

**RETURNS ON INVESTMENT IN
EAST METROPOLITAN PUBLIC HEALTH UNIT'S
PREVENTIVE PROGRAMS**

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EXECUTIVE SUMMARY

The East Metropolitan Population Unit (EMPHU) implements a number of public health programs within the East Metropolitan Health Service region. This study was an attempt to assess the economic value of selected program areas of this Unit, using existing published data on the effectiveness and cost-effectiveness of similar programs implemented elsewhere.

The program areas examined were diabetes, falls prevention, immunisation and smoking cessation. Information relating to the specific programs and the cost of these programs was provided by EMPHU and the Injury Prevention Unit in the Health Department. The burden of disease data and the effectiveness and cost-effectiveness data were obtained from published material, either official reports or peer-reviewed journal articles.

Diabetes, falls and smoking contribute considerably to the burden of disease in Western Australia. In the year 2000, type 2 diabetes accounted for 5.0% of deaths in Western Australia and 2.4% of years of life lost. Approximately 12% of both premature deaths and premature years of life lost were attributable to tobacco use. Falls accounted for 2.6% of total health system costs in 2000, and 31.0% of health system costs attributable to injury. Infectious diseases do not contribute a high burden of disease within the population. This is partly due to effective infectious disease control programs to control and prevent the spread of infection within the population. Vaccine-preventable infectious diseases also do not contribute a significant proportion to the burden of disease in Western Australia as high immunisation rates have significantly reduced the overall rate of infection. However, immunisation rates need to be maintained at high levels to prevent the resurgence of vaccine preventable infections within the population.

Across all program areas being examined, the literature suggested that public health initiatives and community interventions tended to be more cost-effective than acute care or other clinical interventions. Economic evaluation studies have found immunisation and smoking cessation programs to in fact be cost saving by reducing overall health costs through reduced demand on acute care services and corresponding gains generated from improved health status. For example, in the case of the measles, mumps and rubella vaccine, \$16 was found to be saved in direct health care costs for every \$1 spent on immunisation. In a study analysing the returns on investment in public health in Australia, the net cost savings from a societal perspective from the measles

immunisation program implemented between 1970 and 2003 was demonstrated to be \$10.2 billion. In the case of the investment in public health programs to reduce tobacco consumption over the period 1971 to 2010, the net benefit to society was found to be \$8.4 billion. In terms of public finances, the net benefit to the government from investing in health programs to reduce tobacco consumption was \$344 million, a saving of \$2 for every \$1 of expenditure.

In the past, investing in public health initiatives was believed to lead to health gains only in the longer term, in contrast to clinical treatment that was seen to provide relatively immediate improvements in health. However, recent research has shown that many public health interventions, including smoking cessation programs, immunisation and infectious disease control, injury prevention, folate fortification of foods and low birth weight preventive programs have substantial short-term economic and health gains. Increasing investment in these public health programs can capitalise upon these short-term gains.

With the rising cost of health care, decisions about purchasing and provision in the health system should be based, where possible, on interventions proven to work. In addition, with public spending of all kinds under intense scrutiny, investment of the available resources allocated to health care should be directed at those interventions that have been shown to be most cost-effective in addressing the community's priority health needs. This study has presented the results of economic evaluations of programs similar to those implemented by EMPHU, which have suggested that public health interventions targeting the areas of preventive care for diabetes, falls prevention, immunisation and smoking cessation represent an efficient use of resources relative to acute care and other clinical health services. While EMPHU's programs in these areas are not identical to those evaluated elsewhere, they are broadly similar programs that are likely to represent comparable value for money. Considering public health spending in the context of financing for the health system as a whole, spending on public health by EMPHU appears to represent a good investment of the health system's resources. More generally, spending on public health of 2.0% of government expenditure on health in Western Australia appears modest in the light of the evidence of the cost-effectiveness of public health initiatives relative to acute care and other health services

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1. INTRODUCTION

The East Metropolitan Population Unit (EMPHU) conducts public health activities in several program areas within the East Metropolitan Health Service region. Many of the programs support existing state-based programs implemented and coordinated by the Department of Health, while others target specific conditions or high risk groups.

In Australia, as in many developed countries, the ratio of health expenditure to Gross Domestic Product has consistently increased over the past decade, from 7.9% in 1990/91 to 9.0% in 2000/01. In Western Australia, total expenditure on health increased in real terms from \$4064 million in 1995/96 to \$5173 million in 1999/00 (base year 1999/00), an annual rate of increase of approximately 6% (AIHW 2002a). Reasons to explain increases in health spending include the rapid advances in health technology, community expectations relating to access to health care and an ageing population. With expenditures of this magnitude, health financing is inevitably a significant policy issue.

Public health competes with all other forms of health care, and public expenditure in general, for funding of its programs. Health expenditure statistics show hospitals accounting for 38% of health spending in Western Australia, followed by medical services (16%) and pharmaceuticals (10%) (AIHW 2002a). By comparison, community and public health comprised 7% of total health expenditure. Deeble (1999) has argued that public health has remained at the periphery of the health sector, and has not increased as a proportion of total health sector spending over the past 20 to 30 years. This is despite the growing body of evidence demonstrating the cost-effectiveness of investing in effective public health programs (CDC 1999; WHO 2000; Woodley 2000; AIHW 2002b).

This study was an attempt to assess the economic value of selected activities conducted by EMPHU, using existing published data on the effectiveness and cost-effectiveness of similar programs implemented elsewhere. The underlying purpose of the study was to examine the adequacy of public health spending relative to other forms of health expenditure. Section 2 of the report outlines expenditures on public health in Australia and overseas. Section 3 presents the costs and likely effectiveness and cost-effectiveness of four program areas covered by EMPHU. Section 4 examines the benefits obtained in

the short term from investing in public health. Finally, Section 5 summarises the findings of the study and discusses its implications for public health funding.

2. EXPENDITURE ON PUBLIC HEALTH

The National Public Health Partnership (NPHP) defines public health as the organised response by society to protect and promote health, and to prevent illness, injury and disability (AIHW 2002c). The AIHW has identified nine core activities falling within this definition of public health and has collected information on expenditure on these public health services. The core activities are communicable disease control, selected health promotion, organised immunisation, environmental health, food standards and hygiene, breast cancer screening, cervical screening, prevention of hazardous and harmful drug use and public health research.

