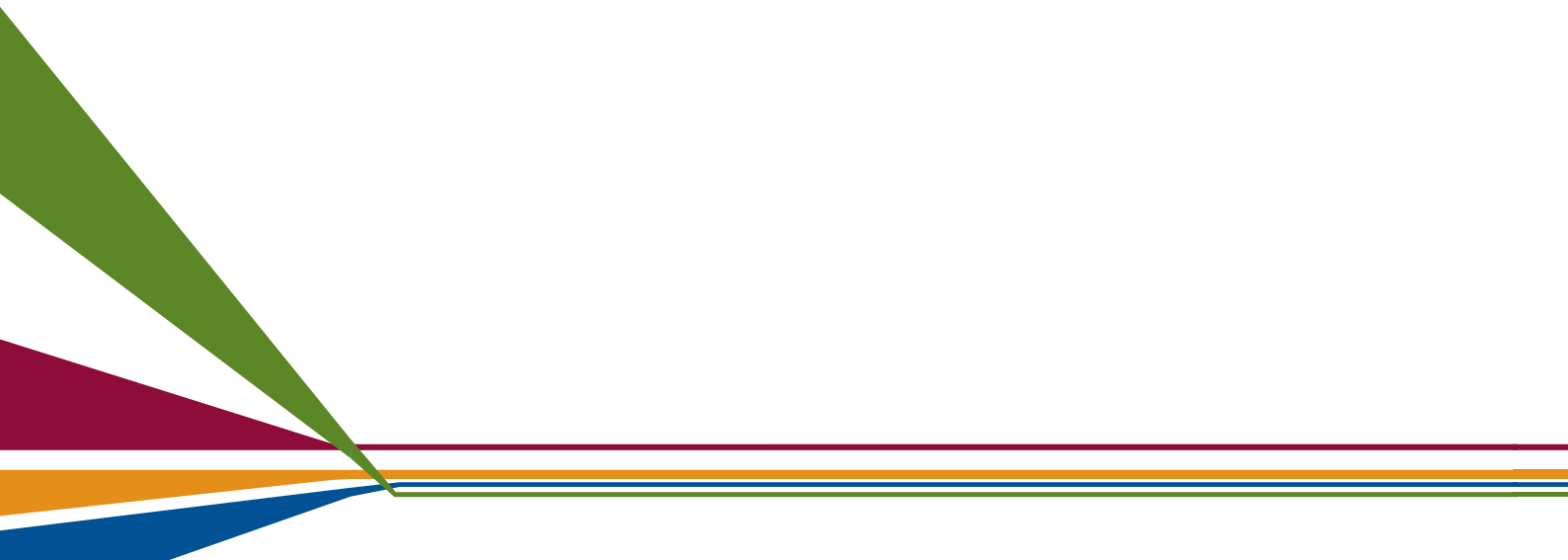
We updated the economic evaluation analysis carried out in a previous ACE study (ACE Heart disease) which was based on extensive literature reviews and meta-analyses that summarised the available evidence of effectiveness of the following interventions in 2003. To the list of currently available interventions has been added the novel Polypill medication which is generating interesting results in clinical trials during 2009. Interventions are targeted at persons without previous cardiovascular disease, in three categories of absolute risk of a coronary or stroke event in the next 5 years (>5% risk, >10% risk, >15% risk). Absolute risk takes into account the combined risk of multiple risk factors, including tobacco smoking, body weight, blood pressure, cholesterol, age and sex.

CHOLESTEROL LOWERING STRATEGIES

1. Community heart health program: A population-wide program of social marketing and education aimed at increasing healthy lifestyles and the reduction of cardiovascular disease risk factors.
2. Dietary counselling by a dietician: The provision of dietary advice by a dietician to an individual for several weeks
3. Dietary counselling by a GP: The provision of dietary advice by a GP to an individual for several weeks
4. Promotion of phytosterol or phytostanol supplementation: Substitution of normal butter/margarine with phytosterol-enriched margarine (brand names Proactive, Logicol)
5. Statin drug therapy: cholesterol-lowering medication in conjunction with monitoring and follow up with general practitioner visits and blood tests.
6. Combination drug therapy with a statin plus ezetimibe: Medications given in combination in conjunction with monitoring and follow up with general practitioner visits and blood tests

BLOOD PRESSURE LOWERING STRATEGIES

7. ACE inhibitor treatment: blood pressure lowering medication in conjunction with monitoring and follow up with general practitioner visits and blood tests.
8. Low dose diuretic treatment: blood pressure lowering medication in conjunction with monitoring and follow up with general practitioner visits and blood tests.



