Investment analysis of the Aboriginal and Torres Strait Islander Primary Health Care Program in the Northern Territory

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ISBN 0 642 82496 7

Publication Approval Number: 3487/JN8644

In 2003, a series of papers was commissioned to provide information, analysis and advice to Government as part of a Review of the Australian Government's Aboriginal and Torres Strait Islander Primary Health Care Program. The Review examined issues relating to funding for comprehensive primary health care for Aboriginal and Torres Strait Islander people and the impact of activity in this area. The commissioned material complemented information obtained from previous reviews and evaluations as well as that obtained from program data.

An Interdepartmental Committee (IDC) oversaw the Review process. Members of the IDC were from the Australian Government Departments of the Treasury; Prime Minister and Cabinet; Finance and Administration; Immigration and Multicultural and Indigenous Affairs; Health and Ageing (Chair); and Aboriginal and Torres Strait Islander Services.

This is Volume 2 of the published Review papers.

The papers in this series are:

Volume 1. National Strategies for Improving Indigenous Health and Health Care by Judith Dwyer, Kate Silburn and Gai Wilson, La Trobe University.

Volume 2. Investment Analysis of the Aboriginal and Torres Strait Islander Primary Health Care Program in the Northern Territory by Carol Beaver, Centre for Chronic Disease, University of Queensland and Yuejen Zhao, Health Gains Planning Unit, Department of Health and Community Services, Northern Territory.

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The opinions expressed in these papers are those of the authors and are not necessarily those of the Australian Government.

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During the time she spent as Director, Health Economics, Carol undertook several studies utilising the Health Benefits Group/Healthcare Resource Group (HBG/HRG) framework. In 2001 Carol undertook a review of diabetes expenditure in six Pacific Island countries. This work culminated in the WHO publication: *Health care decision-making in the Western Pacific Region: Diabetes and the care continuum in the Pacific Island countries*. The HBG/HRG framework was also used to inform an Option Appraisal in Mongolia. Related publications include: Health benefit and healthcare resource group classifications: linking health care needs to resource requirements across the health care sector. Carol Beaver, Yuejen Zhao, Steven Skov and Helen Morton (2000), *CASEMIX Quarterly* 2 (2): 58-64.

Yuejen Zhao is a medical doctor and epidemiologist. He has been employed with the NT Department of Health and Community Services for seven years and is currently the Senior Health Economist. Since joining the NT Department, Yuejen has worked extensively on the development of the Health Benefits Group/ Healthcare Resource Group (HBG/HRG) classification system, as well as on cost-effectiveness modelling in health care and the burden of disease in the Northern Territory. He is also involved with managing the NT Cancer Registry.

Since 1999 Yuejen has collaborated with health professionals interstate on the development of a range of related projects. These projects have led to publications such as : Territory Health Services and Commonwealth Department of Health and Aged Care (1999): *Development of a strategic computer-based model for increasing allocative efficiency*. Territory Health Services: Darwin; Carol Beaver, Yuejen Zhao, Steven Skov and Helen Morton (2000): Health benefit and healthcare resource group classifications: linking health care needs to resource requirements across the health care sector. *CASEMIX Quarterly* 2 (2): 58-64; and, most recently, Yuejen Zhao, Steve Guthridge, Anne Magnus, Theo Vos (2004): Burden of disease and injury in Aboriginal and non-Aboriginal populations in the Northern Territory. *MJA*, 180 (10):498-502.

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1 Summary

This report was commissioned by the Australian Government Department of Health and Ageing on behalf of the Aboriginal and Torres Strait Islander Primary Health Care Review to assess the cost-effectiveness of current services provided for Aboriginal and Torres Strait Islander Australians. The work presented here relates to the Northern Territory of Australia only. The authors believe that the approach taken in the study (strategic investment analysis utilising the Health Benefit Group/Healthcare Resource Group (HBG/HRG) classification as the base information model) has much to offer other population groups as do the results of the modelling. Determination of the actual impact of investments as modelled to sub-population groups in the Northern Territory and other jurisdictions, as well as at specific points in time, will need to be tested.

The health sector is a complex system in which there are multiple and interacting determinants of health. Against this complexity, there is a paucity of relevant published information from which to construct a comprehensive model for informing the actual impact of a selection of investment decisions in primary health care. However, there is some recent published evidence such as the findings from research undertaken in a range of contexts (e.g. the Tiwi Islands and North Queensland) which does show that investments in primary health care do result in prevention of complex diseases/disorders and hospital admissions.

To provide an understanding of what might happen if changes were made to investment streams over time for primary care, a partial equilibrium model, with the focus on a set of preventable diseases was developed. The conditions addressed were hypertension, diabetes, renal disease, ischaemic heart disease, chronic obstructive pulmonary disease, respiratory and related ear infections, diarrhoea, malnutrition and skin infections. For the purposes of the analysis, these preventable diseases were separated into two groups: chronic diseases primarily impacting on adults (those aged over 15 years); and infectious diseases primarily impacting on children (those aged 15 years and under). A Health Benefit Group/Healthcare Resource Group model is used to allocate sections of the client population across a range of health services. A phased approach to investment (incremental increase on a yearly basis) was used to allow time for health agencies to scale up the service response. A series of 'what if' analyses were undertaken to explore the implications of alternate investment and dis-investment assumptions. The approach to scenario modelling taken in this study means that even in the absence of 'perfect' information it is still possible to examine a range of alternatives for the purpose of informing decision making.

The modelling addressed investments in comprehensive primary health care, which include services funded from mainstream and Indigenous-specific funding mechanisms as part of the Aboriginal and Torres Strait Islander primary health care program. The impact of investments in primary care on hospital (secondary and tertiary care) is also addressed. An assessment of the changes in both cost-effectiveness and health outcomes for a range of scenarios in which the balance of investment is varied between elements of the health sector, from primary through to tertiary health care, was undertaken. It is necessary to acknowledge that, while increases in primary health care (when that care is effective) will lead to decreases in admissions for persons concerned, it is likely that actual hospital expenditure levels may not decrease, particularly in areas of high unmet need.

The underlying assumptions were informed by a review of relevant literature and by expert opinion. A preliminary model was presented to staff of the Office for Aboriginal and Torres Strait Islander Health (OATSIH) during a two-day seminar during which Australian Government funding arrangements were discussed and model scenarios were developed. The resulting analysis was then presented to an expert group and after their review of the assumptions and the approach, the model was refined and the outcomes adjusted.

Main findings of the analysis

- Projecting forward the potential impact of the current investment in primary health care, it was found that projected funding allocations will not be able to cater for treatment of the growing burden of chronic disease in the Indigenous population. The Northern Territory (NT) shortfall based on the NT Indigenous population (around 12 per cent of national Indigenous population, with a greater proportion living in remote areas with higher costs) is approximately $7 million over five years, $17 million over 10 years, and $46 million over 20 years.
- Using the NT Indigenous population as a base, the value of existing Australian Government investment in primary health care (through the OATSIH grants program) was estimated by modelling the withdrawal of that funding and estimating the impact. While savings to the Australian Government were identified through lower OATSIH funding, it was also estimated that such a funding withdrawal would lead to a delay in diagnosis and treatment, more severe chronic conditions and increased hospitalisations, indicating that current investments were having an impact in terms of providing greater levels of diagnosis and treatment of disease, preventing progression to more severe chronic disease and reducing hospitalisation levels. If this funding was not provided, it was estimated that total health costs on other parts of the system would be higher, exceeding $136 million over five years after funding was no longer provided, $470 million in 10 years, and $1,261 million over 20 years (which is largely expected to be hospital, renal dialysis and some Medical Benefits Scheme (MBS)/Pharmaceutical Benefits Scheme (PBS) costs). Also, without these investments, late diagnosis and treatment could be expected to lead to worse health outcomes, with a loss of healthy life years due to premature death and increased disability equivalent to 2.6, 6.1 and 12.6 years per person over five, ten and 20 years time respectively.
- Estimates were also made of the impact of changing funding allocations between activities (i.e. reallocating funds within existing resources). This showed that shifting funding from clinical primary health care (treatment for new and existing cases) to health promotion and prevention activities, results in gains to the area receiving funding and a loss in the other area. Overall, this element of the analysis showed that, given the current burden of disease, shifting funding between categories while maintaining the same overall level of expenditure is likely to bring some change, but only at the margins.
- The potential impact of increasing investment was also modelled. This involved a staged increase in investments in primary health care across the continuum of health promotion, prevention and clinical care rising to double the 2001–02 levels of resources in real terms over a period of ten years. Modelling estimated that this investment would save an additional 3 disability adjusted life years per person over five years, 5.7 years per person over ten years, and 9.9 years per person over 20 years due to reduced rates of disability and death (these years would be otherwise lost due to the nine preventable diseases modelled). The total benefit/cost ratio is 28 over five years, 17 over ten years, and 12 over 20 years with 5 per cent discount.
- Based on the above findings further work was undertaken to determine the optimal investment scenario. Using a combination of organisational savings and societal benefits, the model provides advice on the distribution of funds that would bring the greatest impacts. Using this approach the model shows that investments are required across the continuum of care, with the greatest value achievable with investments in the primary health care sector. Within primary health care, the largest resource requirement is for identifying and treating new cases of the condition, as well as enhancing treatment for people who already have the condition. Investment in prevention and health promotion is also important to reduce the burden of illness. Action in areas such as respiratory infection, renal diseases and skin infection can be expected to bring the greatest benefits.

- The potential impact on health activities of achieving higher engagement from other sectors and communities was also analysed. Analysis shows that it might be possible to increase benefits of primary health interventions by around 35 per cent if services can be delivered in a way that more effectively meets the needs of people at the local level and enables people to take greater responsibility for their health.
- The analysis also assesses the impact of time on investment decisions. The report finds that if the allocation of health resources is to be aligned to population health outcomes, a longer-term view is required. The benefits of investment in health promotion and prevention in particular become greater in the longer term. Analysis shows that with a longer-term view, the proportion of total funding directed towards these two activities, (health promotion and prevention) becomes greater. For all of the preventable disease categories modelled (particularly the chronic diseases of hypertension, diabetes, renal disease, ischaemic heart disease and chronic obstructive pulmonary disease) taking a 20-year view for investment decisions results in a doubling and, in some cases a tripling, of the proportion of overall investment directed towards health promotion and prevention activity, as compared to a shorter-term five-year analysis.

The report demonstrates the value of current investments in the selected conditions, as well as providing information on the varying impact of differing scenarios of investment. This variation of investment across the care continuum is demonstrated both by the differing impact of health outcomes (in disability adjusted life years [DALY]) and by potential cost savings within the broader health sector resulting from different mixes of investment in health promotion, prevention, clinical primary care for new and existing cases, and hospital care.

The report acknowledges that the analysis was conducted over a short period of time (6 weeks) and the limitations of the expenditure and cost data as well as information required to inform scenario assumptions. The modelling is based on the NT population, disease profile, cost structures and service development. If modelling across the whole of Australia were conducted, it would need to take account of local conditions. However, many factors such as health profile, under-provision of primary health care services and the high use of hospitals are consistent between the NT and the rest of Australia for Indigenous populations. For these reasons, the broad direction indicated by this modelling is considered to be consistent with the situation in other parts of the country.

While the findings are useful in informing decisions on the potential impact of changes in investment decisions, future decision making can be enhanced through further work to refine the model. The report makes a number of recommendations about future work, including a research program to further develop and update the current model. This will inform top-down and bottom-up allocations of health resources at both the Australian Government and state/territory levels. Studies undertaken, with subpopulation groups, to determine the impact of changes in investment portfolios and to inform refinement of the model, in particular testing of key assumptions underlying this current work and modelling of new assumptions, can at the same time inform local purchasing and service development decisions.

2 Introduction

This report presents the results of a consultancy commissioned by the Australian Government Department of Health and Ageing on behalf of the Aboriginal and Torres Strait Islander Primary Health Care Review to assess the cost-effectiveness of current services provided for Aboriginal and Torres Strait Islander Australians, as well as an assessment of the likely changes in cost-effectiveness and health outcomes resulting from changing investment patterns from primary through tertiary health care interventions. The assessment was based on scenario analysis and addresses investments in comprehensive primary health care, which include services funded from mainstream and Indigenous-specific funding mechanisms as part of the Aboriginal and Torres Strait Islander primary health care program. The impact of investments in primary care on hospital (secondary and tertiary care) is also addressed.

2.1 Objectives

A key issue to be addressed with regard to Aboriginal and Torres Strait Islander health is how to maximise health outcomes for a designated population through the allocation of adequate levels of funding both to prevent and manage health-related problems and diseases. To do this funders and purchasers need to understand what the current and potential future demands are, in terms of population health care needs and community expectations, and how to best mobilise resources to meet them. Funders and purchasers need to know:

- what services are being provided for what levels of expenditure and what cost; and
- what future services are required at what cost.

Developing a base model, linking the need for health care at key intervention points across the care continuum, provides a sound basis for exploring what could be achieved if resources were reallocated or the overall allocation was increased.

To inform future resource allocation the objectives of this consultancy were to:

- undertake modelling work to estimate the impact of current services, drawing on the Health Benefit Group/Healthcare Resource Group model and taking account of the level of current spending in relation to Aboriginal and Torres Strait Islander health and its impact; and
- provide advice on the likely impacts of increased investments to assist in:
  - the development of advice on the strategy and relevant timeframes required to achieve appropriate levels of health care for Aboriginal and Torres Strait Islander people; and
  - determining the likely health impacts (short-, medium- and longer-term) that could be expected to result from increased investment in this area.

See Attachment A for terms of reference of this scenario analysis.

3 Understanding the care continuum: The HBG and HRG classification system

To support decision making across the health sector it is important that managers have access to the necessary information to inform policy development, purchasing decisions and service development. The Health Benefit Group (HBG) and Healthcare Resource Group (HRG) classification system has been found useful for informing decision making across the health care sector by providing a base information model linking need for health care to services and related costs.

The HBG/HRG classification system is an information model that helps make sense of the health care sector which is a very complex system. It provides a structure that allows for identification and consideration of issues across the care continuum. The framework provides a sound foundation for exploring and modelling the impact of alternative planning and purchasing strategies.

The HBG/HRG classification system deals with components of the health system in which services are conceived for, and delivered to, whole populations. It is a descriptive rather than a prescriptive tool, which can assist decision makers to understand the care continuum and, in so doing, inform the establishment of an appropriate mix of services that meet the health care needs of the population served.

There is no one right way to present information. However, the key to providing good information is to understand the context of the original information request. If the question decision makers are trying to answer is *what is the most appropriate mix of services across the care continuum?* then the HBG/HRG classification provides a sound foundation for addressing this question.

The Healthcare Framework is an information model created by the UK Casemix office, on the basis of the HBG/HRG classification system. It

- uses a language that is understandable to all players in the health care sector;
- is a framework to order thinking; and
- provides a platform to inform resource allocation decisions.

The classification system can integrate information on the following:

- health care needs for the population (populations or groups of people at risk of, or with the disease) or HBGs;
- responses (health services/activities) or HRGs;
- costs (financial expenditure on services) by HRGs; and
- achieved outcomes by health services (health outcomes or proxies for health outcomes such as changes in disability adjusted life years).

It can be used to:

- describe characteristics of populations in need of health care;
- describe current services and resource distribution;
- quantify health care need and service requirements;
- compare services and resource distribution between population groups; and
- assess the impact of changes in utilisation and resource use.

4 Investment analysis

This investment analysis used the NT HBG/HRG classification system as the base information model. An existing population dataset was updated and extrapolated to the NT Aboriginal and Torres Strait Islander population as a whole. The model was refined, including updating of population projections, current disease burden, service use, and price changes. Where possible, updated assumptions were used regarding the link between services and impacts for patients, especially where better information was obtained from the literature or from experts in the field.

Stage 1 of the analysis was presented to staff of the Office for Aboriginal and Torres Strait Islander Health (OATSIH) during a two-day seminar on 7 and 8 October 2003 in Canberra. A number of recommendations were made regarding scenarios to be modelled. The resulting analysis was then presented to an expert group on 23 October 2003 in Sydney. Following a review of the underlying assumptions and the approach taken, a number of refinements were made and the analysis re-run.