In 1999/00 the total expenditure on public health in Australia was \$931.2 million, which accounted for 1.7% of total health spending. Funding by the Commonwealth government comprised \$465.2 million, of which \$279.5 million was spent directly and the balance was in the form of payments to the States and Territories (AIHW 2002c).

Table 2.1 shows expenditure on public health by State and Territory governments. Public health spending relative to all Commonwealth and State government expenditure on health ranged from 1.3% in Victoria to 8.1% in the Northern Territory, while per capita expenditure on public health varied from \$25 in Victoria to \$202 in the Northern Territory. In Western Australia, public health spending of 2.0% of government expenditure on health and \$39 per capita was slightly above the respective means for all States and Territories.

A comparison of the pattern of spending on public health across States and Territories shows those jurisdictions with higher populations spending relatively less on public health and those with smaller populations spending relatively more. This is partly a result of the economies of scale achieved in the delivery of services to larger populations. Relative differences between States and Territories can also be attributed to special needs factors in each jurisdiction. In Western Australia, special needs factors in relation to public health expenditure arise from its unique geographic and socio-demographic characteristics such as a low population density, the remoteness of communities in the north of the State and a relatively high indigenous population.

Table 2.1 Public Health Expenditure in Australia by State and Territory, 1999/00

| Country | Expenditure on Public Health | | |
|-------------------------|------------------------------|---------------------------------|---------------|
| | \$m. | % of govt expenditure on health | \$ per capita |
| New South Wales | 196.4 | 1.5 | 30 |
| Victoria | 120.6 | 1.3 | 25 |
| Queensland | 122.0 | 1.6 | 34 |
| Western Australia | 72.6 | 2.0 | 39 |
| South Australia | 57.9 | 1.8 | 39 |
| Tasmania | 19.9 | 2.1 | 42 |
| ACT | 22.8 | 3.2 | 72 |
| Northern Territory | 39.6 | 8.1 | 202 |
| All states/ territories | 651.8 | 1.7 | 34 |

Source: AIHW 2002c.

Differences in accounting conventions and ways public health activities are funded make international comparisons difficult. Table 2.2 compares expenditure on prevention and public health in 1997 for selected countries for which this information was available. While accounting and organisational procedures might not allow for rigorous comparison, the figures suggest Australia spends relatively less than other countries on prevention and public health. For example, Australia spent 0.1% of its GDP on prevention and public health whereas Canada and the United States each spent 0.5%. On a per capita basis, expenditure on prevention and public health was \$36 in Australia and \$166 in Canada (Bennett 2003).

Table 2.2 International Comparisons of Expenditure on Prevention and Public Health, 1997

| Country | Expenditure on Prevention and Public Health | |
|---------------|---|----------------|
| | % GDP | \$ per capita* |
| Australia | 0.1 | 36 |
| Canada | 0.5 | 166 |
| France | 0.2 | - |
| Germany | 0.4 | - |
| Korea | 0.2 | 32 |
| Netherlands | 0.3 | - |
| United States | 0.5 | - |
| OECD mean | 0.3 | 102 |

* expressed in Australian dollars

Source: Bennett 2003.

3. COSTS, EFFECTIVENESS AND COST-EFFECTIVENESS OF SELECTED PREVENTIVE PROGRAMS IMPLEMENTED BY THE EMPHU

This section examines four of EMPHU's program areas and discusses –

- the burden of disease associated with the condition or risk factor targeted in each program area;
- the specific programs implemented within each program area;
- the cost of EMPHU's preventive programs implemented in each program area; and
- the effectiveness and cost-effectiveness of the types of programs implemented.

The program areas are diabetes, falls prevention, immunisation and smoking cessation. Information relating to the programs implemented in each area and the cost of these programs was provided by EMPHU and the Injury Prevention Unit at the health Department. The burden of disease data and the effectiveness and cost-effectiveness data were obtained from published material, either official reports or peer-reviewed journal articles. All monetary values are expressed in 2000 Australian dollars unless otherwise stated.

3.1 Diabetes

Diabetes mellitus is a chronic disease, characterised by hyperglycaemia or high levels of blood glucose. It is caused by deficient insulin production and/or resistance to its action, and has several complications such as retinopathy, neuropathy, nephropathy, foot ulcers and amputations (Mathers, Vos & Stevenson 1999). The prevalence of diabetes is rising worldwide, with over one million people in Australia estimated to have the disease (Segal, Dalton & Richardson 1998; McKay, McCarthy & Taylor 2000). There are two main types of diabetes: Type 1 or insulin-dependent diabetes and Type 2 or non-insulin-dependent diabetes.

3.1.1 Indicators of the Burden of Diabetes

Table 3.1 presents selected indicators of the burden of diabetes in Western Australia. In 2000, Type 2 diabetes accounted for 5.0% of total deaths in Western Australia and 2.4% of years of life lost (YLL) (Katzenellenbogen, Somerford & Serafino 2003). The corresponding data for Type 1 diabetes were not available. The health system costs of Type 1 and 2 diabetics in Western Australia in this year were estimated as \$42.6

million, or 1.2% of total health system costs. Hospital costs were estimated to comprise \$11.0 million of total health system costs (Mathers & Penn 1999a (WA costs estimated from national costs based on relative share of the population)).

Table 3.1 Indicators of the Burden of Disease from Diabetes, Western Australia, 2000

| Indicator | Burden/Cost | | |
|----------------------------------|-------------|---------|----------|
| | Type 1 | Type 2 | Total |
| Deaths attributable to diabetes | - | 253 | - |
| % of total deaths | | (5.0%) | |
| YLL attributable to diabetes | - | 2733 | - |
| % of total YLL | | (2.4%) | |
| Health system cost of diabetes** | \$17.8m. | \$24.8m | \$42.6m |
| % of health system costs | (0.5%) | (0.7%) | (1.2%) |
| Hospital costs** | \$4.8m. | \$6.2m. | \$11.0m. |
| % of total hospital costs | (0.3%) | (0.4%) | (0.7%) |

* YLL denotes years of life lost

** estimate

Sources: Mathers & Penn 1999a; Katzenellenbogen, Somerford & Serafino 2003.

3.1.2 Overview of EMPHU's Diabetes Preventive Programs

EMPHU implements several programs targeting preventive health for people with diabetes.