9. Low dose aspirin: Low dose aspirin in conjunction with monitoring and follow up with general practitioner visits and blood tests.
10. Calcium channel blocker: blood pressure lowering medication in conjunction with monitoring and follow up with general practitioner visits and blood tests.
11. Beta blocker: blood pressure lowering medication in conjunction with monitoring and follow up with general practitioner visits and blood tests.
12. Current practice: The combination of advice and medications currently provided in conjunction with monitoring and follow up with general practitioner visits and blood tests.

COMBINATION BLOOD PRESSURE AND CHOLESTEROL LOWERING STRATEGY

13. Polypill treatment: A polypill comprising a diuretic, ACE inhibitor, beta blocker and a statin, is given to each individual without previous history of cardiovascular disease, over the age of 55, or individuals targeted in the 3 risk groups, in conjunction with monitoring and follow up with general practitioner visits and blood tests. As this is currently an experimental preventive measure, a range of potential prices suggested by experts have been evaluated (\$50, \$200, \$500) to assess the impact of price on cost-effectiveness results.

4. CHOICE OF COMPARATOR

The comparator to the interventions is doing nothing. This requires a hypothetical back-calculation of disease rates as if none of the currently used blood pressure and cholesterol lowering interventions were in place. This allows us to also evaluate the cost-effectiveness of current practice in comparison with all the nominated interventions.

5. INTERVENTION COST-EFFECTIVENESS

The population based media/education campaign yields more health benefits at cost savings even when all uncertainty is taken into account. All other cardiovascular prevention interventions produce health benefits with a positive net cost. In the analyses of single interventions, the only one with a smaller chance of being cost-effective would be to provide dietary advice by a GP to every individual at greater than 5% risk of a cardiovascular event in the next 5 years (Table 1). It is important to take into consideration that in practice a combination of these interventions will be provided and that therefore the more important information is which interventions are part of a cost-effective package of interventions. Some of the interventions that appear to be cost-effective if analysed in isolation, are no longer so if added to a more cost-effective package of cardiovascular prevention options.



Table 1: Average cost-effectiveness ratios and probability of being cost-saving or cost-effective for the blood pressure and cholesterol lowering interventions

Intervention	\$Cost per DALY (95% uncertainty range)	Probability of being under \$50,000/DALY
Community Heart Health Program to everyone regardless of risk level	Health gain with cost saving	100%
Low-dose diuretic $\geq 15\%$	600 (dominant – 6,600)	100%
Low-dose diuretic $\geq 10\%$	1,800 (dominant – 8,600)	100%
Low-dose diuretic $\geq 5\%$	4,200 (dominant – 13,000)	100%
Calcium channel blocker $\geq 15\%$	6,200 (dominant – 28,000)	99%
Calcium channel blocker $\geq 10\%$	8,200 (770 – 33,000)	99%
Dietary counseling (dietician $\geq 15\%$)	8,600 (dominant – 35,000)	99%
ACE inhibitor $\geq 15\%$	9,100 (3,600 – 19,000)	100%
Dietary counseling (dietician $\geq 10\%$)	11,000 (710 – 41,000)	98%
ACE inhibitor $\geq 10\%$	12,000 (5,400 – 23,000)	100%
Calcium channel blocker $\geq 5\%$	12,000 (3,200 – 44,000)	98%
Phytosterol supplementation $\geq 15\%$	14,000 (4,100 – 42,000)	99%
Beta blocker $\geq 15\%$	14,000 (4,300 – 50,000)	98%
Dietary counseling (dietician $\geq 5\%$)	16,000 (3,100 – 55,000)	97%
Beta blocker $\geq 10\%$	17,000 (6,300 – 58,000)	97%
ACE inhibitor $\geq 5\%$	17,000 (9,100 – 32,000)	100%
Phytosterol supplementation $\geq 10\%$	18,000 (6,000 – 50,000)	98%
Dietary counseling (GP $\geq 15\%$)	21,000 (7,500 – 84,000)	92%
Statin and ezetimibe $\geq 15\%$	21,000 (17,000 – 25,000)	100%
Statin $\geq 15\%$	21,000 (15,000 – 28,000)	100%
Beta blocker $\geq 5\%$	24,000 (10,000 – 78,000)	93%
Phytosterol supplementation $\geq 5\%$	24,000 (9,900 – 65,000)	94%
Dietary counseling (GP $\geq 10\%$)	25,000 (9,900 – 98,000)	88%
Statin $\geq 10\%$	25,000 (19,000 – 34,000)	100%
Statin and ezetimibe $\geq 10\%$	25,000 (21,000 – 29,000)	100%
Current practice	29,000 (22,000 – 40,000)	100%
Statin and ezetimibe $\geq 5\%$	34,000 (30,000 – 39,000)	100%
Statin $\geq 5\%$	34,000 (26,000 – 44,000)	100%
Dietary counseling (GP $\geq 5\%$)	35,000 (15,000 – 130,000)	77%