A series of 'what if' analyses were undertaken to explore the implications of alternate investment and disinvestment assumptions. A phased investment stream (incremental increase on a yearly basis) was applied as it is assumed health agencies will need time to scale up the service response. The approach to scenario modelling taken in this study allowed examination of a range of alternatives, in the absence of perfect information for the purpose of guiding decision-making. Chronic disease is a major and increasing problem for Aboriginal and Torres Strait Islander people. It is the main reason for the significant gap between life expectancy of the Aboriginal and Torres Strait Islander population and that of the remainder of the Australian population. Addressing chronic disease requires a strong focus on prevention and management, with particular focus on preventing the development of high cost complications related to diseases such as hypertension and Type 2 diabetes. To control and manage the growing 'epidemic' of chronic disease requires realignment of the service delivery model from an acute care model to a chronic care model, with a stronger focus on comprehensive primary care. Consequently, a subset of chronic diseases and infectious diseases were selected as the basis of this investment analysis.

4.1 Data sources

Data was obtained from the following sources.

(a) Population and population projection

ABS 2001 NT estimated resident population has been used for this study, with Aboriginal experimental population projections (Series B, 2006 and 2011). Mortality long-term trends were also applied to relevant HBGs for chronic diseases.

(b) Coordinated Care Trial Datasets—NT

Coordinated Care Trial (CCT) activity data (1995–2002) including demographic variables, date of consultation and diagnosis coded in ICPC+ (international classification of primary care – Australian version), which has been used to map HBGs. Activity data was also used to derive resource usage patterns based on acute nursing cost weights.

(c) NT hospital morbidity dataset

Unique patients and associated activity data (separations and DRG [diagnosis related groups] weighted separations) were measured for acute care activities for the NT's five public hospitals. Acute care costs were derived by using AR-DRG 4.1 (Australian refined diagnosis related groups) national public hospital cost weights and NT benchmark prices (2001/02).

(d) NT Department of Health and Community Services expenditure dataset (2001–02)

Analysis of this dataset was based on methods developed for the Australian Institute of Health and Welfare (AIHW) Health Expenditure Analysis. Indigenous health expenditure analysis is a national project managed by AIHW, which splits the total Government health expenditure between the Indigenous and non-Indigenous population for each state/territory on the basis of health care activity or population.

(e) Australian Government expenditure data

Australian Government health expenditure data were obtained from OATSIH, which classifies the total expenditures into three main streams: OATSIH total expenditure, estimated MBS and estimated PBS expenditure for NT Indigenous Australians in 2001–02.

4.2 Preventable diseases

Based on a review of the relevant data and consultations with key stakeholders, nine categories of preventable diseases in the NT Aboriginal and Torres Strait Islander population were identified, including common non-communicable diseases (NCDs) that could benefit from increased investment in primary care. These nine categories are:

i. hypertension (high blood pressure);

ii. diabetes (Types 1 and 2, excluding diabetes during pregnancy)[i];

iii. renal diseases (including end stage renal disease);

iv. ischaemic heart disease (IHD);

v. chronic obstructive pulmonary disease (COPD);

vi. respiratory and related ear infections (including otitis media);

vii. diarrhoea;

viii. malnutrition (including anaemia); and

ix. skin infection (including scabies and cellulitis).

For the purposes of this analysis, the nine preventable diseases were separated into two groups: chronic diseases (hypertension, diabetes, renal disease, chronic obstructive pulmonary disease, and ischaemic heart disease) primarily impacting on adults (those aged over 15 years); and infectious diseases (acute respiratory disease, diarrhoea, malnutrition, and skin infection) primarily impacting on children (those aged 15 years and under).

It should be noted that some of the nine preventable diseases are linked aetiologically. For example, hypertension is a risk factor for both IHD and renal disease. This study shows among hypertension, diabetes, IHD and renal disease, 63 per cent of adult patients (aged 30 or above) have two or more diagnoses, and 31 per cent have three or more diagnoses (see Figure 1). Among acute respiratory infection, diarrhoea, malnutrition and skin infection, 55 per cent of child patients (aged 12 or younger) have two or more diagnoses, and 23 per cent have three or more diagnoses (Figure 2).

Figure 1: Interaction between four common chronic diseases (hypertension, diabetes, IHD and renal disease) in NT Indigenous adults, 2001

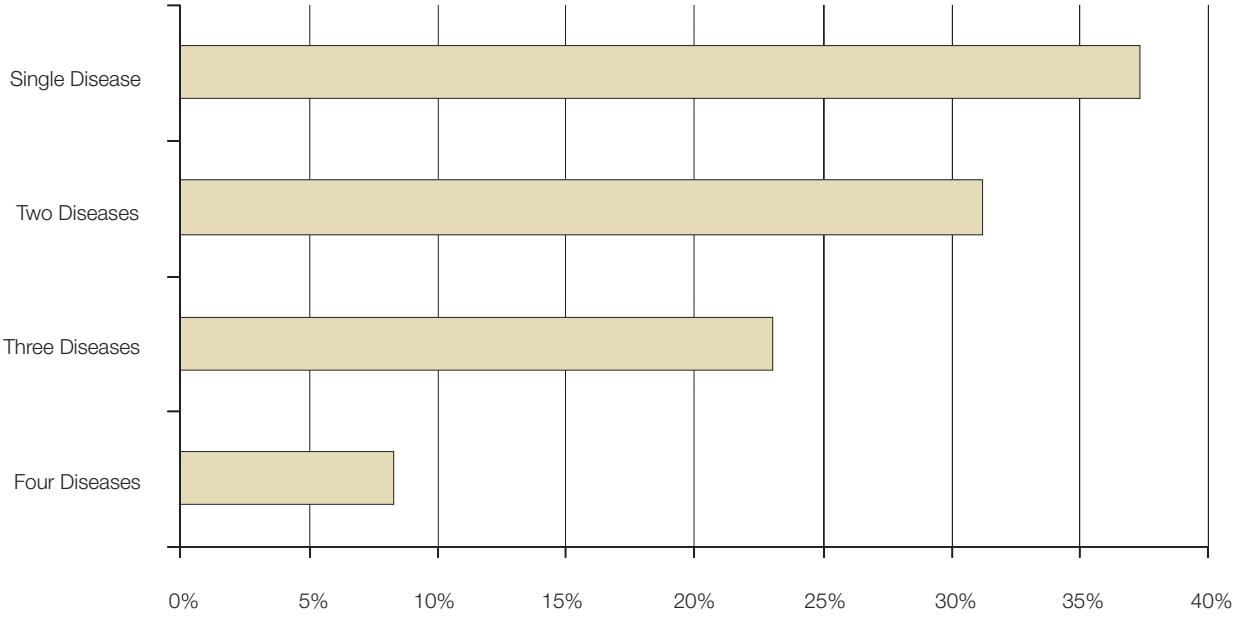
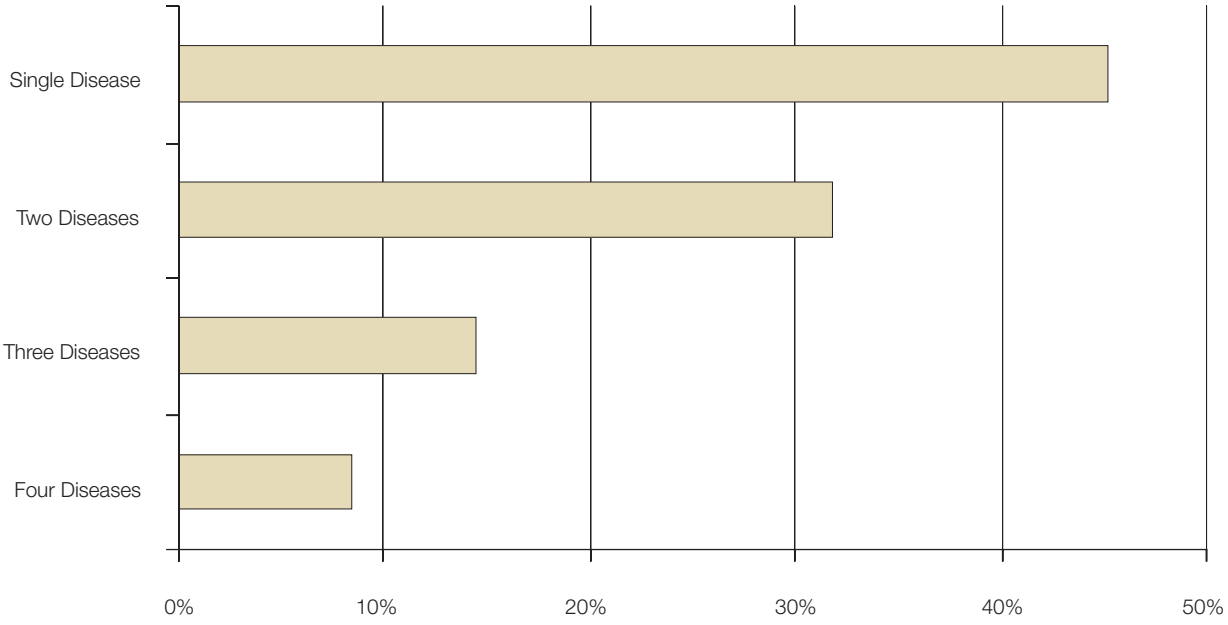


Figure 2: Interaction between four common childhood diseases (acute respiratory infection, diarrhoea, malnutrition and skin infection) in NT Indigenous children, 2001



Further information on local incidence and mortality trends for the nine preventable diseases is provided at Attachment D.

4.3 Funding streams

In the financial year 2001–02, the NT through the Department of Health and Community Services spent $281.4 million (57 per cent of total $489.9 million) for the Indigenous population, who constitute 29 per cent of the total NT population. Excluding overhead and indirect cost, the total NT Department health care costs for the Indigenous population are estimated at $226.6 million. Patient travel costs of $14.4 million and public health research costs are excluded from the analysis. The total modelled cost for the NT Department is $209.1 million. The MBS and PBS have contributed an estimated $5.6 and $1.7 million respectively, while direct Australian Government spending was $38.0 million for services for NT Indigenous Australians during the same period.

Of the total amount of health spending on Indigenous Australians in the NT, it is estimated that 27 per cent was spent on the nine preventable diseases modelled, with the balance allocated across the remaining 67 disease categories. These other disease categories are listed at Attachment B.

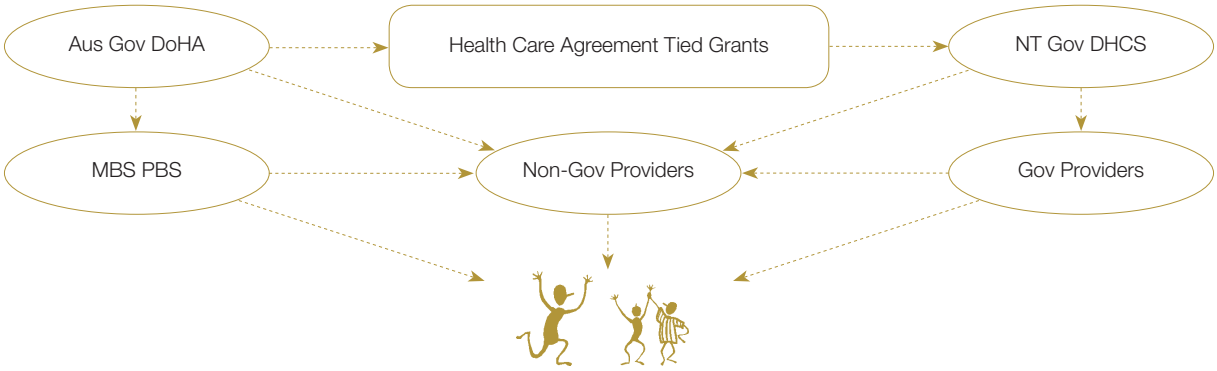
Estimated NT Department of Health and Community Services, Australian Government, and MBS/PBS funding allocations (2001–02) for NT Indigenous people with the nine preventable diseases are displayed in Table 1.

Table 1: Estimated NT DHCS, Australian Government grant funding, MBS/PBS funding allocation, NT Indigenous Australians (2001–02), $'000

	NT DHCS	Australian Government grant funding	MBS	PBS	Total
Hypertension	1 588	743	155	42	2 528
Diabetes	4 288	1 125	234	63	5 710
Renal disease	22 765	3 000	625	169	26 559
IHD	5 168	294	61	17	5 540
COPD	3 663	381	79	21	4 144
Respiratory infection	10 070	398	83	22	10 573
Diarrhoea	4 384	94	20	5	4 503
Malnutrition	2 128	147	31	8	2 314
Skin infection	4 942	84	17	5	5 048
Other diseases and administration costs	144 144	31 724	4 249	1 325	181 442
Total	203 140	37 990	5 554	1 677	248 361

Note: Other diseases include 67 disease categories such as stroke, injury, STIs, cancers, perinatal and neonatal conditions.

Main funding streams of health services for the NT Indigenous Population, 2001–02



4.4 Health Benefit Groups

Health Benefit Group classification is a population grouping based on health care need. It was originally developed in the United Kingdom National Health Service. ICPC+ codes, ICD 10 (International classification of disease, 10th Revision) codes, date of consultation, hospital morbidity data, and demographic variables such as age and sex, were used to classify the CCT population into five categories: Not At Risk, At Risk, New Cases, Existing Cases and Requiring Hospital Care[ii]. In this study, mapping tables were developed between ICPC, DRG and HBG (see Attachment C). The CCT population was then extrapolated to the total Indigenous population in the NT. Table 2 shows the number of people in each Health Benefit Group for each of the 9 preventable diseases. The new and existing cases requiring hospital care shown in Table 2 are not mutually exclusive. In fact people requiring hospital care are either new cases or existing cases who need acute services. Therefore, requiring hospital care is a subset of new and existing cases. Also in Table 2, the number of new and existing cases were based on population and clinical data from areas where good diagnosis and treatment services were provided. For areas where there is no or a lack of adequate primary health care resources, these figures include numbers of undetected new and existing cases representing the true pattern of the diseases.

Table 2: HBGs for nine common preventable diseases, NT Indigenous Australians, 2001

HBG	HBG Name	Not At Risk	At Risk	New Cases	Existing Cases	Requiring Hospital Care *
HP	Hypertension	37 067	12 695	975	6 098	15
DB	Diabetes	35 854	13 811	542	6 629	133
RD	Renal disease	34 987	14 526	1 181	6 142	298
IH	IHD	40 381	14 341	314	1 798	554
CB	COPD	36 839	18 187	152	1 657	384
RI	Resp infection	37 034	12 641	4 051	3 109	1 379
DR	Diarrhoea	36 504	17 667	1 386	1 278	865
MN	Malnutrition	42 201	9 781	1 690	3 163	172
SI	Skin infection	33 005	17 667	1 094	5 069	1 023

* People in the Requiring Hospital Care category are a subset of New Cases and Existing Cases.

Note: HBGs provide information on population profiles of human ill health. In epidemiological terms, presentations means incidence and chronic disease denotes prevalence. Risk factors are separately defined for each disease on the basis of contemporary aetiological understanding of the disease. For example, at risk of diabetes means age over 35, diabetes during pregnancy, hypertension, renal disease, IHD, high cholesterol, alcoholism, skin infection or recorded blood glucose test.

4.5 Healthcare Resource Groups

The HRG classification system was used to define service categories to be reviewed with regard to expenditure levels. HRGs are a classification for healthcare provision and associated costs. Corresponding with HBGs, there are five general groups—namely, Health Promotion, Prevention, Clinical Primary Health Care (new cases), Clinical Primary Health Care (existing cases) and Hospital Care.

No widely accepted community-based cost weight is available for HRG financial analysis in Australia. Acute care nursing weight (2001–02) is the best resource use relative weight currently available. A top-down approach was used to derive average costs of each package of care by using community activity data and

acute nursing cost weights. Weights of Health Promotion and Prevention were derived separately for three groups (Group 1—hypertension, diabetes, ischaemic heart disease and renal diseases; Group 2—COPD; Group 3—respiratory infection, diarrhoea, malnutrition and skin infection) by using mean nursing weights adjusted for population sizes. Table 3 shows the current average cost per person for each HRG for the nine preventable diseases. Caution must be exercised when interpreting HRG data. Table 3 represents total current spending in a specific service divided by the total target population in each group. It does not necessarily represent the amount of resources required to adequately address the needs of the total target population. In services where there is a paucity of resources such as primary health care in remote and regional areas, the current spending may be far from adequate. Under such circumstances, some people in the HBG received no service at all, even though they require it (e.g. diabetics not being detected and treated early in the disease process), some people receive partial service and some receive the right level of service. Taking MBS/PBS as a benchmark, current spending when averaged across new and existing cases is $370 on the NT Indigenous population. This is much less than the average MBS/PBS figure of $1252 per person with diabetes which is expended to treat this condition in the largely non-Indigenous population of Western Australia.