The Living with Diabetes Program aims to improve self-management and facilitate lifestyle modifications for people with diabetes, and to reduce the risk or delay the onset of complications associated with uncontrolled diabetes. Program participants attend six weekly sessions of 180 minutes duration. These sessions provide information about diabetes management, appropriate diet, healthy choices from supermarkets, balancing stress and relaxation, medications and their use, and self-confidence to make the right choices about managing their diabetes. The evaluation of the Living with Diabetes program indicated the program was highly effective in increasing participants' knowledge about diabetes, enhancing confidence in the self-management of their diabetes, and providing skills to adopt and maintain a healthy lifestyle.

A second program is the bilingual and bicultural diabetes program, which was piloted with Italian and Vietnamese people living in the Inner City and Swan Health precinct during 2003. The evaluation of the pilot program strongly supported the implementation of an enhanced program within the service area, showing it was more effective than the existing services.

A third diabetes program targets pregnant women with a history of gestational diabetes mellitus (GDM). GDM is one of the most common medical complications of pregnancy, resulting in maternal complications, and an increased risk of infant morbidity and mortality. Regular exercise and a healthy diet can prevent this condition developing into diabetes in the mother post-partum. The GDM prevention program involved both general practitioners and women with a history of GDM who worked or resided in the northern and eastern precincts of the Perth metropolitan area.

Other services offered by EMPHU are the provision of podiatry consultations and individual counselling sessions for diabetes. Professional development is also available for health professionals.

3.1.3 Cost of EMPHU's Preventive Programs for Diabetes

The cost of the preventive programs run by EMPHU was \$535 000 in 2002/3.

Table 3.2 Cost of EMPHU's Preventive Programs for Diabetes, 2002/3

| Item | Estimated costs \$ |
|------------------------------|-----------------------|
| Salaries | 471 310 |
| Living with diabetes | 13 807 |
| Sessional podiatry | 41 602 |
| Health professional training | 4 225 |
| Program resources | 2 800 |
| Support | 1 300 |
| Total | 535 044 |

Source: EMPHU financial records.

3.1.4 Effectiveness and Cost-Effectiveness of Preventive Programs for Diabetes

Type 2 diabetes occurs in adults and is usually not diagnosed until after the age of 40 years (Mathers, Vos & Stevenson 1999). There is substantial evidence that it is predominantly a lifestyle disease, with incidence and disease progression exacerbated by

obesity and a sedentary lifestyle. There is also evidence that interventions to address obesity and sedentary lifestyle can reduce the incidence of Type 2 diabetes. For example, some behavioural interventions can lead to a reduction in the incidence of Type 2 diabetes of up to 90% (Hu et al. 2001).

Table 3.3 presents the effectiveness and cost-effectiveness of a range of possible intervention options for the prevention of Type 2 diabetes. The results are shown for two target groups: people with impaired glucose tolerance (IGT) and a mixed group of the Australian population and people with IGT. Effectiveness was measured as (undiscounted) life years gained per 100 program participants and cost-effectiveness as discounted net cost per life year gained (discount rate of 5%). Preventive programs were considerably more cost-effective than surgery, with costs per life year gained in the range of \$1100 to \$2900 compared with \$5100 to \$13 700 for surgery for the seriously obese.

Table 3.3 Effectiveness and Cost-effectiveness of Diabetes Preventive Programs, 2000

| Program type | Participant group | Undiscounted life years gained per 100 program participants | Discounted net cost per life year gained \$* |
|---|-------------------|---|--|
| Intensive diet and behavioural intervention for seriously obese | mixed | 173 | 2900 |
| | IGT | 238 | net saving |
| Intensive diet/ behavioural women with previous GDM | mixed | 250 | 2700 |
| | IGT | 259 | 1300 |
| Surgery for seriously obese | mixed | 280 | 13 700 |
| | IGT | 472 | 5100 |
| Group behavioural for overweight men | mixed | 124 | net saving |
| | IGT | 154 | net saving |
| Media campaign plus community support | | - | net saving |
| General Practitioner advice | mixed | 48 | 2700 |
| | IGT | 71 | 1100 |

* Note: Costs converted to 2000 Australian dollars using AIHW's health price index (AIHW 2002a).

Source: Segal, Dalton and Richardson 1998.

The cost-effectiveness of preventive programs for diabetes can also be compared with that of treatment for complications of diabetes. Tengs et al. (1995) provided a review of estimates of the cost-effectiveness of 500 life-saving interventions. After converting the results of the studies they reviewed to Australian 2000 dollars, the cost-effectiveness of home dialysis was in the range of \$34 000 to \$51 000 per life year saved, hospital dialysis was between \$53 000 and \$126 000 per life year saved and renal transplantation was between \$29 000 and \$49 000 per life-year saved. These interventions to treat the complications of diabetes cost considerably more per life-year saved than the preventive programs shown in Table 3.3.

The evaluations of the preventive programs for diabetes implemented by EMPHU indicate these are effective in achieving their stated objectives. While no economic evaluation has been conducted of these programs, the published evidence on the effectiveness and cost-effectiveness of preventive programs compared with other interventions for diabetes and its complications suggest these types of programs represent value for money as a health intervention. The analysis by Segal, Dalton and Richardson (1998) using cost-effectiveness to determine the role of prevention of Type 2 diabetes concluded that primary prevention for Type 2 diabetes can be highly cost-effective relative to other funded health programs.

3.2 Falls Prevention

Falls are of particular concern for people aged over 65 years as they account for the largest proportion of all injury related deaths and hospitalisations (Department of Health and Aged Care 2001). The National Injury Prevention Advisory Committee has identified fall injury as a priority area on the basis of the burden of injury it imposes, as well as a strong evidence base of promising and proven interventions that can be implemented by the health sector.

3.2.1 Indicators of the Burden of Falls

In Australia, falls account for 15% of all injury deaths and 33% of all injury-related hospitalisations (Injury Control Program 1998). Table 3.4 shows estimates of the burden of injury from falls in Western Australia. The cost of injury falls to the health system in Western Australia in 2000 was estimated as \$92.4 million. This accounted for 2.6% of total health system costs and 31.0% of total health system costs attributable to injury.

The share of hospital costs was estimated as \$57.1 million, or 62% of the cost of injury falls to the health system. (Mathers & Penn 199b (WA costs estimated from national costs based on relative share of population)).