* Dominant means the cost-effectiveness ratio falls in the south-east quadrant, where more benefits can be accrued at a lower cost (i.e. health gain with cost saving).

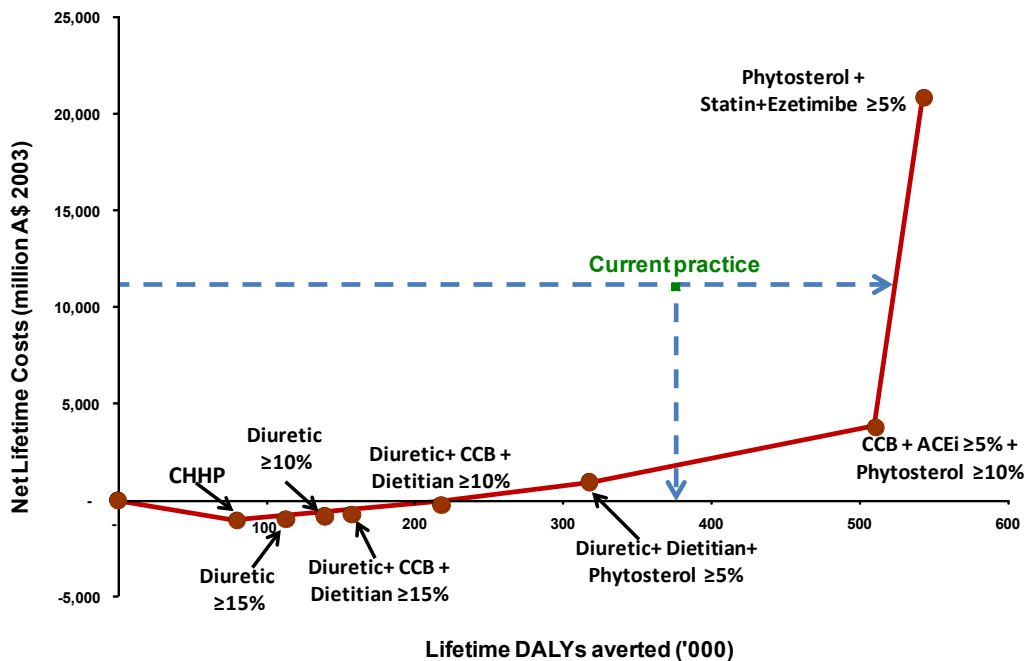
Whether prescribed to individuals according to their level of cardiac risk or alternatively to all persons over the age of 55, the polypill is very cost-effective within the price range \$50 to \$500 (Table 2).

Table 2: Cost-effectiveness ratios and probability of being cost-effective for Polypill interventions compared to doing nothing

Intervention	\$Cost per DALY (95% uncertainty range)	Probability of being under \$50,000/DALY
Polypill \$50 to over 55 y	Health gain with cost saving	100%
Polypill \$200 to over 55 y	48 (dominant – 3,400)	100%
Polypill \$500 to over 55 y	11,000 (6,700 – 16,000)	100%
Polypill \$50 ≥5%	Health gain with cost saving	100%
Polypill \$200 ≥5%	Health gain with cost saving (dominant – 2,000)	100%
Polypill \$500 ≥5%	6,700 (2,800 – 11,000)	100%
Polypill \$50 ≥15%	Health gain with cost saving	100%
Polypill \$200 ≥15%	Health gain with cost saving	100%
Polypill \$500 ≥15%	2,200 (dominant – 5,800)	100%
Polypill \$50 ≥10%	Health gain with cost saving	100%
Polypill \$200 ≥10%	Health gain with cost saving (dominant – 330)	100%
Polypill \$500 ≥10%	3,700 (290 – 7,600)	100%