Table 3: Average cost per person for HRGs of nine common preventable diseases, NT Indigenous Australians (2001–02)

HRG	HBG Name	Health Promotion ($)	Prevention ($)	Clinical Primary Health Care (new cases) ($)	Clinical Primary Health Care (existing cases) ($)	Hospital Care* ($)
HP	Hypertension	15	49	377	227	4 081
DB	Diabetes	15	49	1 026	316	14 864
RD	Renal disease	15	49	1 255	911	55 710
IH	IHD	15	49	463	305	8 237
CB	COPD	4	11	1 241	429	7 500
RI	Resp infection	2	8	49	239	6 709
DR	Diarrhoea	2	8	33	137	4 845
MN	Malnutrition	2	8	43	86	10 624
SI	Skin infection	2	8	38	31	4 663

* Hospital Care includes services provided in hospital or funded by hospitals but provided in community setting (e.g. dialysis or day surgery).

Note: HRGs are a classification of health service delivery and associated costs. For example, acute care for diabetes includes AR-DRG K60A (Diabetes + Cscc), K60B (Diabetes – Cscc), K01Z (Diabetic Foot), K09Z (Other Endcrn, Nutr& Meta Or Pr), and K40Z (Endosc/ Invest Pr Metab Dsdr-Cc). Health promotion for COPD includes public anti-tobacco education and legislation.

4.6 Scenario modelling

As part of the analysis, five scenarios were considered. For each scenario, modelling was undertaken for five, ten and 20 year periods. Modelling was based on average expenditure by HRGs and population response to investments. An important distinction between expenditure and cost should be noted at this point. Expenditure is the amount spent on treatment and is not equivalent to the cost of treating a disease appropriately. Where services are insufficient to meet health needs, expenditure will be less than cost of treatment. Another distinction is that between average expenditure and per person expenditure. Expenditure

per person for the same disease will differ depending on whether the person is detected as having the disease and then how they are treated. Average expenditure masks these variations in expenditure on each person.

The mix of Australian Government and state/territory funding is based on the current funding mix in which there are an even distribution of regions which receive funding primarily from the Australian Government, primarily from state/territory sources, or which receive similar funding from Australian Government and state/territory sources (see Table 4). This was used to model funding increases and decreases as part of the scenarios.

Table 4: Current funding share of primary health care services, NT Indigenous Australians, 2001–02

Funding mix	Primarily Australian Government funded (%)	Both Australian Government and NT funded (%)	Primarily NT funded (%)
Population size	33	33	33
Territory funding	30	50	60
MBS/PBS	10	10	10
Australian Government funding	60	40	30

The scenarios modelled are:

Scenario 1 – Base Model – assumes that the levels of services are provided in line with changing price, population and mortality trends.

Scenario 2 – Current Situation Model – assumes no real change in primary health care funding for these diseases. Funding is only adjusted for price and total population changes (i.e. there is no additional funding for increasing mortality trend). This will mean about a 2 per cent drop in primary health care funding per year compared with the base model.

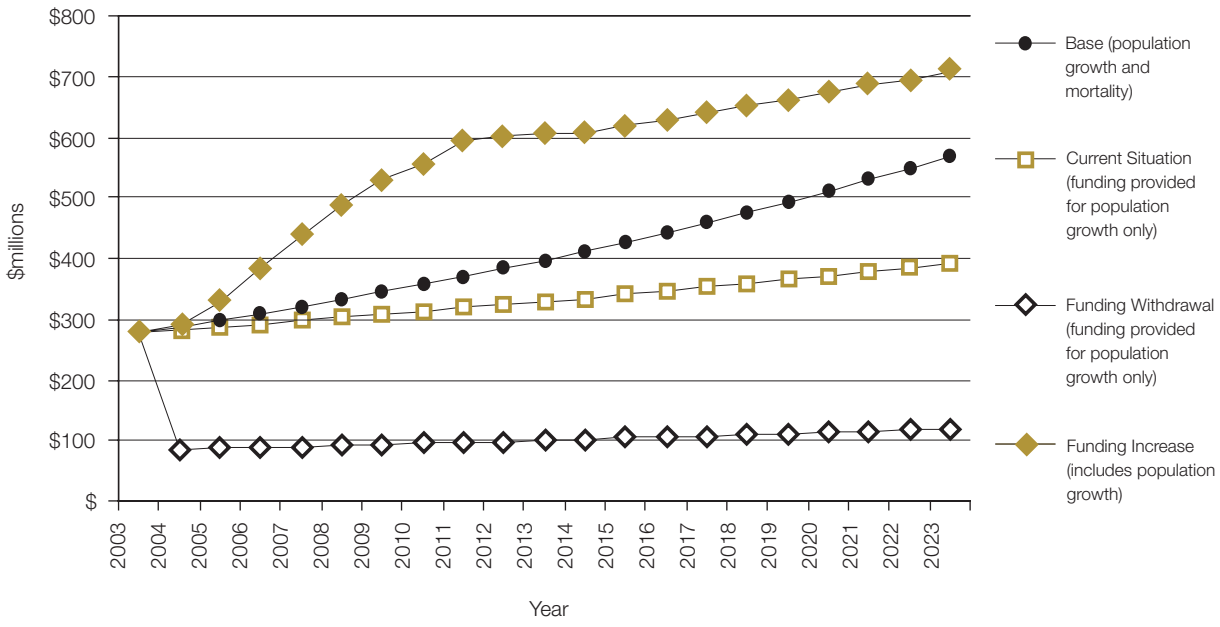
Scenario 3 – Funding Decrease Model – removes current Australian Government OATSIH grant investment from the Current Situation Model scenario and estimates the impact over time. The scenario was modelled to proxy the value of current investment in primary health care. The modelling indicated that while removal of Australian Government funding would result in an overall decrease in primary health care funding of 43 per cent, the impact on regions would vary depending on the level of Australian Government funding compared to state/territory funding.

Scenario 4 – Changing Mix Model – changes the mix of funding across disease categories (based on the Current Situation Model scenario). It involves moving $1 million from Health Promotion and Prevention to Primary Health Care (new cases) and Primary Health Care (existing cases), and the reverse– (that is moving $1 million from Primary Health Care (new and existing cases) to Health Promotion and Prevention). For the whole of the Indigenous population of Australia, $1 million represents less than 1 per cent of total primary health care funding.

Scenario 5 – Funding Increase Model – assumes an increase in funding compared with the Current Situation Model. Australian Government primary health care funding for the Indigenous population is doubled in real terms over ten years, through a mixture of additional grant funding and improved access to MBS/PBS. This will lead to an overall increase in total primary health care of 13 per cent annually over ten years on the assumption that Territory funding remains steady in real terms per capita.

Figure 3: Impact on funding resulting from scenarios modelled—graph shows the level of national funding under each of the scenarios modelled

Impact of Commonwealth funding for Scenarios modelled (OATSIH plus estimated MBS and PBS)



Optimal Investment Analysis – Based on the analysis undertaken in this modelling work, the optimal distribution of additional Australian Government resources across the HRGs for the nine preventable diseases is discussed. This Optimal Investment Analysis was undertaken based on organisational savings and societal benefits available.

4.7 Assumptions

4.7.1 Underlying Assumptions

The modelling of the cost-effectiveness of alternative investment approaches is based on a set of underlying assumptions. These assumptions outline the expected system response (HBG) to a targeted clinical intervention and investment (HRG). These assumptions were developed in a three-stage process:

- setting assumptions using previous HBG and HRG modelling which included research undertaken into the impact of primary health care interventions;[iii]
- updating assumptions using recent research into the impact of primary health care programs on Indigenous health;[iv v vi vii] and
- testing the assumptions by a number of technical experts against their clinical experience and providing additional data with which to assist with the refinement of the model.[viii ix]

In finalising the assumptions to be used, a conservative approach was adopted. The sensitivity of the assumptions was also tested as part of the sensitivity analysis. The assumptions are:

(a) increasing Health Promotion funding by 5 per cent each year will result in a 1 per cent decline in the number of people in the At Risk HBG;

(b) increasing funding for Prevention by 5 per cent each year will cause a 1 per cent decline in the number of New Cases each year;

(c) increasing funding for Clinical Primary Health Care (new cases) by 5 per cent each year will result in a 2.5 per cent reduction in Hospital Care HBG and Clinical Primary Health Care (existing cases);

(d) increasing funding for Clinical Primary Health Care (existing cases) by 5 per cent each year will result in a 1 per cent reduction in the Hospital Care HBG;

(e) increasing funding for Hospital Care by 5 per cent each year will result in a 5 per cent rise in the Hospital Care HBG; and

(f) once funding reaches the threshold for full basic delivery (see section 4.7.2 (h) below), the impact becomes one-fifth of the original impact before reaching the threshold (e.g. additional 5 per cent funding increases for Clinical Primary Health Care (existing cases) each year will only result in 0.2 per cent reduction in the Hospital Care HBG after funding reaches the threshold).

4.7.2 Other assumptions

(a) The model attributes only that impact of HRG activity that can be attributed to the health system. Health Promotion activity for example, involves several sectors including health, education, environmental health, legislation and others and therefore only the impact generated by the health system is included in the model. The literature reports various attempts to quantify the relative contribution of health system and non-health determinants. While there is a clear lack of consensus in regard to the approach, accuracy, generalisability, and appropriateness of the results, for the purposes of this model assumptions have been made based on available evidence. In general terms, attempts to quantify the importance, despite these limitations, attribute 15 to 30 per cent of health gains to health system interventions.[x] While little evidence is available, under this assumption a greater proportion of the total impact of primary health care and hospital care is attributed to the health system as compared to health promotion and prevention activity where other sectors are more likely to be involved.

The amount of the total impact attributable to the health care system for the various HRGs are:

- 10 per cent of the overall impact for Health Promotion;
- 20 per cent for Prevention;
- 60 per cent for Clinical Primary Health Care (new cases);
- 60 per cent for Clinical Primary Health Care (existing cases); and
- 95 per cent for Hospital Care.

(b) Forty-eight per cent of Community Care Centre activities for health promotion and prevention is related to the administration function of head office rather than health care clinical work.[xi]

(c) Net present value. As benefits from investment in one time period will impact on another, it is important for future benefits to be discounted to the initial investment time period. Determining net present value of investments is a valid way of discounting benefits that occur in a future time period. Net present value was calculated to convert future benefits or costs to current measures to discount costs or benefits in the future. Discount rates (of 0 per cent, 5 per cent and 8 per cent were assumed for all output measures and scenarios) were used to determine net present value. Sensitivity analysis was undertaken to determine how sensitive the outcome of the analysis was to different rates.

(d) Optimal investment share: saving/cost ratio 50 per cent and benefit/cost ratio 50 per cent were combined to estimate optimal investment shares.

(e) Societal benefit is measured by disability adjusted life years (DALYs). For a defined population, DALYs are the total number of years lost due to premature deaths and living with profound disabilities. Number of DALYs saved is a measure of benefits of a health care service to the whole society. The DALYs have been estimated from Australian and NT burden of disease studies. The process is as follows:

- estimate DALYs for each HBG;
- estimate disability adjusted life expectancy (DALE) for each HBG, which denotes how many years the person will remain healthy; and
- estimate DALYs saved on the basis of HBG changes of each option.

(f) In benefit–cost ratio calculations, $16 000 per DALY (average NT income reported by the ABS) has been assumed to compare impact of alternate investments.[xii]

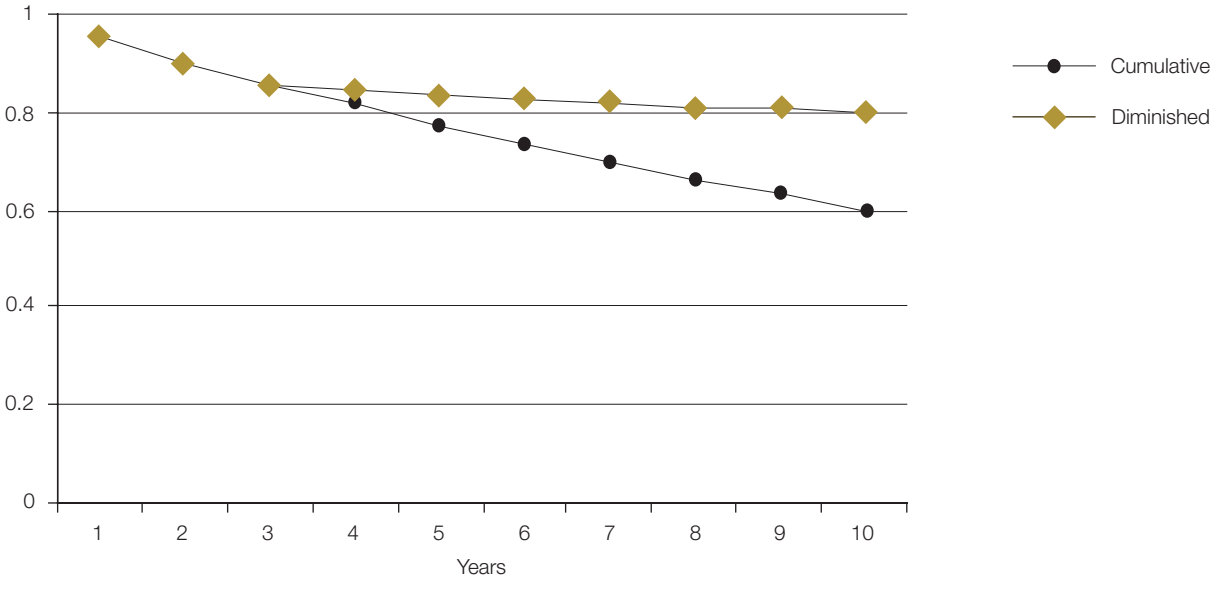
(g) Sensitivity analysis used the @Risk approach. All assumptions were analysed with a 5 per cent margin. One hundred simulations were generated for estimation of average key output measures and their uncertainty.

(h) The impact of diminishing returns on investment was also included in the underlying assumptions where relevant. This was done in recognition of the fact that the system response to a defined level of investment would begin to reduce as the level of investment increased and the health of the population improved. The model used to estimate the point of diminishing returns is based on a comparison of current investment levels, and investment levels required to provide effective services.[xiii xiv] These estimates show that the current level of investment in primary health care is approximately half that required to provide effective services. Therefore the point of diminishing returns is estimated to be at double the current level of investment. A simplified model for estimating the impact of diminishing returns (see Figure 4) is used for this analysis where diminishing returns are experienced after the initial funding level has been doubled.

- Stage 1 – Up to the threshold for full basic service delivery – the impact is 20 per cent of the increase in investment. For example, a funding increase of 25 per cent will cause a 5 per cent reduction.
- Stage 2 – Additional funding increases beyond full basic service delivery – the impact will be one-fifth of the original impact. For example, a funding increase of 25 per cent will cause a 1 per cent reduction (one-fifth of the original 5 per cent).

(i) The impact of withdrawing funding on a population is modelled using Stage 1 of the model used to estimate the impact of increasing funding (see (h) above) (i.e. the impact is not reduced due to diminishing returns associated with higher investments).

Figure 4: Diminishing effect of funding



5 Results

5.1 Scenario 1 – Base Model – assumes that the same levels of services are provided in line with changing mortality trends

Change in the total costs for Indigenous primary health care is largely driven by population change (size, life expectancy and mortality trends, see Table 5), burden of disease and injury (including mortality and morbidity) and government health policy. As population numbers increase, life expectancy becomes longer and burden of disease increases, the demand and the total cost for primary health care will increase. People who used to be healthy (not at risk) may move to other HBGs becoming 'at risk', 'in need of primary medical care' or in some cases 'requiring hospital care'.

The base model is based on the 2001 HBG/HRG patterns, population projections and mortality trends. Mortality trends are analysed using Australian Bureau of Statistics (ABS) mortality data for NT Indigenous Australians. Total estimated health care costs based on HBG/HRG base model are listed in Table 6. It is estimated that, if there is no significant change in policy, the health care system would face increasing disease burden. The total costs for the nine preventable diseases among NT Indigenous Australians alone will be nearly $100 million in ten years and $140 million in 20 years in real terms.