Table 3.4 Indicators of the Burden of Injury from Falls, Western Australia, 2000

| Indicator | Cost |
|---|----------|
| Health system cost of falls* | \$92.4m. |
| % of total health system costs | (2.6%) |
| % of total health system costs attributable to injury | (31.0)% |
| | - |
| Hospital cost of falls* | \$57.1m. |
| % of total hospital costs | (3.5%) |
| % of total hospital costs attributable to injury | (29.9%) |

* estimate

Source: Mathers & Penn 1999b.

3.2.2 Overview of EMPHU's Falls Prevention Programs

The falls prevention programs conducted by EMPHU are described below.

Healthy Ageing Program

The Healthy Ageing Program combines components from existing falls prevention programs to provide a multifaceted falls prevention program. These programs are the Stay On Your Feet Falls Prevention Program, the Stepping Out Safely Senior Pedestrian Program, and the Mobility Abilities and Aqua Programs. Over a ten week course, seniors aged 65 years and over receive a program that includes education, self assessment and self management principles of falls prevention. These include physical activity, medications, foot-care, home environment audits and home programs addressing the intrinsic risks associated with balance.

Stay on Your Feet WA

Stay On Your Feet WA (SOYF) is a falls prevention program designed for seniors aged 70 years and over. It incorporates five phases. The first phase is an education component to increase awareness and knowledge of the risk factors associated with falls. The second phase focuses on the relationship between falls and medication. The third phase identifies environmental risk factors such as walkways, footwear and household

hazards. The fourth phase encourages seniors to remain physically active and the fifth phase seeks to increase the knowledge of seniors in relation to chronic conditions and the risk of falling. Impact evaluation of the Stay on Your Feet Program has shown positive results with intermediate improvements in attitude, knowledge and reduction in some risk factors (Garner, Kempton, & van Beurden 1996).

Stepping Out Safely

The Stepping Out Safely Project is a community-based pedestrian safety program aimed at seniors. The major issues and concerns for senior pedestrians include crossing at traffic lights, turning traffic at busy intersections, the condition of footpaths, sharing pathways with cyclists, and the complex nature of some crossing tasks. Health changes also have an impact on their road crossing abilities. This program seeks to redress these concerns through educational and practical interventions.

Community Physiotherapy Services

The aim of the Community Physiotherapy Services Program is to prevent falls, maximise function and maintain independence in seniors. Forty five physiotherapists received training in the administration of a self-education program for the education of seniors in maintaining mobility.

Abilities

The Abilities program targets seniors with neurological conditions (e.g. Parkinson's disease) that increase their risk of falling. The program uses education and specific exercises in an endeavour to reduce the risk of falls in this group.

Aqua

The Aqua Program is an education and exercise program that is water-based. This program enables balance skills to be practiced in a safe environment over a ten week period.

Specialised classes

Specialised classes addressing strength and balance issues are provided in a circuit format. Participants are also provided with educational instruction relating to osteoporosis and medications that increase the risk of falling.

3.2.3 Cost of EMPHU's Programs for Falls Prevention

EMPHU spent \$632 684 on community physiotherapy services (see Table 3.5). Participants contributed \$154 957 towards the cost of these services, providing a cost to government of \$477 727.

Table 3.5 Cost of EMPHU's Community Physiotherapy Services, 2002/3

| | Estimated costs \$ |
|--------------------|-----------------------|
| Expenditure | 632 684 |
| Revenue | 154 957 |
| Cost to government | 477 727 |

Source: EMPHU's financial records.

3.2.4 Effectiveness and Cost-Effectiveness of Falls Prevention Programs

A Cochrane review of interventions for preventing falls in elderly people found the following interventions were likely to be beneficial in reducing the incidence of falls in elderly people –

- programs of muscle strengthening and balance retraining, individually prescribed at home by a trained health professional;
- Tai Chi group exercise interventions;
- home hazard assessment and modification that is professionally prescribed for older people with a history of falling;
- withdrawal of psychotropic medication; and
- multidisciplinary, multifactorial, health/environmental risk factor screening/intervention programs, both for unselected community dwelling older people and for people with a history of falling, or selected because of known risk factors (Gillespie et al. 2001).

The outcome measures that are generally used in economic evaluations of falls prevention programs are falls prevented and injury falls prevented, with the corresponding cost-effectiveness ratios being cost per fall prevented and cost per injury fall prevented. Table 3.6 shows the results of several cost-effectiveness studies of falls prevention programs. These included exercise, strength and balance programs, home modification programs and multifactorial programs. The exercise, strength and balance programs tended to have a lower cost per fall prevented and cost per injury fall prevented than other programs, with cost-effectiveness ratios in the ranges of \$136 to \$1332 per fall prevented and \$505 to \$2986 per injury fall prevented respectively. If assessed over a 10-year period, the home assessment and modification program was found to generate cost savings.

Comparing the cost-effectiveness of falls prevention programs with treatment programs relating to falls is difficult, as the latter studies tend to use generic outcome measures rather than falls-related measures. For example, studies evaluating the cost effectiveness of hip replacements often use quality adjusted life years (QALYs) as the outcome measure. Quality adjusted life years represent years of life adjusted for the quality of those years of life, with a single life year lived in perfect health counting as 1.0 and in less than perfect health as less than 1.0. For hip replacements, the cost per quality adjusted life year has been calculated as \$3116/QALY (Drummond et al. 1997).

Table 3.6 Cost-effectiveness Studies of Falls Prevention Programs

| Source | Intervention | Country (Year) | Incremental cost-effectiveness* | Author's conclusions |
|--------|---|--------------------|---|---|
| 1. | Home-based muscle strengthening and balance retraining for older women vs. usual care | New Zealand (1995) | \$373 per fall prevented and \$542 per injury fall prevented over 1 year \$314 per fall prevented and \$505 per injury fall prevented over 2 years | Programme worth implementing based on effectiveness and cost-effectiveness |
| 2. | Home exercise program delivered by nurse from within general practice vs. standard care | New Zealand (1998) | Cost per fall prevented of \$1332 and cost per injury fall prevented of \$2986 | Falls can be reduced in older people using an exercise program but the value for money is unclear as the hospital costs were not reduced in comparison with standard care |
| 3. | Home exercise program delivered by a nurse vs. normal practice | New Zealand (1998) | Cost per fall prevented of \$136 and cost per injury fall prevented of \$561 | Nurse-delivered home exercise program is cost-effective. |
| 4. | Home assessment and modification program vs. no intervention | Australia (1996) | \$1876 per fall prevented and \$18766 per injury prevented over one year Cost saving per fall prevented of \$999 and per injury prevented of \$9986 over 10 years | Potential for considerable benefit to be gained from this intervention in terms of lower morbidity, fewer hospitalisations and, possibly, improved quality of life |
| 5. | Home hazard reduction (HHR) program vs. no HHR program | Australia (1997) | Cost per fall prevented of \$5302 (\$4248 for those who had fallen in the last year) | More cost-effective to employ a HHR program on patients who have had at least one fall in the previous year |
| 6. | Home-based, multifactorial targeted risk-factor abatement strategy vs. usual care | U.S. (1993) | Cost per fall prevented of \$2593 among high-risk subjects and \$7036 among low-risk subjects Cost per injury fall prevented of \$13320 among high-risk subjects and \$28992 among low-risk subjects | Targeted risk factor abatement strategy was cost-effective in preventing falls among elderly people particularly among those at high risk |