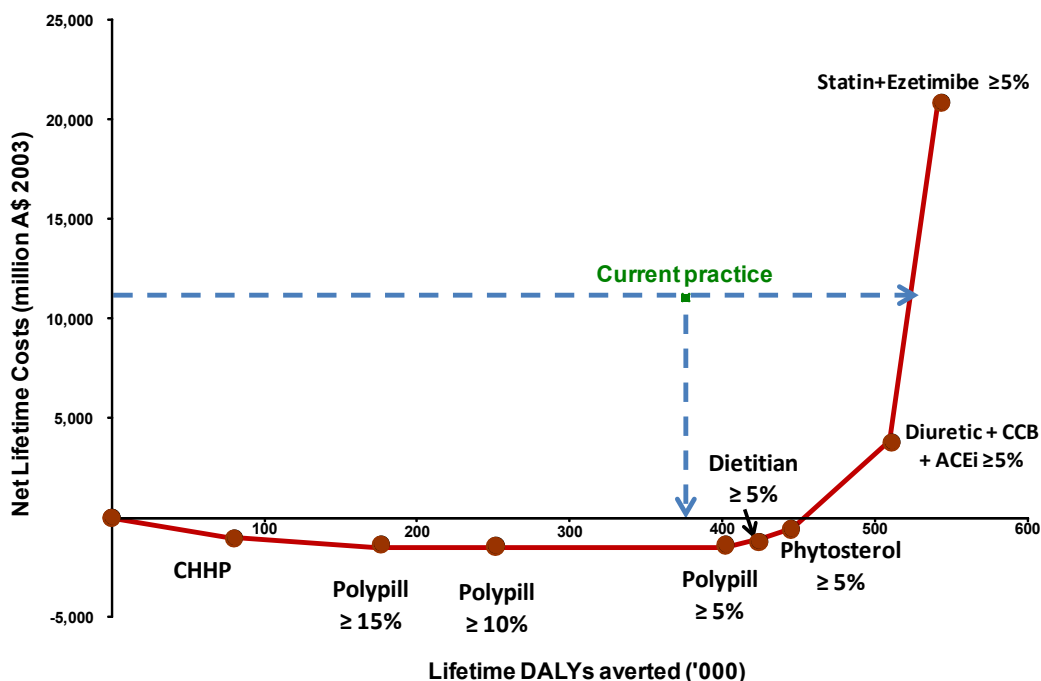
All interventions except the use of statins, ezetimibe, beta blockers and dietary advice by a GP, would be included in the optimal mix of intervention strategies to address cardiovascular disease prevention in a cost-effective manner (Figure 1). The combined package of these interventions could for one third of net costs prevent over 30% more disease burden than current practice. Due to high cost, adding the cholesterol-lowering drugs to the pathway is not cost-effective (\$0.5million/DALY), far greater than the \$50,000 threshold used in this study and would not be recommended.

Figure 1: An intervention pathway for the blood pressure and cholesterol lowering interventions excluding the polypill



If a polypill (a combination of three generic blood pressure lowering drugs – diuretic, calcium channel blocker and ACE-inhibitor– at half strength and a statin in a single pill) were introduced at an annual cost of \$200 per person treated the immediate cost savings would be much greater still. The package would prevent more than 500,000 DALYs over the lifetime of the 2003 Australian population (Figure 2). We have not taken into account that adherence to a single polypill may be greater than to a larger number of pills.

Figure 2: An intervention pathway for the blood pressure and cholesterol lowering interventions including the polypill to risk groups at the price of \$200 per annum



6. CONCLUSIONS

Current practice in blood pressure and cholesterol lowering is inefficient. A more efficient approach with large immediate cost savings is feasible if –in order of importance– (a) the most cost-effective drugs are used in preference to more expensive and less cost-effective drugs; (b) prevention is targeted by absolute risk rather than individual risk factor thresholds; and (c) better use is made of cost-effective non-drug interventions. The introduction of the polypill at a reasonable price offers to achieve the same health gain as current practice at a much greater net cost saving.

Acceptability to stakeholders is the most important of the second filter criteria in evaluating blood pressure and cholesterol lowering interventions. It will take time and effort to introduce new guidelines based on absolute risk and this may meet with resistance by clinicians. There may also be a degree of resistance among public health practitioners and patients against the medicalisation of prevention and the risk of side effects.

For more information on this topic area, please visit website www.sph.uq.edu.au/bodce-ace-prevention

ACE–PREVENTION PAMPHLETS

7. ABOUT ACE-PREVENTION

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.

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

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

Indigenous population results

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