Table 5: Annual mortality trend, NT Indigenous Australians

HBG	HBG Name	Annual increase (%)
HP	Hypertension	1.2
DB	Diabetes	4.9
RD	Renal disease	3.4
IH	IHD	2.7
CB	COPD	1.1
RI	Respiratory infection	0.0
DR	Diarrhoea	0.0
MN	Malnutrition	0.0
SI	Skin infection	0.0

Table 6: Estimated total health care cost, NT Indigenous Australians, nine preventable diseases – Base Model ($'000)

HRG	HBG Name	2001	5 years	10 years	20 years
HP	Hypertension	3 007	3 390	3 798	4 708
DB	Diabetes	5 859	7 697	10 130	17 652
RD	Renal disease	24 927	31 736	40 171	63 571
CB	COPD	4 144	4 730	5 364	6 796
IH	IHD	6 583	7 971	9 620	13 901
RI	Respiratory infection	10 363	11 278	12 190	14 025
DR	Diarrhoea	4 621	5 029	5 435	6 253
MN	Malnutrition	2 334	2 540	2 746	3 159
SI	Skin infection	5 168	5 624	6 079	6 994
Total		**67 008**	**79 997**	**95 536**	**137 062**

The model uses actual expenditure and population for the Indigenous population of the NT, splitting it into groups of people treated across the continuum of care (prevention through to chronic) and the associated costs of the continuum of care. Taking diabetes as an example, in 2001 there were 57 000 Indigenous residents in the NT of whom 36 000 are identified as not at risk of diabetes, 14 000 as at risk, 540 who have presented with diabetes of which 130 are being treated in an acute setting (hospital) and 6600 in a maintenance manner (ongoing treatment through visits to the DMOs, GP, drugs, etc.). The health care cost associated with these groups is as follows:

- $15 spent on average on promotion for the not at risk group (which is the largest group);
- $49 on average spent on prevention for the at risk group;
- $1026 spent on diagnosis and treatment for the presenting group;
- $14 864 for hospitalisations; and
- $316 for chronic treatment.

Interpreting this data, prevention programs are cheap and target a large group, there is a mid-range of cost for diagnosis and treatment, and a very high cost for a small group of people if earlier forms of treatment fail and they end up in hospital. Primary health care funding is currently not adequate to meet the health care needs of Indigenous people, so only a proportion of people with diseases are detected and treated for those diseases. This is reflected in the coordinated care trial results at Attachment D, which show that it is likely that more than 1000 NT Indigenous Australians had diabetes that was not detected or treated.

Discussion/practical implications

The impact of non-communicable diseases discussed in this report result in chronic conditions that are cumulative over time. For example, early diabetes (which requires clinical care over the life-time) if not controlled increases the likelihood of cardio-vascular disease, eye disease, renal disease and sepsis (serious infections) that lead to septicemia (and death if untreated) and lower-limb amputations developing. If diabetes is poorly controlled, the individual concerned is significantly more likely to develop renal disease than someone whose illness is well controlled.

On the Tiwi Islands in the NT, a program of prevention, early diagnosis and treatment of high blood pressure reduced the frequency of end stage renal disease and led to a reduction in deaths in the 1990s.[xv]

The past inadequacies of primary health care have contributed to a population of Indigenous people with high acute health care needs. If primary health care had been adequate, people with diabetes would not have the advanced symptoms of the disease such as renal disease, sepsis and would not need amputations. Prevention and promotion now will reduce the future health costs associated with hospitalisations as people will not get the advanced symptoms. However, there still needs to be expenditure on the existing pool of people who have already developed advanced symptoms.

If health services respond to increases in demand for care for diseases discussed in this report, the results from demographic changes will ‘crowd out’ other health priorities. For instance in the NT every year hospital costs go up because diseases are not treated early and advanced symptoms develop. This means less money is available for prevention and primary medical care which leads to increased complications.

5.2 Scenario 2 – Current Situation Model – assumes no real per capita change in primary health care funding for these diseases

This scenario represents the current funding policy that only considers population growth and does not take into account increase in the burden of disease due to high mortality and disability. It clearly illustrates that as the real number of people with preventable diseases is increasing, without taking burden of disease into account, the HRG dollars per person would be reducing over time, so there will be fewer services per person. Consequently fewer people with preventable diseases will be diagnosed and treated, and more people become sicker and go to hospital.

Funding shortfalls due to higher health care needs are estimated to be $7 million in five years, $17 million in ten years and $46 million in 20 years (see Table 7). This is equivalent to a 1.9 per cent annual Budget cut in real terms.

Table 7: Estimated funding shortfall, NT Indigenous Australians, nine preventable diseases ($'000)

HRG	HBG Name	2006	2011	2021
HP	Hypertension	116	260	637
DB	Diabetes	1 321	3 239	9 723
RD	Renal disease	4 603	10 844	29 831
IH	IHD	220	489	1 187
CB	COPD	813	1 884	5 001
RI	Respiratory infection	0	0	0
DR	Diarrhoea	0	0	0
MN	Malnutrition	0	0	0
SI	Skin infection	0	0	0
Total		**7 074**	**16 716**	**46 380**

Discussion/implications

In the event that there is no increase in services for persons with these conditions, they will suffer a high cost in terms of increased loss of quality of life in the short term and, for many, an early death. In terms of costs to the health sector, not providing care in the early stages of disease may save money but only in the very short term. As conditions worsen for the individuals concerned, they will eventually be admitted to hospitals for emergency high cost care, which means governments eventually have to pay and they pay a lot more than if they had intervened early.

In the Torres Strait in 1999 enhanced primary health care was introduced which encompassed a simple recall system, managed by local healthcare workers and supported by a diabetes outreach service. This enhancement achieved significant improvements in diabetes care and reduced hospitalisations in a high-risk population.[xvi]

Not providing access to essential basic care severely disadvantages Indigenous populations, and not just in terms of health status. There is solid evidence that there is a population effect on economic growth – that poor health status has a detrimental impact on economic development.[xvii] Indigenous populations have a much lower level of socioeconomic status than non-Indigenous persons. If access to basic services is compromised then health status will only become worse and this will have a flow-on effect further compromising socioeconomic wellbeing.

5.3 Scenario 3 – Funding Decrease Model – removes current Australian Government OATSIH grant investment from Scenario 2 – Current Situation Model

This scenario illustrates the health impact to the NT Indigenous population if the current primary health care funding from the Australian Government were to be withdrawn. The purpose of this scenario was to illustrate the importance and value of the current primary health care resources, rather than to demonstrate the process of withdrawing funding.

Withdrawal of Australian Government funding will result in estimated five years savings of $23 million, ten years savings of $59 million, and 20 years savings of $104 million to the Australian Government with a 5 per cent discount for these nine categories of diseases. This withdrawal of funding of primary health care would lead to delayed diagnosis and treatment, more severe chronic conditions and more hospitalisations. The total increase of costs for the NT Government, and MBS and PBS would exceed $136 million in five years, $470 million in ten years, and $1261 million in 20 years (see Table 8).

Loss of healthy life would be 163 000 years in five years, 406 000 years in ten years, and 969 000 years in 20 years due to premature death and increased disability (see Table 9). This is equivalent to a loss of 2.6, 6.1 and 12.6 years per NT Indigenous person in 5, 10 and 20 years' time.

Table 8: Estimated funding impact on NT Government, hospital, MBS and PBS, NT Indigenous Australians, nine preventable diseases ($'000)

HRG	HBG Name	5 years	10 years	20 years
HP	Hypertension	-82	1 778	9 249
DB	Diabetes	7 955	31 921	107 478
RD	Renal disease	57 369	203 955	578 729
CB	COPD	8 071	27 194	67 607
IH	IHD	11 181	41 213	117 314
RI	Respiratory infection	24 131	77 556	178 330
DR	Diarrhoea	10 431	33 714	77 856
MN	Malnutrition	4 739	15 448	35 964
SI	Skin infection	11 929	38 497	88 771
Total		**135 726**	**471 275**	**1 261 298**

Table 9: Estimated Impact on DALYs, NT Indigenous Australians, nine chronic diseases – Australian Government funding withdrawal

HRG	HBG Name	5 years	10 years	20 years
HP	Hypertension	-25 885	-65 902	-144 924
DB	Diabetes	-27 062	-75 735	-227 584
RD	Renal disease	-42 437	-113 086	-296 787
IH	IHD	-10 408	-23 814	-49 394
CB	COPD	-15 914	-37 818	-89 970
RI	Respiratory infection	-16 128	-37 605	-71 360
DR	Diarrhoea	-6 666	-12 408	-19 643
MN	Malnutrition	-13 336	-27 049	-46 191
SI	Skin infection	-5 360	-12 343	-23 193
Total		**-163 196**	**-405 760**	**-969 046**

Discussion/practical implications

Any reduction in Australian Government funding would necessarily lead to a movement of resources away from health promotion and prevention, where the benefits of investment would not be felt immediately, towards hospital care to treat urgent and more severe cases of a disease. Investment in detection and treatment of new and existing cases would be likely to fall in favour of funding emergency hospital care. Such an investment strategy would lead to more people developing disease, fewer people being detected and treated adequately, and more people being admitted to hospitals with complications which ultimately could have been prevented.

A reduction in funding for the prevention of hypertension, for example, would lead to more people developing the condition. As funding for diagnosis and treatment would fall, many new cases would remain undetected and thus would not receive adequate treatment. Treatment is particularly important with hypertension as, of itself, it usually produces no symptoms. However the complications associated with poorly managed hypertension include renal disease, heart disease, heart attack and stroke. An increase in the number of complications would involve a reduction in the quality and quantity of life for patients and a higher number of hospital admissions leading to increased expenditure. This is demonstrated in Table 9, which shows that the withdrawal of Australian Government funding would, over five years, increase the number of DALYs resulting from hypertension by 25 885 disability adjusted life years.

Another example of the importance of not reducing funding for prevention programs comes from the Anangu Pitjantjatjara lands where a coordinated screening, immunisation and health care approach has increased the birth weight of children and reduced the number of hospitalisations[xviii].

5.4 Scenario 4 – Changing Mix Model – changes the mix of funding across disease categories (based on Scenario 2 – Current Situation Model)

This scenario demonstrates the changes in mix of funding categories between clinical care and public health, assuming the total funding constant.

Shifting $1 million from Clinical Primary Health Care (new cases) and Clinical Primary Health Care (existing cases) to Health Promotion and Prevention, will result in a gain of 14 000 DALYs in five years as a consequence of better prevention. However, this also leads to a loss of 18 600 DALYs in five years as a consequence of shifting resources away from primary health care (diagnosis/treatment and continuing care for chronic diseases) (see Table 10). Therefore, the benefit is offset by the loss. Shifting funding will result in a decrease in benefit in the source HRG and a marginal increase in benefit in the target HRG.

Table 10: Estimated Impact on DALYs, NT Indigenous Australians, nine preventable diseases – shifting funding by $1 million

	Shifting	Gains (in DALYs)		
		5 years	10 years	20 years
From	Clinical Primary Health Care for new/existing cases	-18 622	-45 489	-100 949
To	Health Promotion/Prevention	14 016	28 292	58 497
	Net impact	-4 606	-17 197	-42 451
	Per person (DALY)	-0.07	-0.26	-0.55
From	Health Promotion/Prevention	-14 016	-28 292	-58 497
To	Clinical Primary Health Care for new/existing cases	18 622	45 489	100 949
	Net impact	4 606	17 197	42 451
	Per person (DALY)	0.07	0.26	0.55

Discussion/practical implications

Examples from the CCTs where there has been increased primary health care show that the number of people going to hospital is reduced. However, for some diseases there may be higher referral rates as detection is increased. Examples of this impact include better diabetes management in the Torres Strait and Nganampa Health Council's services that impacted on childhood diseases resulting in reduced numbers of medical evacuations.

Given the poor health status of Indigenous populations in Australia, shifting funding from one area to another is little more than '*robbing Peter to pay Paul*'. Shifting funding from primary care to public health essentially means the priority is improvements in the longer term. If we shift funding from public health to primary care the reverse applies.

A decrease in funding for early intervention and ongoing clinical management would result in shortened life spans and increased disability. A decrease in funding for public health would mean communicable diseases are likely to increase and the prevalence of non-communicable diseases will increase over time. Hence, unless the two happen together any potential gains in population health from improving public health infrastructure would be offset by losses from lack of essential primary health care.

5.5 Scenario 5 – Funding Increase Model – assumes an increase in funding compared with Scenario 2 – Current Situation Model

This scenario represents the potential benefit of funding increase in primary health care for the NT Indigenous population. The level of funding increase simulates for the NT Indigenous population to reach the national current average in ten years.

This funding increase will save an additional 185 000 healthy life years in five years, 383 000 in ten years and 762 000 in 20 years, which would be otherwise be lost due to the nine preventable diseases. This is equivalent to a gain of 3.0 years per person in five years, 5.7 years per person in ten years, and 9.9 years per person in 20 years. Total benefit/cost ratio is 28 years for five years, 17 years for ten years and 12 years for 20 years with 5 per cent discount.

Table 11: Estimated benefit in DALYs, NT Indigenous Australians, nine chronic diseases – Australian Government funding increase

HRG	HBG Name	5 years	10 years	20 years
HP	Hypertension	27 318	47 321	32 085
DB	Diabetes	30 238	68 580	156 475
RD	Renal disease	47 049	99 106	185 042
CB	COPD	11 418	20 359	7 912
IH	IHD	18 046	36 909	77 072
RI	Respiratory infection	17 955	33 002	47 176
DR	Diarrhoea	9 301	24 054	93 026
MN	Malnutrition	17 466	42 062	143 505
SI	Skin infection	6 084	11 620	20 139
Total		**184 874**	**383 013**	**762 432**

Discussion/Practical implications

With a funding increase, more people would be diagnosed and treated which would reduce hospital costs (such as for dialysis). For many services, low funding levels would mean they only have the capacity to provide services of a reactive and emergency nature. These services would have a limited capacity to provide early detection and prevention services which form an essential component of the primary health care required for this population group in order to address the emerging epidemic of chronic disease. Expenditure on promotion and prevention would mean that people would understand more about their own health and they would feel better and take steps to improve their own health. Such progress is not linear though; it must be managed through a staged approach.

5.6 Optimal investment analysis

The purpose of this scenario is to evaluate the marginal effects of investment in individual services across the care continuum. These effects can be divided into two broad categories: organisational saving within the health sector, and benefit to the whole society.

5.6.1 Cost saving ratio (organisational savings)

This ratio includes the costs of any increase in investment and the resulting organisational savings due to a reduction in health expenditure. It does not include any reductions in mortality or morbidity that result from the investment.

For the purpose of saving health care resources, it is shown in this study that the first and second priorities are different for individual diseases (see Table 12). Clinical Primary Health Care (new cases) would be the first priority, and Clinical Primary Health Care (existing cases) the second priority for skin infection, diarrhoea, respiratory infection and IHD. Clinical Primary Health Care (existing cases) would be the first priority, and Clinical Primary Health Care (new cases) the second priority for hypertension, diabetes, renal diseases, COPD and malnutrition. Health Promotion would be the third priority for all diseases except malnutrition, followed by Prevention and Hospital Care in terms of saving resources.

The longer term shows a different pattern for individual diseases. In general, Health Promotion and Prevention look more promising in saving resources in the long term, but still less cost-effective than Clinical Primary Health Care. For all diseases except respiratory infection and diarrhoea, the first priority would still be Clinical Primary Health Care (existing cases). But for respiratory infection, Health Promotion and Prevention would be more important in saving health care resources and for diarrhoea, Primary Health Care would be more cost effective. For all diseases, Hospital Care would be the lowest priority for the purpose of saving health care resources.