* Cost-effectiveness ratios adjusted to 2000 Australian dollars using AIHW's health price index (AIHW 2002a)

Sources: 1. Robertson et al. 2001a; 2. Robertson, et al. 2001b; Robertson, M.C. 2001c; 4. Smith & Widiatmoko 1998; 5. Salkeld et al. 2000; Rizzo et al. 1996.

The falls prevention programs conducted by EMPHU cover a range of approaches including exercise, strength and balance programs, home assessment and education. The results of the Cochrane review and the economic evaluation studies presented in Table 3.6 suggest there are benefits to be gained from programs of this type, especially if well targeted at people with a history of falling or to have known risk factors.

3.3 Immunisation

Immunisation has the potential to prevent infection-related diseases such as pertussis, poliomyelitis, measles, tetanus, hepatitis A and B, some influenza strains, some diarrhoeal disease, yellow fever and meningococcal disease.

3.3.1 Indicators of the Burden of Communicable Diseases Preventable by Immunisation

Reported cases of infectious diseases that can be prevented by immunisation have decreased significantly in Australia because of the immunisation programs provided by the Commonwealth, State and Local governments. As a result the burden of these diseases is relatively low in Australia and is therefore not reported in this study. However, coverage of immunisation programs needs to be maintained at high levels to prevent the re-emergence of vaccine-preventable infections as a significant burden of disease in the population. A lapse in the level of immunisation required to maintain herd immunity and control the spread of infectious diseases within a population will lead to outbreaks, causing an increase in demand on acute health care services and community concern. Due to low vaccination coverage in some developed countries, a resurgence of preventable infectious diseases and conditions such as pertussis, pneumococcal disease, meningococcal disease, hepatitis and influenza has occurred (Broholm et al. 2001; Demicheli 2003; Grimprell et al. 1999; Halliday et al. 2003; Hanna et al. 2001; Rancourt et al. 2003; Skinner et al. 2000; Szilagyi 2002).

3.3.2 Overview of EMPHU's Immunisation Programs

Immunisation activities undertaken by EMPHU include taking an active part in the Canning Division Immunisation Coordination Committee, liaising with community health staff to ensure that standards of vaccine maintenance are adhered to, and supporting education/promotion programs for the general community and for specific target groups such as travellers, parents and school students. A specific example of one of EMPHU's immunisation programs is the School Health Immunisation Program.

EMPHU staff, specifically school health nurses and district staff, visited over 100 schools during the first half of 2003 and administered Hepatitis B and Meningococcal C vaccinations. There are also two immunization clinics located within the precinct that provide all the recommended immunisations for infants and children. The aim of immunisation programs is to fully immunise at least 90% of all children with routine childhood immunisations. The current rate of immunisation of children who live within the EMPHU precinct is 86%.

Table 3.7 Number of Immunisations Administered by EMPHU, 2002/03

| Condition | Number of immunisations completed |
|------------------------------------|-----------------------------------|
| Diphtheria Tetanus Pertussis (DTP) | 686 |
| Poliomyelitis | 550 |
| Meningococcus C | 115 |
| Measles Mumps Rubella (MMR) | 120 |
| Haemophilus influenza B (Hib) | 200 |
| Hepatitis | 2 045 |

Source: EMPHU activity records.

3.3.3 Cost of EMPHU's Immunisation Programs 2002/3 (Child clinics)

The salary costs of immunisation programs delivered through child clinics was approximately \$25 600.

3.3.4 Effectiveness and Cost-Effectiveness of Immunisation Programs

Excellent clinical data exist to support a direct causal relationship between health gain from immunisation and a public health program (Applied Economics 2003). Moreover, if the incidence of a communicable disease is sufficiently high then the cost of immunising the target population is generally low compared with the gains from the prevention of disease, disability and deaths.

The Centres for Disease Control and Prevention (CDC) (1999) in the U.S. Department of Health and Human Services has identified those prevention strategies that yield the most benefit for the investment incurred. Immunisation is one of these strategies. Table 3.8 shows the benefit-cost ratio of three immunisation programs. All programs were demonstrated to be cost saving. In the case of the measles, mumps and rubella (MMR) vaccine, \$16 was saved in direct health care costs for every \$1 spent on immunisation.

The diphtheria, tetanus and pertussis (DTP) vaccine saved \$6 for every \$1 spent, and vaccination against influenza saved between \$30 to \$60 in hospital costs for every \$1 spent vaccinating people aged 65 years and over. In the case of the MMR and influenza vaccines, the benefit-cost ratios would be higher if all cost savings were included rather than only direct health care costs and hospital costs respectively. Additional information provided by the CDC indicated that the cost-effectiveness of immunising elderly people against influenza was \$224 per life year saved.

Table 3.8 Cost-effectiveness of Immunisation Programs, 2000

| Disease | Benefit-cost ratio | Comments |
|------------------------------------|--------------------|---|
| Measles-mumps-rubella (MMR) | 16 | Benefits include savings in direct health care costs only |
| Diphtheria-tetanus-pertussis (DTP) | 6 | All benefits included |
| Influenza | 30-60 | Benefits include savings in hospital costs only |

Source: CDC 1999.

Other studies support the findings that immunisation programs are cost-effective. For example, a randomized trial of influenza vaccinations involving healthy adults was found to be cost-effective with a cost saving of between \$22 and \$28 per healthy person immunised (Ahmed et al. 2001). The cost-effectiveness of the universal hepatitis B vaccination program, available to all newborns in Australia, was estimated at \$11 862 per year life saved and, if this vaccination program was extended to adolescents, the net cost saving was estimated as an additional 443 years of life saved each year at a cost saving to the Australian health care system of \$1.63 million per year (Harris, Yong & Kermod 2001; Skinner & Nolan 2001).

Applied Economics (2003) examined the returns on investment in public health in Australia for five programs, including immunisation. Immunisation for measles and *Haemophilus influenzae* type b disease (Hib disease) was evaluated. In the case of the measles immunisation program, over the study period of 1970 to 2003 the net cost savings from a societal perspective was \$10 211 million. The Hib immunisation program implemented between 1993 and 2003 provided a lower return on investment,

with net cost savings from a societal perspective of \$11.0 million. From a government perspective the net benefit of the measles immunisation program was \$8.5 billion, but the Hib disease immunisation program had a net cost to the government of \$110 million.

Very few interventions in the health sector are cost saving, thus programs that are cost saving offer an excellent opportunity to promote good health at no net overall cost. Given the available evidence that immunisation programs have generally been found to be cost saving, EMPHU's expenditure on immunisation represents good value for money compared with other spending elsewhere in the health system.

3.4 Smoking Cessation

Tobacco increases the risk of coronary heart disease, stroke and peripheral vascular disease as well as a range of cancers and other diseases (Mathers, Vos & Stevenson 1999). The harm from smoking is not limited to the individuals involved, with passive smoking having been shown also to have negative health effects.

3.4.1 Indicators of the Burden of Tobacco Use

Table 3.9 shows that approximately 12% of both premature deaths and premature years of life lost in Western Australia were attributable to tobacco use. This was significantly greater than the burden of disease attributed to each of alcohol consumption, other drug use, overweight and obesity, hypertension, high blood cholesterol, insufficient physical activity, unsafe sex and occupational exposure and risks (Katzenellenbogen, Somerford & Serafino 2003).

In a study of the social costs of drug abuse in Australia in 1998/99, Collins and Lapsley (2002) calculated the health system costs and hospital costs of tobacco use to be \$1 094.9 million and \$308.6 million respectively. Apportioning these national costs on a population basis and allowing for price increases suggests that health system costs attributable to tobacco use in Western Australia in 2000 were \$111.0 million, of which \$31.3 million were hospital costs.

Table 3.9 Indicators of the Burden of Disease from Tobacco Use, Western Australia, 2000

| Indicator | Burden/Cost |
|--|-------------|
| Number of deaths attributable to tobacco use | 1331 |
| % of total deaths | (12.5%) |
| YLL attributable to tobacco use* | 13698 |
| % of total YLL* | (12.1%) |
| Health system cost of tobacco use** | \$111.0m. |
| Hospital costs of tobacco use** | \$31.3m. |

* YLL denotes years of life lost

** estimate

Sources: Mathers & Penn 1999a; Katzenellenbogen, Somerford & Serafino 2003.

3.4.2 Overview of EMPHU's Smoking Cessation Programs

The regional initiatives of the Statewide Quit campaign were supported by EMPHU. Two Fresh Start courses were conducted over a four week period (two sessions per week). The course has also been promoted to departments within Royal Perth Hospital.

Two nursing staff completed a staff development course that provided local information relating to smoking cessation. This course also provided attendees with the opportunity to develop skills in areas such as one-on-one interviews and motivational interviews. These trained nurses assisted with the Smarter than Smoking Program.

3.4.3 Cost of EMPHU's Smoking Cessation Programs

EMPHU spent \$49 467 on smoking cessation programs in 2002/3 (see Table 3.10).

Table 3.10 Cost of EMPHU's Smoking Cessation Programs Year, 2002/3

| Item | Estimated costs |
|--------------------|---|
| | \$ |
| Salaries | 47 467 |
| Prevention program | 1 200 (\$200 facilitator training and \$1000 brochures) |
| Nurse training | 200 (2 nurses x 3 hour training workshop) |
| Incidentals | 600 |
| Total | 49 467 |

Source: EMPHU financial records

3.4.4 Effectiveness and Cost-Effectiveness of Smoking Cessation Programs

VicHealth Centre for Tobacco Control (2003) reported that numerous authoritative, independent bodies have systematically reviewed the evidence on the impact of tobacco control interventions and all have agreed that realistically funded, comprehensive tobacco control programs that include anti-smoking advertising as a major component reduce tobacco consumption amongst adult and teenage smokers. These bodies include the World Bank, the World Health Organisation, the Cochrane Collaboration, the UK Association for Public Health, the U.S. Centres for Disease Control, the National Cancer Institute of the U.S. Institute of Medicine and National Research Council and the U.S Surgeon General.

Research conducted to provide parallel smoking cessation guidelines for health professionals and guidance on the cost-effectiveness of smoking interventions evaluated the effectiveness and cost-effectiveness of a range of smoking cessation interventions (Parrott et al. 1998). Table 3.11 presents a summary of the evidence relating to this effectiveness and cost-effectiveness

Smoking cessation programs delivered at both an individual level, such as personal advice to stop smoking, and at a community level, such as local No Smoking Days, were shown to be effective in helping smokers to quit and not relapse within 12 months. For most programs the quit rate was below 1%, however, with Quit and Win competitions considerably higher quit rates were achieved. Cost-effectiveness ratios ranged from \$96 per life year saved for local No Smoking Days to \$3219 per life year saved for the high cost and participation Quit and Win competition. These cost-effectiveness ratios represent value for money in the context of funding of health interventions. A study addressing the consistency of decision making by the Pharmaceutical Benefits Advisory Committee found that it generally funded drugs on the Pharmaceutical Benefits Schedule up to an incremental cost per additional life year gained of \$40 800 (George, Harris & Mitchell 1999 (amount increased to 2000 prices)).

Table 3.11 Effectiveness and Cost-effectiveness of Smoking Cessation Interventions at 12 Months after Quit Attempt, 2000

| Smoking cessation intervention | Quit rate | Cost per life year saved |
|--|-----------|--------------------------|
| | % | \$ |
| Brief advice alone | 0.6 | 490 |
| Advice + self-help materials | 0.8 | 622 |
| Advice + self-help + advice for NRT | 0.9 | 758 |
| Above + specialist smoking service | 1.1 | 718 |
| Local No Smoking Day | 0.15 | 96 |
| Broader community wide interventions with: | | |
| high effectiveness | 0.5 | 1433 |
| medium effectiveness | 0.1 | 710 |
| low effectiveness | 0.05 | 144 |
| Quit and Win competition with: | | |
| average cost and participation | 8 | 2461 |
| low cost and participation | 6 | 2371 |
| high cost and participation | 10 | 3219 |

Source: Parrott, et al. 1998.