Table 12: Saving/cost ratios for nine preventable diseases, NT Indigenous Australians (5% discount)

HBG	Health Promotion	Prevention	Clinical Primary Health Care (new cases)	Clinical Primary Health Care (existing cases)	Hospital Care
Five years					
Hypertension	-0.20	-0.48	0.48	7.98	-0.86
Diabetes	1.23	0.50	1.95	22.50	-0.97
Renal disease	8.89	5.93	5.39	29.59	-0.98
IHD	0.96	0.51	13.89	12.49	-0.98
COPD	3.63	2.46	7.17	7.75	-1.00
Resp infection	23.81	17.93	20.96	13.05	-0.96
Diarrhoea	9.97	4.87	39.63	16.71	-0.97
Malnutrition	3.60	4.20	11.52	60.49	-0.98
Skin infection	12.71	5.59	50.02	74.76	-0.99
Ten years					
Hypertension	0.01	-0.29	0.31	7.98	-0.86
Diabetes	2.06	1.28	1.30	22.50	-0.97
Renal disease	12.07	9.09	3.94	29.59	-0.98
IHD	1.61	1.16	10.53	12.49	-0.98
COPD	4.83	3.75	5.74	7.75	-1.00
Resp infection	29.30	24.25	17.71	13.05	-0.96
Diarrhoea	12.39	6.82	33.56	16.71	-0.97
Malnutrition	4.81	5.94	9.70	60.49	-0.98
Skin infection	15.32	7.79	42.37	74.76	-0.99
Twenty years					
Hypertension	0.14	-0.12	0.05	7.98	-0.88
Diabetes	3.50	2.60	0.72	22.50	-0.98
Renal disease	16.23	13.36	2.59	29.59	-0.98
IHD	2.30	1.94	7.30	12.49	-0.98
COPD	5.56	4.82	4.02	7.75	-1.00
Resp infection	30.90	28.00	13.21	13.05	-0.96
Diarrhoea	13.10	7.99	25.20	16.71	-0.97
Malnutrition	5.32	6.97	7.16	60.49	-0.98
Skin infection	15.80	9.10	31.85	74.76	-0.99

5.6.2 Cost benefit ratio (societal benefits)

This ratio includes only the health benefits derived from changing investment patterns. It does not include any organisational savings that may result from an increase in investment. The health benefits are measured in DALYs which are then valued at $16 000 each year.

For the purpose of reducing burden of disease for the society, it is shown in this study that in general investment the highest priority needs to be Clinical Primary Health Care (new cases) for all diseases apart from skin infection, in which Clinical Primary Health Care (existing cases) is the highest priority (see Table 13). In the longer term (comparing 10 years projection with 5 years projection), benefit cost ratio shows a similar pattern. It is demonstrated that early diagnosis and prompt treatment are equally important in longer-term analysis.

Table 13: Benefit/cost ratios for nine preventable diseases, NT Indigenous Australians (5% discount)

HBG	Health Promotion	Prevention	Clinical Primary Health Care (new cases)	Clinical Primary Health Care (existing cases)	Hospital Care
Five years					
Hypertension	5.18	9.09	82.86	11.82	-2.08
Diabetes	9.27	10.31	49.67	48.25	-3.25
Renal disease	16.96	20.53	50.56	5.25	0.87
IHD	8.49	7.90	195.14	7.76	6.45
COPD	17.67	14.87	81.55	14.99	7.90
Resp infection	10.05	15.52	52.18	28.97	-3.26
Diarrhoea	3.86	0.98	80.60	11.19	-1.00
Malnutrition	5.65	10.01	125.70	55.44	-1.43
Skin infection	1.94	1.92	44.77	50.98	-1.07
Ten years					
Hypertension	4.43	8.44	42.75	7.98	-0.97
Diabetes	8.86	11.43	25.01	35.25	-1.69
Renal disease	15.50	21.16	26.02	3.71	0.43
IHD	7.49	7.90	101.93	5.41	3.14
COPD	14.61	13.69	42.42	10.07	3.66
Resp infection	8.05	13.56	28.29	18.98	-1.46
Diarrhoea	3.09	0.85	49.95	7.33	-0.45
Malnutrition	4.69	8.74	73.78	36.32	-0.64
Skin infection	1.51	1.68	24.42	33.40	-0.48
Twenty years					
Hypertension	4.67	9.62	25.11	7.34	-1.23
Diabetes	12.50	18.55	16.92	36.22	-2.37
Renal disease	19.44	29.69	17.24	3.66	0.58
IHD	8.36	10.41	67.94	5.23	4.16
COPD	14.40	15.33	25.29	9.21	4.59
Resp infection	7.44	13.67	17.87	16.67	-1.76
Diarrhoea	2.86	0.86	42.77	6.44	-0.54
Malnutrition	4.47	8.82	56.71	31.89	-0.77
Skin infection	1.37	1.69	15.70	29.32	-0.58

5.6.3 Optimal investment

One hundred simulations have been undertaken to iron out some uncertainty of the model. By assuming a 50:50 split between organisational saving and societal benefits, the model provides advice on the distribution of funds that would bring the greatest impacts in the form of an investment share ratio. An investment share ratio is the percentage of new resources directed to each type of care for each disease category.

Using this approach the model shows that investments are required across the continuum of care, with the greatest value achievable with investments in primary health care (see Table 14). This table shows the optimal share of resources that should be invested in each type of care for each disease, for three different time periods (5, 10 and 20 years) if access to resources is increased from its current projected level. The investment share for each time period adds to 100 per cent of the increase in resources, with four types of care having their resources increased (Health Promotion, Prevention, and Clinical Primary Health Care new and existing cases) while hospital care has a reduction in resourcing. Within primary health care the largest resource requirements are for identifying and treating new cases of the condition as well as enhancing treatment for people who already have the condition. Investment in prevention and promotion are also important to reduce the burden of illness, with action in areas such as respiratory infection, renal diseases and skin infection bringing the greatest benefits.

Table 14: Optimal investment share ratios for nine preventable diseases, NT Indigenous Australians (organisational saving and societal benefit combined, 50/50 split)

HBG	Health Promotion (%)	Prevention (%)	Clinical Primary Health Care (new cases) (%)	Clinical Primary Health Care (existing cases) (%)	Hospital Care (%)
Five years					
Hypertension	0.20	0.34	3.59	1.31	-0.18
Diabetes	0.52	0.49	2.32	4.34	-0.24
Renal disease	1.62	1.48	2.71	3.22	-0.06
IHD	0.46	0.39	9.74	1.60	0.18
COPD	1.12	0.88	4.21	1.42	0.24
Resp infection	2.84	2.48	4.35	2.56	-0.24
Diarrhoea	1.17	0.53	7.46	2.17	-0.14
Malnutrition	0.61	0.85	6.53	8.49	-0.16
Skin infection	1.37	0.65	6.98	9.75	-0.15
Ten years					
Hypertension	0.30	0.55	2.96	1.34	-0.15
Diabetes	0.81	0.91	1.84	4.65	-0.21
Renal disease	2.26	2.35	2.17	3.19	-0.07
IHD	0.67	0.66	8.02	1.61	0.12
COPD	1.48	1.31	3.47	1.46	0.15
Resp infection	3.46	3.33	3.69	2.59	-0.20
Diarrhoea	1.44	0.74	6.75	2.16	-0.13
Malnutrition	0.80	1.19	6.01	8.49	-0.14
Skin infection	1.62	0.89	5.88	9.70	-0.13
Twenty years					
Hypertension	0.39	0.77	2.04	1.40	-0.19
Diabetes	1.36	1.76	1.44	5.20	-0.29
Renal disease	3.21	3.75	1.66	3.28	-0.05
IHD	0.91	1.04	6.23	1.68	0.24
COPD	1.73	1.73	2.45	1.53	0.27
Resp infection	3.72	3.93	2.78	2.66	-0.24
Diarrhoea	1.55	0.87	6.00	2.20	-0.14
Malnutrition	0.90	1.42	5.31	8.68	-0.16
Skin infection	1.70	1.05	4.48	9.91	-0.15

Greater Engagement Model

While investment in other sectors such as education and housing cannot replace health services, it is acknowledged that investment in other sectors will have a positive compounding effect when undertaken in conjunction with improved health services.

To achieve optimal health care outcomes, the health care system must engage the whole society. Action taken to improve health can also involve other sectors (such as education and housing). It can also be done in such a way that local people become more engaged on health issues and take greater responsibility for improving health (at the individual, family and community level). If this were the case, modelling indicates that the benefits of investments outlined above could be increased by around 35 per cent (i.e. 35 per cent more DALYs could be saved). See Table 15.

Under the Greater Engagement Model the components of activity attributable to the health care system are increased to:

- 20 per cent of the overall impact for Health Promotion activity;
- 30 per cent for Prevention;
- 70 per cent for Clinical Primary Health Care (new cases);
- 70 per cent for Clinical Primary Health Care (existing cases); and
- 95 per cent for Hospital Care.

Table 15: Optimal investment share ratios for nine preventable diseases, Greater Engagement Model, NT Indigenous Australians (organisational saving and societal benefit combined, 50/50 split)

HBG	Health Promotion (%)	Prevention (%)	Clinical Primary Health Care (new cases) (%)	Clinical Primary Health Care (existing cases) (%)	Hospital Care (%)
Five years					
Hypertension	0.33	0.42	3.35	1.28	-0.16
Diabetes	0.76	0.58	2.18	4.20	-0.21
Renal disease	2.06	1.65	2.56	3.21	-0.07
IHD	0.68	0.46	9.19	1.57	0.12
COPD	1.58	1.01	3.98	1.38	0.17
Resp infection	3.10	2.61	4.20	2.48	-0.21
Diarrhoea	1.27	0.54	7.23	2.14	-0.13
Malnutrition	0.75	0.94	6.18	8.34	-0.15
Skin infection	1.42	0.67	6.85	9.61	-0.14
Ten years					
Hypertension	0.47	0.65	2.69	1.29	-0.14
Diabetes	1.15	1.04	1.69	4.42	-0.19
Renal disease	2.85	2.59	2.01	3.17	-0.07
IHD	0.96	0.75	7.39	1.58	0.07
COPD	2.04	1.47	3.21	1.40	0.10
Resp infection	3.76	3.49	3.52	2.48	-0.17
Diarrhoea	1.56	0.75	6.44	2.11	-0.12
Malnutrition	0.98	1.29	5.55	8.26	-0.13
Skin infection	1.68	0.91	5.72	9.50	-0.12
Twenty years					
Hypertension	0.58	0.87	1.79	1.33	-0.16
Diabetes	1.88	1.96	1.28	4.85	-0.24
Renal disease	4.01	4.06	1.49	3.24	-0.06
IHD	1.25	1.15	5.57	1.63	0.15
COPD	2.32	1.89	2.21	1.44	0.18
Resp infection	4.02	4.07	2.60	2.50	-0.20
Diarrhoea	1.67	0.88	5.58	2.14	-0.13
Malnutrition	1.08	1.51	4.76	8.37	-0.15
Skin infection	1.76	1.07	4.33	9.62	-0.14

Figure 5: Optimal investment share (standard engagement): 100 simulations on optimal investment shares, nine preventable diseases, NT Indigenous population, five years, based on 50% organisational savings and 50% societal benefits, 2001–2006

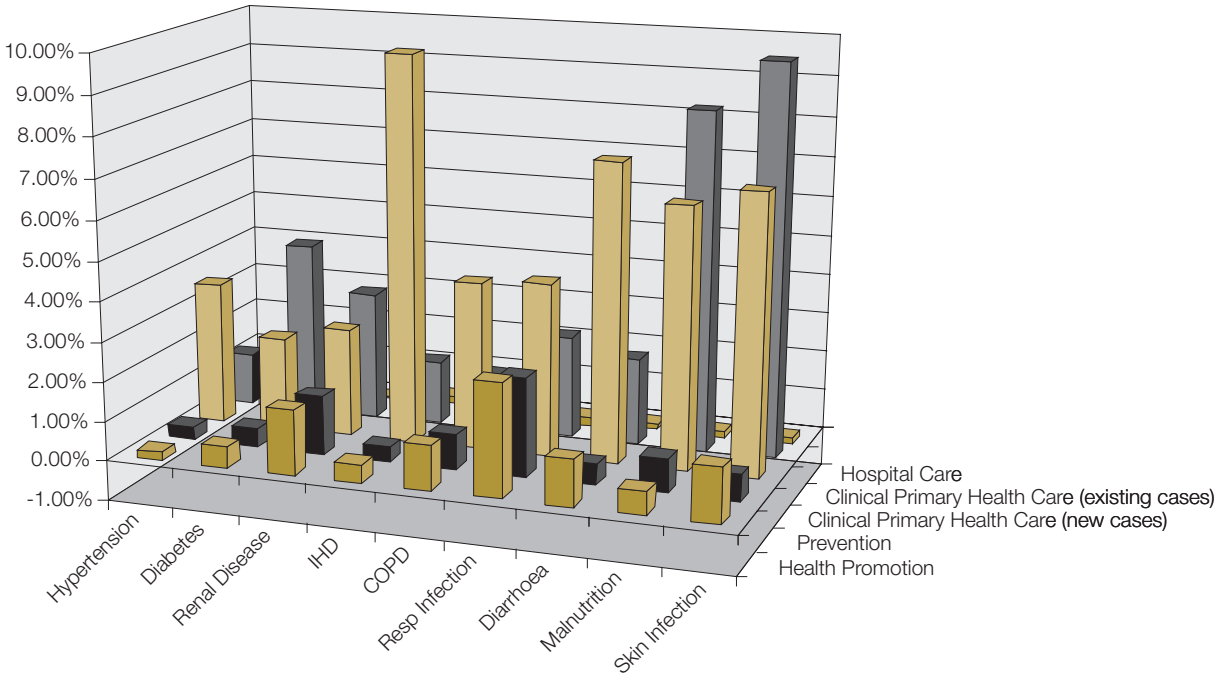
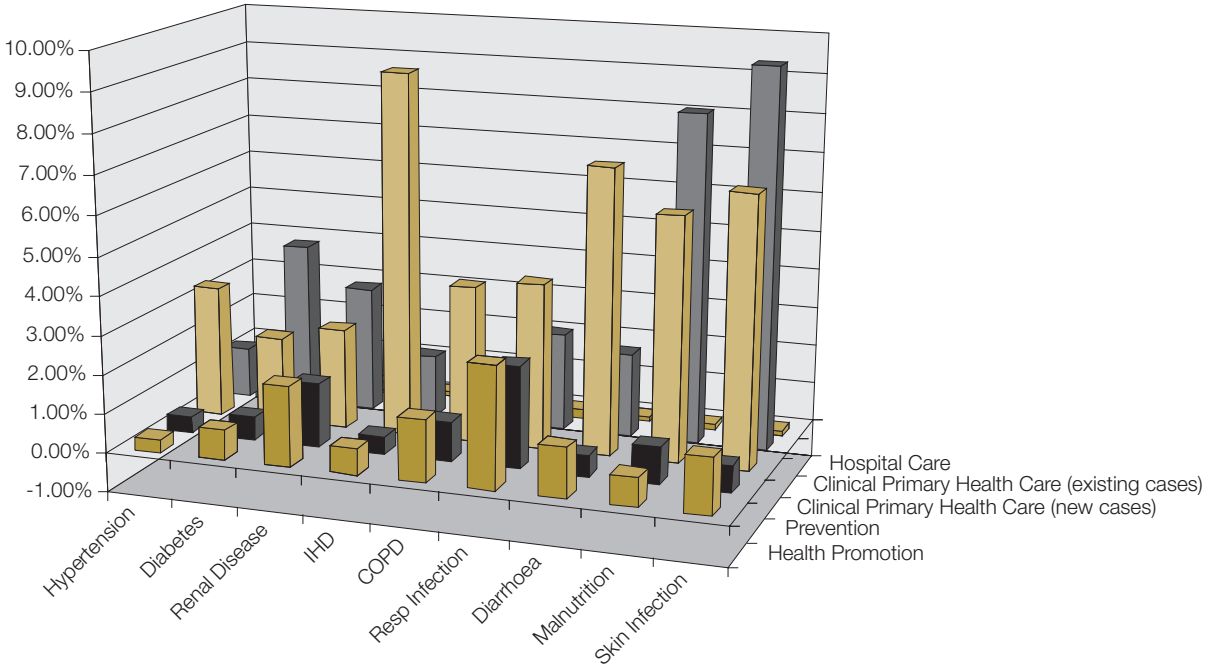


Figure 6: Greater Engagement Model: 100 simulations on optimal investment shares, nine preventable diseases, NT Indigenous population, five years, based on 50% organisational savings and 50% societal benefits, 2001–2006



5.7 Impact of time on investment decisions

Figures 5 and 6 demonstrate the optimal investment share across the nine preventable diseases. These graphs use a five-year timeframe for assessing organisational and societal benefits. If we are to align the allocation of health resources to population health outcomes, a longer-term view is required. The benefits of investment in Health Promotion and Prevention in particular become greater in the longer term.