For the period 1971 to 2010, Applied Economics (2003) estimated there was a net benefit to society of \$8.4 billion from the investment in public health programs to reduce tobacco consumption. In terms of public finances, the present value of the expenditure savings for government was \$344 million, a saving of \$2 for every \$1 of expenditure on public health programs to reduce tobacco consumption.

While EMPHU only allocates a relatively small amount of its budget to smoking cessation programs, advice delivered both at an individual level and in group sessions has been shown to be cost-effective both in relation to other smoking cessation strategies and health interventions more generally. Furthermore, the finding by Applied Economics (2003) that smoking cessation programs are cost saving provides evidence to support that investing in these types of programs is worthwhile.

4. EARLY GAINS FROM INVESTING IN PUBLIC HEALTH

With increasing demands made on the health budget, short-term results are often preferred to interventions that may have their effect many years into the future. It is often assumed that only acute clinical services have immediate or short-term outcomes. However, a number of public health interventions have immediate and short-term benefits also, many of which are cost saving to the health budget. A potentially cost-saving strategy can be to invest more money into public health interventions that will not only produce long-term benefits but also short-term health and economic gains. This section presents some brief examples of public health interventions that produce short-term benefits.

4.1 Smoking Cessation

The gains made through reducing the prevalence of smoking span the spectrum of immediate cost savings (such as reduced pneumonia and asthma) through to longer term cost savings (such as reduced lung cancer prevalence).

- Within 1 year of a decrease in smoking prevalence, significant reductions in the costs of treatment for cardiovascular disease occur (VicHealth 2001).
- Within 1 year, a decrease in smoking prevalence leads to decreased incidence of low birth weight infants, cases of Sudden Infant Death Syndrome (SIDS) and childhood meningitis, thereby reducing direct paediatric health costs as well as the larger indirect costs and family suffering associated with these illnesses (VicHealth 2001). This reduction in health care costs is significant: a decrease of 3% in smoking rates over 3 years would lead to a reduction in perinatal health care costs up to 8.6% (VicHealth 2001).
- Decreased health care costs from asthma, middle ear infection and viral respiratory illness, with the subsequent indirect costs of time off work to recover or care for ill dependants, are seen immediately with smoking cessation (Lightwood, Phibbs & Glantz 1999; VicHealth 2001).
- Decreased smoking rates also lead to early reductions in the number of people on hospital waiting lists through a number of mechanisms such as freeing acute care resources, decreasing the incidence of conditions requiring surgical care, and improving mean recovery and healing time (VicHealth 2001).

4.2 Immunisation

The cost savings made through infectious disease control are also immediate to short-term. A lapse in the level of immunisation required to maintain herd immunity and control the spread of infectious diseases within a population can cause outbreaks, leading to increased demand on acute health care services and community concern. The prevention of infectious diseases through immunisation produces immediate economic savings for health care systems through a decreased demand for acute services.

- As discussed previously, for every \$1 spent on the MMR vaccine, more than \$16 is saved in direct health care costs through reduction in health care utilisation such as hospital admissions and contact tracing (CDC 1999). The DTP vaccine saves over \$6 for every \$1 spent (CDC 1999).
- Based on US figures, vaccination against influenza prior to seasonal influenza epidemics can save up to \$60 in direct health care costs for every \$1 spent on vaccination for people aged 65 years and over (CDC 1999).

4.3 Infectious Diseases Control Infrastructure

Of increasing concern is the economic cost associated with not maintaining public health infrastructure to monitor and control infectious diseases. In the current global age, infectious disease control presents challenges previously not contemplated. These include the implications of international travel and migration (recent examples including severe acute respiratory syndrome (SARS) and tuberculosis), global climate changes (leading to rising incidence of mosquito-borne infections) and the globalisation of our food supply (including Bovine Spongiform Encephalopathy (BSE) and haemorrhagic E.coli infection) (CMAJ 2003). Less than six weeks after the initial SARS case had been described in China, 27 countries had reported cases of SARS, demonstrating that infectious diseases do not respect national borders (CMAJ 2003). There is a strong imperative to build a strong public health infrastructure to maintain surveillance and response capacity.

The recent SARS outbreak around the world demonstrated the health and economic costs of not investing in public health infrastructure. The Canadian experience showed how, even with a highly developed industrialised nation with well-developed medical facilities, SARS spread with alarming rapidity. The rapid spread of SARS within

Toronto was partly attributed to the way their public health infrastructure had been constructed, which did not allow effective communication and control mechanisms to be enacted swiftly and efficiently (CMAJ 2003). Concerns over the quality of the public health infrastructure in Canada, especially in regards to dealing with public health emergencies, had already been highlighted prior to the SARS outbreak, but significant government action did not follow (CMJA 2002).

Although the total economic costs of SARS in Canada have not yet been fully calculated, they will be significant. Most conferences were cancelled during the outbreak and hotels reported millions of dollars in cancelled registrations during the first few weeks (Mackay 2003). The Ontario government had to spend CAN\$30 million on SARS control measures in just the first few weeks of the outbreak (Zarowsky 2003).

Other recent examples of the economic costs of infectious diseases around the world provide further evidence of the dangers of inadequate public health infrastructure. The recent avian influenza cost the Hong Kong government US\$22 million in 1997; BSE cost the UK US\$38 billion over 1990-98; and in 1999 West Nile Fever cost New York City US\$100 million (UKDH 2002). Given the inevitable occurrence of a major infectious disease outbreak, such as a virulent influenza pandemic or another SARS epidemic, maintaining and strengthening our public health infrastructure to appropriately respond to the likely event of an outbreak is a priority for the health sector.

4.4 Injury Prevention

Much of the economic savings gained through injury prevention programs are made in the short-term. A reduction in road crashes or falls in the elderly impacts directly on emergency department admissions, surgical procedures and patient numbers within hospitals.