This analysis shows that with a longer-term view, the proportion of total funding directed towards these two activities, Health Promotion and Prevention becomes greater (see Figures 7–9).

As shown, for all disease categories (particularly the chronic diseases hypertension, diabetes, renal disease, ischaemic heart disease and COPD) taking a 20-year view for investment decisions results in a doubling, and in some cases a tripling, of the proportion of overall investment directed towards Health Promotion and Prevention activity, as compared to a shorter term five year analysis.

Figure 7: Optimal investment: five-year analysis

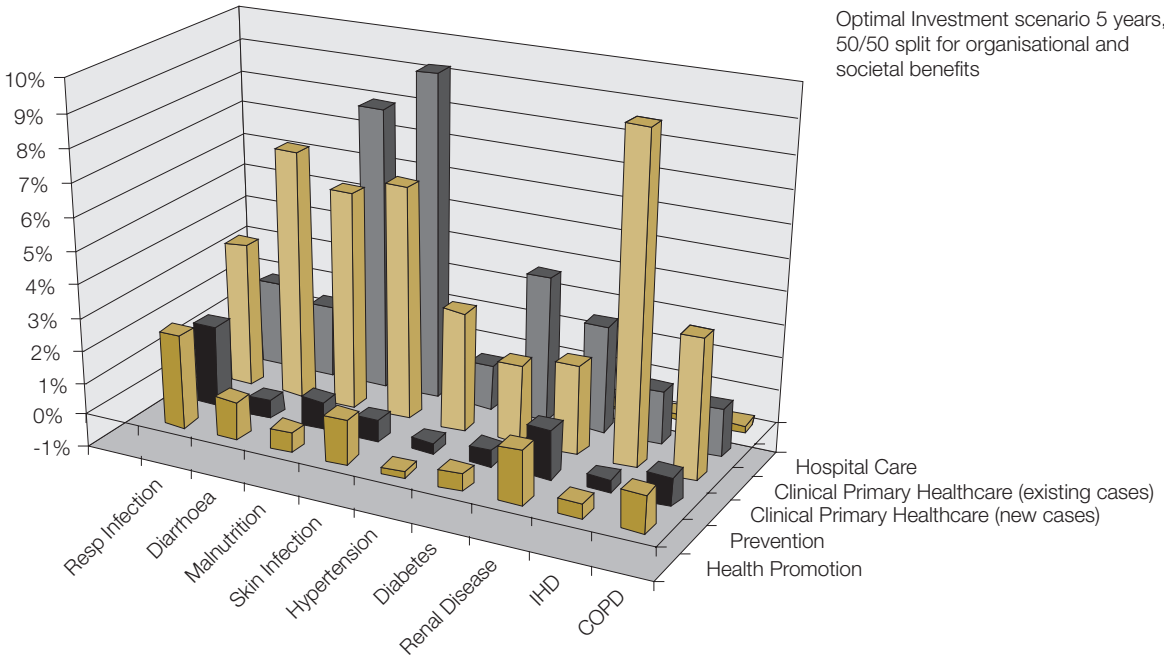


Figure 8: Optimal investment: 10-year analysis

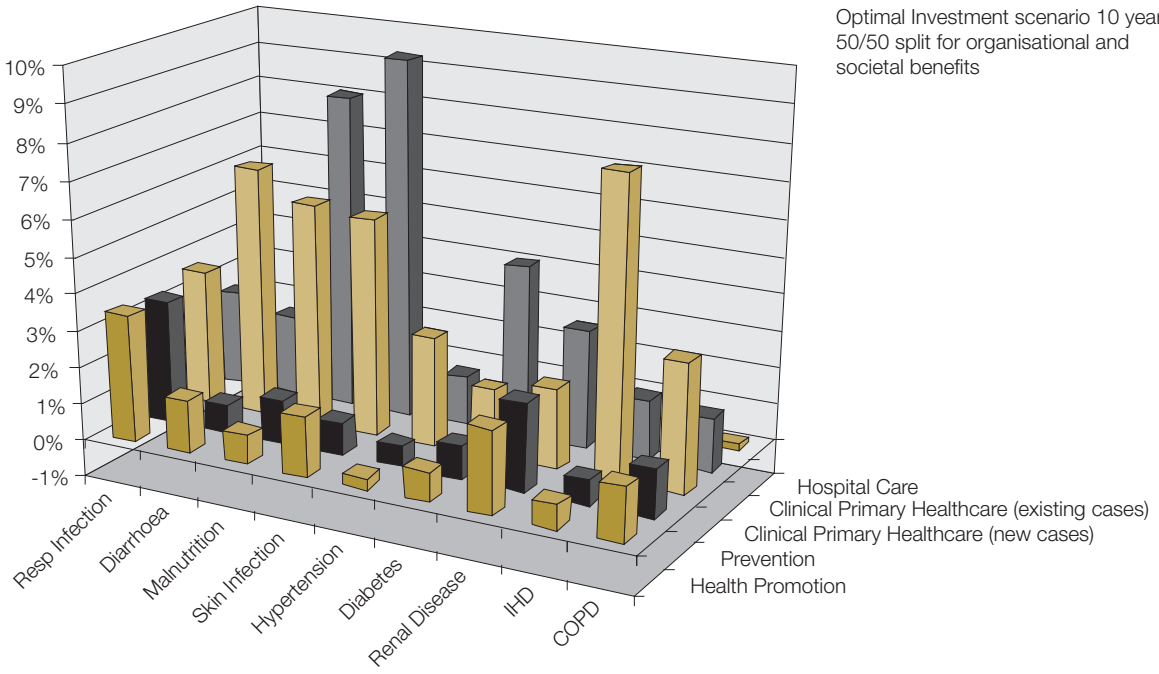
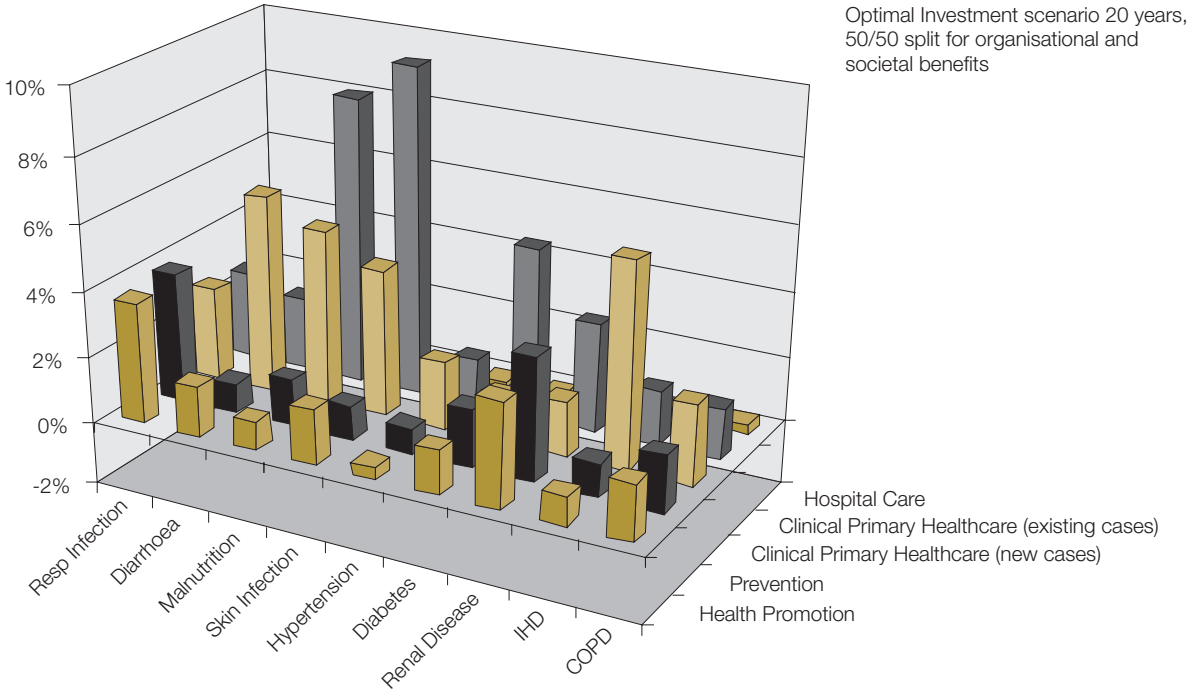


Figure 9: Optimal investment: 20-year analysis



6 Sensitivity analysis

There are 18 key assumptions in the HBG/HRG model including percentages of annual investment (5) and related impacts on health outcomes (5), interest rate (1) and shares between organisational saving and societal benefit (2). In the sensitivity analysis, it is assumed that all key assumptions are subject to an error of 5 per cent of the mean which follows a normal distribution. One hundred simulations show that the output measures (optimal investment share) are robust. Standard error of the mean output measure is approximately 10 per cent.

7 Discussion

The authors are often asked – *how much should be allocated by governments to improve Aboriginal and Torres Strait Islander health?* While there is no correct answer there are a number of ways to address the question.

In the first instance it will depend on the relative value and cost assigned by the funder compared to other demands on the public purse. Second, it will depend on the mix of funding sources. In a country where public funds are the key financial source, a higher percentage of funds will need to be allocated than in a country where a private health insurance or out-of-pocket payments are significant sources of health financing. In respect to Aboriginal and Torres Strait Islander populations, in general, because of their lower socioeconomic status, it is likely that they will be less able to afford private health insurance and out-of-pocket payments at the level the rest of the population can afford. Consequently, allocations to this group should be marginally higher than to the Australian population at large.

Third, needs-based allocation formulae are often used to allocate resources between different population groups. While such formulae take account of the epidemiological profile of the population and (hopefully) the differential costs/prices that occur due to geographic dispersion and other factors, what is often missing is consideration of the cost-effectiveness of the mix of services provided. In the context of our target population, many of whom live in rural and remote settings, the level and mix of expertise required to provide efficient and effective services that are possible in urban settings, is often unachievable. Hence, alternate ways to manage and provide services/interventions may mean costs will be higher than in urban situations.

The more relevant question may be – *what is an appropriate funding base for primary care?* This will require ensuring population-based funding takes account of the need for comprehensive primary care services and specific investments for health promotion and prevention that are appropriate to address the rising tide of chronic disease. The high and increasing prevalence of chronic disease is not just a phenomenon of this target population but a worldwide concern. By 2020 chronic diseases are expected to account for two-thirds of the global burden of disease with associated high burden on governments for funding health care. In many countries, including Australia and in particular in remote and rural areas where many Aboriginal and Torres Strait Islander people live, current service delivery models are geared more to acute illness rather than long-term chronic disease management. In the acute care model the treatment is primarily short-term and focused on the disease process and the technology to treat the problem. To address chronic disease the model of care required is medium- to long-term and focused on the whole person and the environment in which he or she lives. Hence the traditional disease based acute care service delivery model will have to be realigned to address chronic disease—this is what is meant by comprehensive primary care.

The aforementioned analysis has sought to inform debate as to the likely impact of three investment decisions and one disinvestment decision with regard to comprehensive primary health care for Aboriginal

and Torres Strait Islander people. The current situation was used as the base model. The potential impact of changes in terms of effectiveness (measured as DALYs saved) and health care expenditure was modelled over five years, ten years and 15 years.

This investment analysis used the NT HBG/HRG classification system as the base information model. The approach to scenario modelling taken in this study allowed for the examination of a range of alternatives in the absence of perfect information for the purpose of guiding decision making. The underlying assumptions were informed by a review of relevant literature and expert opinion. Experts in Indigenous health, economics and epidemiology also provided advice. Following a review of the underlying assumptions and the approach taken a number of refinements were made and the analysis re-run.

An existing population dataset was updated and extrapolated to the NT Aboriginal and Torres Strait Islander population as a whole. The model was refined, including updating for population projections, current disease burden, service use and price changes. Where possible, updated assumptions were used regarding the link between services and impacts for patients, especially where better information was obtained from the literature or from experts in the field. A series of 'what if' analyses were undertaken to explore the implications of alternate investment and disinvestment assumptions with regard to selected adult and childhood chronic diseases. Chronic disease is a major and increasing problem for Aboriginal and Torres Strait Islander people. It is the main reason for the significant gap between Aboriginal and Torres Strait Islander life expectancy and the remainder of the Australian population. Addressing chronic disease requires a strong focus on prevention and management, with particular focus on preventing the development of high cost complications related to diseases such as hypertension and Type 2 diabetes. Managing the growing 'epidemic' of chronic disease requires realignment of the service delivery model from an acute care model to a chronic care model, with a stronger focus on comprehensive primary care. Consequently, a subset of chronic diseases was selected as the basis of this investment analysis.

In summary, key findings of the analysis follow.

Projecting forward the potential impact of the current situation (base model) for the selected diseases it was found that, if funding allocations do not take account of increasing mortality and disability, the resultant shortfalls in funds required to effectively intervene will be approximately $7 million in five years, $17 million in ten years and $46 million in 20 years.

To gain some understanding of the impact of the current level of Australian Government investment in primary care, the consultants undertook to explore the potential impact on the NT population of withdrawing the OATSIH grant funding. It has been estimated that withdrawal of this Australian Government funding would result in five years savings of $23 million, ten years saving of $59 million, and 20 years savings of $104 million to the Australian Government with a 5 per cent discount for these nine categories of diseases. This withdrawal of funding of primary health care would lead to a delay in diagnosis and treatment, more severe chronic conditions and more hospitalisations. The total increase of costs for the NT Government, and MBS and PBS would exceed $136 million in five years, $470 million in ten years, and $1261 million in 20 years. Loss of healthy life would be 163 000 years in five years, 406 000 in ten years, and 960 000 in 20 years due to premature death and increased disability. This is equivalent to a loss of 2.6, 6.1 and 12.6 years per person in 5, 10 and 20 years time respectively.

Changing the way in which funds are allocated in an environment of no new investment showed that shifting $1 million from Clinical Primary Health Care (new cases) and Clinical Primary Health Care (existing cases) to Health Promotion and Prevention would result in a gain of 14 000 DALYs in five years as a consequence of better prevention. However, this also would lead to a loss of 18 600 DALYs in five years as a consequence of shifting resources away from primary health care (diagnosis/treatment and continuing care for chronic diseases). Therefore, the benefit would be offset by the loss. Shifting funding would result in a decrease in benefit in the source HRG and a marginal increase in benefit in the target HRG.

The potential impact of increased investment was also modelled under the Funding Increase Model. This funding increase would save an additional 185 000 healthy life years in five years, 383 000 in ten years and 762 000 in 20 years which would be otherwise lost due to the nine preventable diseases. This is equivalent to a gain of 3.0 years per person in five years, 5.7 years per person in ten years, and 9.9 years per person in 20 years. Total benefit/cost ratio would be 28 for five years, 17 for ten years and 12 for 20 years with 5 per cent discount.

Based on the above findings further work was undertaken to determine the optimal investment scenario. One hundred simulations were undertaken to iron out some uncertainty of the model. By assuming 50:50 split between organisational savings and societal benefits, the model provides advice on the distribution of funds that would bring the greatest impacts.

Using this approach the model shows that investments are required across the continuum of care, with the greatest value achievable with investments in primary health care. Within primary health care the largest resource requirements are for identifying and treating new cases of the condition as well as enhancing treatment for people who already have the condition. Investment in prevention and promotion are also important to reduce the burden of illness, with action in areas such as respiratory infection, renal diseases and skin infection bringing the greatest benefits.

For the purpose of saving health care resources, it is shown in this study that the first and second priorities are different for individual diseases;

- Clinical Primary Health Care (new cases) is the first priority, and Clinical Primary Health Care (existing cases) is the second priority for skin infection, diarrhoea, respiratory infection and IHD.
- Clinical Primary Health Care (existing cases) is the first priority, and Clinical Primary Health Care (new cases) is the second priority for hypertension, diabetes, renal diseases, COPD and malnutrition.
- Health Promotion is the third priority for all diseases except malnutrition, followed by Prevention and Hospital Care in terms of saving resources.

The longer term shows a different pattern for individual diseases.

- In general, Health Promotion and Prevention look more promising in saving resources in the long term, but are still less cost-effective than Clinical Primary Health Care.
- For all diseases except respiratory infection and diarrhoea, the first priority is still Clinical Primary Health Care (existing cases). But for respiratory infection, Health Promotion and Prevention are more important in saving health care resources and for diarrhoea, Clinical Primary Health Care is more cost effective.
- For all diseases, Hospital Care is the lowest priority for the purpose of saving health care resources.