- Road safety programs were responsible for saving an estimated 1000 lives and 5000 hospital cases per year (Applied Economics 2003). This reduction in road trauma is responsible for considerable short-term savings to the health system due to fewer hospital admissions and medical consultations, the need for less rehabilitation care and so on.

- Costs from falls in the elderly, most of which are incurred by acute care and rehabilitation hospitals, will increase by approximately 50% by 2011 if current trends continue (Moller 2002). Comprehensive falls prevention policies can effectively reduce the incidence of falls and hospitalisation (Moller 2002).

4.5 Folate Fortification of Foods

U.S. studies have estimated that half of all neural tube defects (NTD) can be prevented with folate (CDC 1999). The average lifetime cost of treating and caring for a person with a NTD is over A\$1 million (CDC 1999). Fortification of foods with folate would not only prevent NTDs, but would also be cost saving for government through a reduction of treatment costs of patients with NTDs (CDC 1999). This is depicted in Figure 4.1, which illustrates that with increasing investment in high levels of folate fortification, lower overall costs from NTD will eventuate. These savings begin from birth due to the high associated costs of investigations and ongoing management of infants with NTDs.

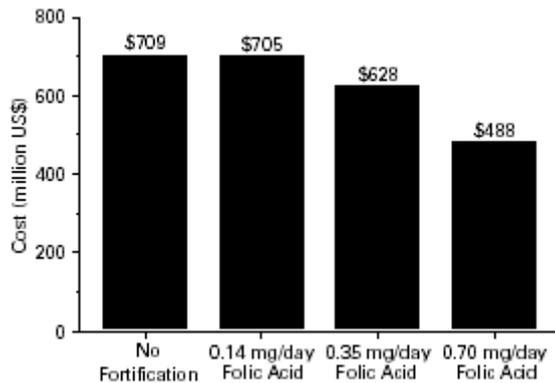


Figure 4.1 Yearly Costs of Neural Tube Defects Associated with Different Levels of Folate Fortification of Food

Source: CDC 1999, p.14.

4.6 Low Birth Weight Preventive Programs

Low birth weight (LBW) is one of the major causes of infant mortality and illness (CDC 1999). In the U.S., medical costs incurred for LBW infants in the first year of life were estimated to be approximately US\$15 000 in 1988. Early and adequate prenatal care and proper nutrition during pregnancy can lower the risk of having a LBW infant. A

universal system of prenatal care would prevent US\$14 755 per LBW child born, demonstrating the high cost savings that can be made through prevention (CDC 1999).

The above are estimates of the short-term gains in investing in programs to prevent low birth weight in infants. In light of recent evidence demonstrating the profound influences that foetal and early life experiences have on the health of an individual across the whole life-course, these cost-savings would multiply greatly due to the prevention of significant adult-onset diseases such as cardiovascular disease, diabetes and renal disorders (see for example Fall et al. 1995).

5. DISCUSSION

This study has considered the health and economic benefits of some of the public health programs implemented by EMPHU. Across all areas, public health and community interventions tend to be more cost-effective than acute care or other clinical interventions. In some cases, such as smoking cessation and immunisation, public health interventions are cost saving by reducing overall health and related costs through a reduced demand on acute care services and corresponding gains generated from improved health status.

In the past, investing in public health initiatives was believed to lead to health gains only in the longer term, in contrast to clinical treatment that was seen to provide relatively immediate improvements in health. However, recent research has shown that many public health interventions have substantial short-term health and economic gains, in addition to their longer term benefits. Increasing investment in these public health programs can capitalise upon these short-term gains.

While no economic evaluations have been conducted of EMPHU's public health programs, the evaluations conducted of their impact have shown effectiveness in terms of achieving intermediate outcomes such as increasing awareness of health conditions and risk factors. In addition, public health programs have been well targeted at the needs of the population of the East Metropolitan Health Service. Compared with the other metropolitan health services, the East Metropolitan Health Service has a relatively older population (Australian Bureau of Statistics 2002). The range of EMPHU activities aimed at preventing falls for older people addresses the need to decrease the incidence, morbidity and mortality associated with falls of older people. The East Metropolitan Health Service also has a significantly higher number of deaths due to diabetes for females than the State expected rate and a significantly higher number of deaths due to tobacco for males and females than the state expected rate (Saunders & Daly 2000). Programs promoting preventive health for people with diabetes and smoking cessation programs target these health needs of the population.

As resources have become scarcer and public accountability greater, public health, like clinical medicine, has been forced to examine the costs and benefits of its activities in order to make better decisions about how to allocate budgets most efficiently.

Evaluating the cost-effectiveness of public health is more difficult than for clinical health care for several reasons. First, for some public health interventions a time lag exists between committing resources and realising an outcome. This can make defining and demonstrating the complex causal chain between a program and the ultimate change in final outcomes difficult. Second, the effects of public health interventions are sometimes easily confounded by other causal factors. Third, the beneficiaries of a public health program can be invisible in that the program reduces people's risk of ill health and therefore their need for health care. On the other hand, clinical care involves the individual as a specific focus and the problem is manifest and immediate.

However, the evidence base relating to the effectiveness and cost-effectiveness of public health programs is growing. This study has examined the literature relating to the cost-effectiveness of selected activities conducted by EMPHU. The results of economic evaluations of similar programs conducted elsewhere suggest that public health initiatives targeting the areas of preventive care for diabetes, falls prevention, immunisation and smoking cessation tend to represent an efficient use of resources. While EMPHU's programs in these areas are not identical to those evaluated elsewhere, they are broadly similar programs that are likely to represent comparable value for money.

With the rising cost of health care, decisions about purchasing and provision in the health system should be based, where possible, on interventions proven to work. In addition, with public spending of all kinds under intense scrutiny, investment of the available resources allocated to health care should be directed at those interventions that have been shown to be most cost-effective in addressing the community's priority health needs. Considering public health spending in the context of financing for the health system as a whole, spending on public health by EMPHU appears to represent a good investment of the health system's resources. More generally, spending on public health of 2.0% of government expenditure on health in Western Australia appears modest in the light of the evidence of the likely cost-effectiveness of public health initiatives relative to acute care and other clinical health services

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List of Abbreviations

ABS – Australian Bureau of Statistics
AIHW – Australian Institute of Health and Welfare
CDC – Centers for Disease Control and Prevention
CMAJ – Canadian Medical Association Journal
UKDH – United Kingdom Department of Health
WHO – World Health Organisation

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