For the purpose of reducing burden of disease for the society, this study predicts that in general, the highest investment priority is Clinical Primary Health Care (new cases) for all diseases apart from skin infection, in which Clinical Primary Health Care (existing cases) is the highest priority. In the longer term (comparing the 10 years projection with the 5 years projection), the benefit-cost ratio shows a similar pattern. It is demonstrated that early diagnosis and prompt treatment are equally important in longer-term analysis.

The potential impact of achieving higher engagement from other sectors which have an influence on health, including education and environmental health, was also assessed. Analysis predicts that it is possible to increase benefits by around 35 per cent if services can be delivered in a way that better meets the needs of people at the local level and enables people to take greater responsibility for their health.

While the study has been able to demonstrate the potential impact in changes in investment in primary health care for Aboriginal and Torres Strait Islander people, if changes in the mix of investment and or new investments are to be maximised then a number of key issues will need to be considered:

i. Achieving a sector-wide response.

Changing or increasing investments in comprehensive primary health care, while essential is not sufficient. It must be developed and provided within the context of the broader health sector. Chronic diseases are the number one problem facing the target population and there is evidence to suggest that if we can get the service delivery model right for chronic disease then we will get it right for all diseases. Why? Because chronic disease prevention and control is complex and requires reorientation of service models to provide individual patient-focused care that includes a high component of individual and community action to address risk factors and self (patient) management of the disease/problem. This has relevance to the management and prevention of communicable diseases as well.

In Australia, hospitals are increasingly changing their service delivery model, lengths of stay are decreasing and discharged patients are often in need of sub-acute care (previously provided in hospitals) in community settings. Further, persons with some acute problems are being treated in outpatient, general practice and community health clinics. Of concern is the requirement for primary care providers in community clinics in Aboriginal and Torres Strait Islander communities to provide acute and sub-acute care that was not previously provided without additional funding. Comprehensive primary health care providers/models, if they are to be efficient and effective, must in some way interface with acute care providers/models.

ii. Integrated service delivery is well recognised as an appropriate way to provide a sector-wide response in a cost-effective manner to address health care needs across the care continuum.

To achieve comprehensive primary care for Aboriginal and Torres Strait Islander people, the Australian Government Department of Health and Ageing has identified the need for providing services that are currently not in place, changing the mix and level of services and, providing such services in an integrated way. Integration must occur within primary care and between primary care and acute care systems.

iii. Health care decision makers need support to make the right decisions.

Decision making in every day life is difficult enough but when it comes to decision making in the health sector it is even more so. Individuals are often stressed when faced with the need to make a major decision, the complexity of multiple options, the uncertainty about the likely outcomes and the distressing feeling of trying to weigh all conflicting scenarios. Supporting decision-making is seen as essential if changes are to be made at the organisational and service delivery level to develop the sustainable and comprehensive primary care that is required to address the expanding chronic disease epidemic.

Decision making in the health care sector impacts on many players, including those in need of care, the population in general, health care providers (both private and public funded), health insurance agencies and a range of government agencies. When it comes to decision making, which is done on behalf of others at the policy development and service management levels in the health care sector, the uncertainty that the impact of the decisions will have and the number of decision makers increases—thus raising the level of conflict and stress.

There is also the time factor. Often, through no fault of the decision makers, major decisions have to be made in response to internal and external pressures in a matter of days and sometimes hours—decisions that many, including economists, would like to be supported by more informed debate if not in-depth analysis.

iv. Achieving the right mix of response.

If decision makers wish to take a whole of population approach to addressing health care needs with regard to prevention and management of health-related issues, an integrated response is needed at

the planning, purchasing and service management levels. This will require input from a broad range of health-related people including politicians, community representatives, managers, health care professionals and organisational specialists. It is difficult to understand all issues especially in the short time frame decision makers often need to respond. The establishment of a standard approach, or agreed information model, to quantify health services (information on health care needs, outputs and expenditure) can help inform decision making and support policy development and service implementation. However, this is lacking in Australia. While there has been considerable investment in understanding how hospitals operate, very little has been invested in understanding how the rest of the health sector works. An agreed approach to classifying and costing health services across the entire care continuum is needed.

To answer the question, what is the appropriate mix of services to be purchased across the care continuum, in terms of health gain and cost, we need first to create an understanding of the health sector as a whole. The UK CASEMIX office has created such a model—the Health Care Framework. It allows for linking of information on health care needs, services response, costs and outcomes across the care continuum.

The Health Care Framework (HCF) is based on the HBG/HRG classification and is an information model that helps us to understand the complex system of the health care sector. It provides a structure that allows for identification and consideration of issues across the care continuum. The framework provides a sound foundation for exploring and modelling the impact of alternative planning and purchasing strategies.

If we are to develop a shared understanding of what is happening with regard to service delivery and expenditure on Aboriginal and Torres Strait Islander health then we need a classification system that allows for comparison of effort across sectors in terms of care packages/services provided (Casemix). Such a classification is required to allow mapping of packages of care/services and costs to the HBG/HRG classification. Prototypes for this comparison have been developed and it is recommended that these be further developed and tested for their relevance in providing a shared language for classifying and costing services for Aboriginal and Torres Strait Islander populations.

v. The importance of comparing the cost-effectiveness of a range of different approaches.

Why is it important to compare a variety of health interventions? Resources are scarce and to undertake interventions that are not the most appropriate in terms of their cost-effectiveness and acceptance by the target group is clearly wasting resources. It is unlikely that managers and clinicians have the time to explore the best way to proceed for the multitude of interventions that take place on a daily basis. Further, it is not just a matter of going to the literature to see what is recommended as the most cost-effective way to prevent or treat a particular health problem. We need to take into account the best way to proceed given the local situation (i.e. availability of required expertise, equipment and medication).

Health systems have multiple goals, but the fundamental reason they exist is to improve health. Yet health systems with very similar levels of health expenditure per capita show wide variations in population health outcomes. Part of the difference can be explained by variation in non-health system factors, such as the level of education of the population. But part can also be explained by the fact that some systems devote resources to expensive interventions with small effects on population health, while at the same time low cost interventions with potentially greater benefits are not fully implemented.

Policy makers (funders) and purchasers need to assess the appropriate mix of a range of interventions for their settings, taking into account other goals of the health system as well as the improvement of population health. They also need to take into account health system infrastructure, staff expertise, equipment, buildings and the economic situation as well as health care needs and the potential impact

of selected interventions. The impact of interventions on population health is vital. It is also important to determine the role of different interventions in contributing to other socially desirable goals, such as reducing health inequalities and being responsive to the legitimate expectations of the population.

It might help if health service providers were supported to implement management approaches such as performance-based budgeting (which implies performance based management) and undertake systematic reviews of performance in relation to key goals and targets. All these will require inputs and thus funding.

vi. Investment in effective governance at the community level

District- and community-based services might benefit from more formal governance mechanisms that focus on integrating health delivery systems to improve service delivery and accountability. Governance of the health care system is the exercise of authority by a group of individuals who are responsible and accountable for the direction and control of the system.

Tied funding should be provided to:

- initiate and manage the change process;
- provide training and clinical and management support on an ongoing basis for providers;
- provide training and support to patients to manage their own chronic disease/s; and
- support individual communities to explore and develop local prevention and support programs.

While there is strong support for an integrated approach to service delivery (i.e. public health, hospital and community services working together to achieve agreed aims), this is often difficult to achieve. The key challenge for purchasers is to facilitate a comprehensive approach to continuity of care (not allowing people to slip through the net). The challenge is applicable for community health boards, government agencies purchasing discrete service types, such as acute care (often hospital-based) and maintenance and support for chronic states (mostly community-based).

Relevance of this work to other populations

This work relates only to the NT. The authors believe that the approach taken to the study (strategic investment analysis using the HBG/HRG classification as the base information model) has much to offer other population groups, as do the results of the modelling. Determination of the actual impact of investments as modelled to sub-population groups in the NT and other jurisdictions, as well as at specific points in time, will need to be tested.

Distribution of the Indigenous population is shown in Table 16. New South Wales (NSW) has the largest share (30%) of the total Indigenous population. NT has the highest proportion (29%) of Indigenous people in the total population. Overall, only 2 per cent of the Australian population is Indigenous. While there are differences, there are also similarities. In some cases the results will apply directly and in some cases they may not. To test the relevance of the analysis to specific populations will require further work.

Table 16: Indigenous population by state/territory, 2001

	Number ('000)*	%	% total population
NT	57	12	29
NSW	138	30	2
VIC	26	6	1
QLD	129	28	4
SA	26	6	2
WA	64	14	3
TAS	20	4	4
ACT	4	1	1
AUS	465	100	2

* mean of low and high series.

Source: ABS, 1998 (b), Experimental Projections of the Aboriginal and Torres Strait Islander Population 30 June 1996 to 30 June 2006 (Cat No. 3231.0); ABS, 2000(e), Population by Age and Sex, Australian States and Territories (Cat No. 3201.0).

The evident similarities between states and territories are that:

- most Indigenous populations live in remote or regional areas where there is a lack of primary health care services;
- health status in the Indigenous population is poor compared to the non-Indigenous population; and
- socioeconomic status, level of education and employment in all Indigenous populations are much below the national average.

The evident differences between states and territories include:

- different pattern of illness: the NT is more representative of populations with high prevalence of tropical diseases, skin infection and child malnutrition—different populations may have high prevalence of other diseases;
- different service delivery models and associated cost structures: the NT has higher cost due to remoteness—funding allocation for primary health care has been adjusted in the model to take this into account and therefore should be applicable Australia wide and the NT has fewer GPs and more Government salaried district medical officers; and
- funding investment differences: the NT has the highest per capita investment for Indigenous health compared with other jurisdictions so that other jurisdictions are starting on a low base and the potential to make a difference through improved service delivery is greater.

8 Conclusions and recommendations

This report was commissioned by the Australian Government Department of Health and Ageing to assess the cost-effectiveness of current services provided for Aboriginal and Torres Strait Islander Australians. The work presented here relates to the NT of Australia only. It was not possible due to time constraints, lack of nationally comparable datasets and different service delivery models to undertake a broader review. The authors believe that the approach taken to the study (strategic investment analysis using the HBG/HRG classification as the base information model) has much to offer other population groups as do the results of the modelling. Determination of the actual impact of investments as modelled to sub-population groups in the NT and other jurisdictions, as well as at specific points in time, will need to be tested.

The health sector is a complex system in which there are multiple and interacting determinants of health. Against this complexity, there is a paucity of relevant published information from which to construct a comprehensive model for informing the actual impact of a selection of investment decisions in primary health care. However, some recent published evidence such as the findings from research undertaken in the Tiwi Islands and North Queensland show that investments in primary health care do result in prevention of complex diseases/disorders and hospital admissions.

To provide an understanding of what might happen if changes were made to investment streams over time for primary care, a partial equilibrium model, with the focus on a set of preventable diseases was developed. The conditions addressed were hypertension, diabetes, renal disease, ischaemic heart disease, chronic obstructive pulmonary disease, respiratory and related ear infections, diarrhoea, malnutrition and skin infections. For the purposes of the analysis, these preventable diseases were separated into two groups: chronic diseases primarily impacting on adults (those aged over 15 years); and infectious diseases primarily impacting on children (those aged 15 years and under). A health benefit group (HBG) – healthcare resource group (HRG) model is used to allocate sections of the client population across a range of health services. A phased approach to investment (incremental increase on a yearly basis) was used to allow time for health agencies to scale up the service response. A series of 'what if' analyses were undertaken to explore the implications of alternate investment and disinvestment assumptions. The approach to scenario modelling taken in this study means that even in the absence of 'perfect' information it is still possible to examine a range of alternatives for the purpose of informing decision making.

The modelling addressed investments in comprehensive primary health care, which include services funded from mainstream and Indigenous-specific funding mechanisms as part of the Aboriginal and Torres Strait Islander primary health care program. The impact of investments in primary care on hospital (secondary and tertiary care) was also addressed. An assessment of the changes in both cost-effectiveness and health outcomes for a range of scenarios in which the balance of investment is varied between elements of the health sectors, from primary through to tertiary health care was undertaken. It is necessary to acknowledge that while increases in primary care (when that care is effective) would lead to decreases in admissions for persons concerned, it is likely that actual hospital expenditure levels might not decrease, particularly in areas of high unmet need.

This study has shown that it is possible to model the potential impacts of different investment decisions over time. The importance of understanding what is invested where across the care continuum is clearly demonstrated by the findings of differential impacts of health outcomes (DALYs saved) and cost savings to the health sector from different mixes of investment in health promotion, prevention, clinical primary care for new and existing cases, and hospital care.

The analysis shows that investments are required across the continuum of care to reduce the increasing burden of disease. The most important area for new investment is in identifying and treating new cases

of the condition as well as enhancing treatment for people who already have the condition. Investment in prevention and promotion is also important to reduce the burden of illness, with action in areas such as respiratory infection, renal diseases and skin infection bringing the greatest benefits.

For the purpose of saving health care resources over time as a result of targeted new investments, it is shown in this study that the first and second priorities are different for individual diseases:

- Clinical Primary Health Care (new cases) is the first priority, and Clinical Primary Health Care (existing cases) is the second priority for skin infection, diarrhoea, respiratory infection and IHD.
- Clinical Primary Health Care (existing cases) is the first priority, and Clinical Primary Health Care (new cases) is the second priority for hypertension, diabetes, renal diseases, COPD and malnutrition.
- Health Promotion is the third priority for all diseases except malnutrition, followed by Prevention and Hospital Care in terms of saving resources.

The longer term shows a different pattern for individual diseases.

- In general, Health Promotion and Prevention look promising in saving resources in the long term, but are still less cost-effective than Clinical Primary Health Care.
- For all diseases except respiratory infection and diarrhoea, the first priority is still Clinical Primary Health Care (existing cases). But for respiratory infection, Health Promotion and Prevention are more important in saving health care resources and for diarrhoea, Clinical Primary Health Care is more cost-effective.
- For all diseases, Hospital Care is the lowest priority for the purpose of saving health care resources.

For the purpose of reducing burden of disease for the society, this study predicts that in general, the highest priority for new investment needs to be Primary Health Care (new) for all diseases apart from skin infection, in which Primary Health Care (existing) is the highest priority. In the longer term (comparing 10 years projection with 5 years projection), benefit–cost ratio shows a similar pattern. It is demonstrated that early diagnosis and prompt treatment are equally important in longer-term analyses.

To achieve optimal health care outcome, the health care system must engage the whole society. Action taken to improve health can also involve other sectors (such as education and housing). It can also be done in such a way that local people become more engaged on health issues and take greater responsibility for improving health (at the individual, family and community levels). If this were the case, then the benefits of investments outlined above would be increased by 35 per cent (i.e. 35% more DALYs could be saved).

This study has been undertaken in a short period of time and the limitations of the expenditure and cost data as well as information required to inform scenario assumptions is recognised. The findings are useful in informing decisions on the potential impact of changes in investment. However, decision making both at the funding and purchasing level can only be enhanced though further work to inform and refine the base HBG/HRG model and underlying scenario assumptions. It is suggested that a research program be instigated to further develop and update the current model. The aim would be to build on work undertaken by the Australian Government Department of Health and Ageing, and Health & Community Services in the NT presented in this report. It would develop and apply a decision support tool to inform top-down and bottom-up allocation of health sector resources at both the Australian Government and state/territory level. Studies undertaken at the community level to inform development of key assumptions for future modelling can at the same time inform local purchasing and service development decisions.

If we are to develop a shared understanding of what is happening with regard to service delivery and expenditure on Aboriginal and Torres Strait Islander health, we need a classification system that allows for comparison of effort across sectors in terms of care packages/services provided (Casemix). Such a classification requires mapping of packages of care/services and costs to the HBG/HRG classification.

Recommendations

- That this report be accepted and be used to inform decision making for new investments in comprehensive primary health care for Aboriginal and Torres Strait Islander populations.
- That further work is undertaken in the medium term to update and refine current service use and cost estimates together with assumptions used as the basis of the scenario of modelling—the intent being to refine the model for future application.
- That a research program is established to develop a more comprehensive and refined investment model.
- That an agreed classification for describing primary health care services/care packages (Casemix classification) is developed.
- That, if decisions are made to increase investment levels, purchasers and/or service managers need to be provided with support to make informed decisions as to the most appropriate course of action to meet the specific needs of the target populations.

Attachment A

Analysis Components

The analysis comprised seven components:

i. Update and use existing data and analysis conducted by the Territory Department and extrapolate the dataset to the NT Aboriginal and Torres Strait Islander population as a whole (and to the whole Australian Aboriginal and Torres Strait Islander population where possible). The model will be based on the HBG/HRG analysis and scenario modelling conducted by the Territory Department in 1999. It will include:

- Specified non-communicable diseases (renal disease, ischaemic heart disease, respiratory disease, hypertension and Type 2 diabetes); and
- If datasets allow, include child health (acute respiratory infection, diarrhoea, and malnutrition).

ii. Refine the model, including updates for population, disease burden, service volume and price changes. Where possible, update assumptions regarding the link between services and impacts for patients, especially where better information is easily available or could be obtained from experts in the field. Dr Patricia Fagan, Senior Medical Adviser, Office for Aboriginal and Torres Strait Islander Health, will be available to assist with this component.

iii. In undertaking this work, the Territory Department must separate total funding investments into funding provided from primary health care budgets (clinic and non-clinic based) from those funded from hospital budgets or other provisions for specialist care. The Territory Department must also provide the Australian Government Department with advice on how the expenditure levels included in these categories in the model relate to total expenditure within those sectors (i.e. across all disease categories).

iv. The Territory Department must provide advice on three different types of scenarios representing changing funding levels. This modelling will determine how changing investments in primary health care will impact on health outcomes (potential measures include Disability Adjusted Life Years saved and changes in mortality and in hospital admissions) and costs across the system over time (5 years, 10 years and longer if possible). The three scenario types are:

- Removal of a proportion of investment equivalent to current Australian Government funding for primary health care for Aboriginal and Torres Strait Islander Australians. The Australian Government Department's financing staff will be available to assist determining the proportion of funds (based on current data) and the Senior Medical Adviser will be available to provide technical assistance on how changes in funding might impact across intervention types.
- Better use of existing resources, which will involve re-distribution of investments across Healthcare Resource Groups, in order to maximise health impacts.
- Increased investments to provide more services as well as a more comprehensive approach to primary health care (in clinical and non-clinical settings). Advice on investment levels for modelling will be provided by the Australian Government Department. Modelling work must include the provision of advice on the optimum distribution of such resources.

v. This work must also include conducting sensitivity analysis around the assumptions underlying the model including changing assumptions around the interrelationships between HRGs, that is, how changes in expenditure on one HRG will impact on the returns in other groups.

vi. Based on this work, the Territory Department must provide an assessment of the impact of different levels and types of investment to achieve appropriate levels of comprehensive and effective primary health care for Aboriginal and Torres Strait Islander Australians.

vii. The report must also contain scoping work (with a project plan and budget) for subsequent analysis using the HBG/HRG model of the health care system. It should be noted that the Australian Government Department makes no commitment for funding beyond that specified in clause 4 of the letter. The project plan should outline two stages of further work being:

- Stage 1 could be conducted along similar lines to the work of this contract, so that it includes an examination of the cost-effectiveness of existing health programs, scenario modelling and sensitivity analysis. However, this stage could incorporate an expansion of the dataset and refinement of the assumptions underlying the interrelationships between Health Related Groups. The latter to be informed by a review of the literature with regard to evidence-based packages of care/service models for both non-communicative diseases and child health. These assumptions will be refined by examining Australian Indigenous clinical data to identify the underlying interrelationships between Health Related Groups, that is, how changes in expenditure on one Health Related Group will impact on the outcomes in other groups. The Australian clinical data to be used for this purpose may include, but not be limited to, data on diabetes in Queensland collected by Robyn McDermott and data on health status in 5 communities and specifically for child health and renal disease in the Tiwi Islands collected by Professor Wendy Hoy, Centre for Chronic Disease University of Queensland.
- Stage 2 could facilitate the development of a longer research program (possibly two years) to inform Australian Government policy/funding negotiations. Over time, a research team (to be identified) could work with the Australian Government Department to undertake specific reviews/studies to address key issues as identified by the Australian Government Department. This could require development of specific HBG/HRG definitions (as required by the research questions to be addressed) further refinement of the assumptions underlying the interrelationships between Health Related Groups by drawing on other Indigenous community data and international data. This data would then also be used to undertake scenario modelling of how changes in the level and distribution of funds will impact on health outcomes, and an assessment of the appropriate distribution and level of expenditure to achieve appropriate health care for Indigenous people.

Attachment B

Complete list of HBGs and major disease categories

HBG	Name
HP	HYPERTENSION
DB	DIABETES
RD	RENAL DISEASE
CB	COPD
IH	IHD
RI	RESP INFECTION
DR	DIARRHOEA
MN	MALNUTRITION
SI	SKIN INFECTION
INFAN	INFANT MORBIDITY
CANCR	CANCER UNSPECIFIED
FRAIL	FRAIL AGED
AOTHR	OTHER GENERAL DISEASE
LEUKM	LEUKEMIA AND LYMPHOMA
BOTHR	OTHER BLOOD DISEASE
ULCER	PEPTIC ULCER
COLIT	ULCERATIVE COLITIS
HEPTI	HEPATITIS
COLCA	DIGESTIVE CANCER
LIVCA	LIVER PANCREAS CANCER
DOTHR	OTHER DIGESTIVE DISEASE
CATAR	CATARACT
GLAUC	GLAUCOMA
BLIND	BLINDNESS
FOTHR	OTHER EYE DISEASE
DEAFS	DEAFNESS
HOTHR	OTHER HEARING DISEASE
HTHBG	HEARING TOTAL HBG
HTFAL	HEART FAILURE
RHMFH	RHEUMATIC HEART DISEASE
CNGTH	CONGENITAL HEART DISEASE
PUMTD	PULMONARY HEART DISEASE
STROK	STROKE
KOTHR	OTHER CIRCULATORY DISEASE
FRACT	FRACTURE
INJUR	INJURY
AROST	OSTEOPOROSIS/ARTHRITIS

LOTHR	OTHER MUSCULOSKELETAL DISEASE
EPILE	EPILEPSY
PARKS	PARKINSONS/PARALYSIS AGITANS
HINJU	INJURY HEAD AND CONCUSSION
NOTHR	OTHER NEUROLOGICAL DISEASE
NTHBG	NEUROLOGICAL TOTAL HBG
PSYCH	PSYCHOSIS
DEPRE	DEPRESSION
NEURO	NEUROSIS
SUIAT	SUICIDE ATTEMPT
DEMEN	DEMENTIA
POTHR	OTHER PSYCHOLOGICAL DISEASE
RSPIN	ACUTE RESPIRATORY INFECTION
LUGCA	LUNG CANCER
ROTHR	OTHER RESPIRATORY DISEASE
SCANC	SKIN CANCER
SOTHR	OTHER SKIN DISEASE
LIPID	ENDOC METABOLISM DIS/LIPID/THYROID
TOTHR	OTHER METABOLIC DISEASE
TTHBG	ENDOCRINE METABOLIC TOTAL HBG
RFHBG	RENAL FAILURE
URINF	URINARY INFECTION
BLACA	BLADDER/KIDNEY CANCER
UOTHR	OTHER UROLOGICAL DISEASE
PREGN	PREGNANCY
HRPGC	PREGNANCY HIGH RISK
MISCA	ABORTION, SPONTANEOUS
WOTHR	OTHER PREGNANCY DISEASE
WTHBG	PREGNANCY TOTAL HBG
SYPHI	SYPHILIS
GOCHL	GONORRHEA/CHLAMYDIA
PIDIS	PELVIC INFLAMMATORY DISEASE
HPVIR	HUMAN PAPILLOMA VIRUS INFECTION
OTSTD	OTHER STDS
HIVAS	HIV/AIDS
XYHBG	SEXUALLY TRANSM DISEASE
BRECA	BREAST CANCER
CERCA	CERVIX CANCER AND OTHER FEMALE REPRODUCT CANCER
XOTHR	OTHER FEMALE GENITAL DISEASE
PROCA	PROSTATE CANCER
YOTHR	OTHER MALE GENITAL DISEASE
ZTHBG	SOCIAL TOTAL HBG

Attachment C

Mapping tables tetween ICPC, DRG and HBG

HBG	HBG Name	Health Issue ICPC Term Dsc	AR-DRG4	AR-DRG4 Description
HP	Hypertension	Elevated Blood Pressure	F67A	Hypertension + Cc
		High Blood Pressure	F67B	Hypertension - Cc
		Hypertension; Benign		
		Hypertrophic; Heart		
		Hypertensive Encephalopathy		
		Hypertension; Uncomplicated		
		Hypertension; Pre-Eclamptic		
		Hypertension; Malignant		
		Hypertension; Labile		
		Hypertension; Heart Disease		
		Hypertension; Essential		
		Hypertension		
		Hypertension; Renal Disease		
		Retinopathy; Hypertensive		
		Cardiomyopathy; Dilated(Congest		
		Hypertension; Cardiorenal		
IH	IHD	Infarction; Myocardial	F66A	Coronary Atherosclerosis + Cc
		Infarction; Heart	F66B	Coronary Atherosclerosis - Cc
		Myocardial Ischaemia; Chronic	F71A	N-Mjr Arythm&Condctn Dsrd+Cscc
		Myocardial Infarction; Old	F71B	N-Mjr Arythm&Condctn Dsrd-Cscc
		Myocardial Infarction; Healed	F72A	Unstable Angina + Cscc
		Disease; Ischaemic Heart	F72B	Unstable Angina - Cscc
		Disease; Ischaem Heart; Chronic	F74Z	Chest Pain
		Disease; Heart	F17Z	Cardiac Pacemaker Replacement
		Coronary Artery Disease	F21A	Ot Circ Sys Or Pr+Ccc/A>64-Ccc
		Stenosis; Mitral; Non-Rheumat	F21B	Oth Circul Sys Or Pr A<65-Ccc
		Coronary Heart Disease	F40Z	Circ Sys Dx+Ventilator Support
		Graft; Coronary Artery Bypass	F41A	Crc Dsrd+Ami+Inva Inve Pr+Cscc
		Failure; Congestive Cardiac	F41B	Crc Dsrd+Ami+Inva Inve Pr-Cscc
		Failure; Heart	F42A	Crc Dsrd-Ami+Ic In Pr+Cmpdx/Pr
		2 Degree Heart Block; Mobitz 1	F42B	Crc Dsrd-Ami+Ic In Pr-Cmpdx/Pr
		Occlusion; Coronary	F60A	Crc Dsrd+Ami-Inva Inve Pr+Cscc
		Failure; Cardiac	F60B	Crc Dsrd+Ami-Inva Inve Pr-Cscc
		Myocardial Infarction; Acute	F60C	Crc Dsrd+Ami-Inva Inve Pr Died
		Postmyocardial Infarct Syndrom	F62A	Heart Failure & Shock + Ccc
		3 Degree Heart Block	F62B	Heart Failure & Shock - Ccc

HBG	HBG Name	Health Issue ICPC Term Dsc	AR-DRG4	AR-DRG4 Description
DB	Diabetes	Nephropathy; Diabetic	K01Z	Diabetic Foot
		Nephrotic Syndrome	K09Z	Other Endcrn, Nutr& Meta Or Pr
		Diabetes Mellitus	K40Z	Endosc/Invest Pr Metab Dsdr-Cc
		Diabetes; Adult Onset	K60A	Diabetes + Cscc
		Neuropathy; Diabetic	K60B	Diabetes - Cscc
		Amputation; Non-Traumatic		
		Retinopathy; Diabetic		
		Diabetes; Type 2		
		Diabetes; Type 1		
		Diabetes; Non Insulin Depend		
		Diabetes; Insulin Dependent		
		Diabetes; Complicated		
		Amputation; Non-Traumatic; Old		
RD	Renal Disease	Glomerulonephritis; Acute	L02Z	Oper Insert Peri Cath Dialysis
		Transplant; Renal	L60A	Renal Failure + Ccc
		Tuberculosis; Kidney	L60B	Renal Failure + Scc/A>69-Scc
		Dialysis; Kidney (Renal)	L60C	Renal Failure A<70 - Cscc
		Haematuria	L61Z	Admit For Renal Dialysis
		Renal; Transplant	L07A	Transurethral Procs + Cscc
		Renal Failure; Chronic	L07B	Transurethral Procs - Cscc
		Glomerulonephritis; Chronic		
		Cyst; Renal		
		Pyelonephritis; Acute		
		Polycystic Kidney		
		Glomerulonephritis		
		Nephropathy		
		Nephritis		
		Nephrectomy; Total		
		Pyelonephritis		
		Pyelonephritis; Chronic		
		Renal Failure; Acute		
CB	COPD	Chronic Airways Disease	E65A	Chrnic Obstrct Airway Dis+Cscc
		Disease;Circulation; Pulmonary	E65B	Chrnic Obstrct Airway Dis-Cscc
		Chronic Airways Limitation	E64Z	Pulmonry Oedema & Resp Failure
		Chronic Obstr Airways Disease		
		Chronic Obstr Lung Disease		
		Chronic Obstr Pulmon Disease		
		Disease; Respiratory		
		Disease; Heart; Pulmonary		
		Fibrosis; Pulmonary		
		Bronchitis; Chronic		
		Respiratory Failure		

HBG	HBG Name	Health Issue ICPC Term Dsc	AR-DRG4	AR-DRG4 Description
RI	Resp Infection	Pneumonia	D64Z	Laryngotracheitis&Epiglottitis
		Disease; Viral	E62A	Respiratry Infectn/Inflamm+Ccc
		Disease; Respiratory; Newborn	E62B	Respiratry Infectn/Inflam+Smcc
		Pneumonia; Atypical	E62C	Respiratory Infectn/Inflamm-Cc
		Pneumonia; Bacterial	D63A	Otitis Media & Uri + Cc
		Pneumonia; Bronchopneumonia	D63B	Otitis Media & Uri - Cc
		Pneumonia; Influenzal	E70A	Whoopng Cgh &Acte Brnchio+Cscc
		Pneumonia; Interstitial	E70B	Whoopng Cgh &Acte Brnchio-Cscc
		Pneumonia; Viral		
		Bronchiolitis; Acute		
		Perforation; Tympanic Membran		
		Deafness; Conductive		
		Tropical Ear		
		Adenovirus		
		Abscess; Lung		
		Discharge; Ear		
		Otitis Media		
		Impairment; Hearing		
		Glue Ear		
		Bronchitis; Asthmatic		
		Bronchitis; Acute		
		Otitis Externa		
		Pneumonia; Aspiration		
		Upper Resp Tract Infection		
		Perforation; Ear Drum		
		Otitis Media; Acute		
		Chest Infection		
		Flu		
		Otitis Media; Chronic		
		Otitis Media; Nonsuppurative		
		Otitis Media; Perforated		
		Otitis Media; Serous		
		Otitis Media; Suppurative; Acute		
		Otitis Media; Suppurative; Chron		

HBG	HBG Name	Health Issue ICPC Term Dsc	AR-DRG4	AR-DRG4 Description
DR	Diarrhoea	Colitis; Infectious	G67A	Oesphs,Gastr&Mis Dg D A>9+Cscc
		Amoebiasis	G67B	Oesphs,Gastr&Mis Dg D A>9-Cscc
		Adhesions; Pelvic	G68A	Gastroenteritis A<10 + Cc
		Colitis	G68B	Gastroenteritis A<10 - Cc
		Gastritis; Regional		
		Colitis; Ulcerative		
		Gastritis; Atrophic		
		Poisoning; Food		
		Impairment; Digestive		
		Gastroenteritis; Viral		
		Gastritis; Acute		
		Gastroenteritis		
		Diarrhoea		
		Gastritis		
		Enteritis; Infectious		
		Enteritis; Campylobacter		
		Disease; Diverticular; Intestine		
		Diarrhoea; Viral		
		Diarrhoea; Infectious; Unproven		
		Diarrhoea; Infant		
		Diarrhoea; Bacterial		
		Diarrhoea; Infectious		
MN	Malnutrition	Anaemia	K61Z	Severe Nutritional Disturbance
		Light For Date; Newborn	Q61B	Red Blood Cell Disders + Scc
		Poor; Weight Gain; Infant	Q61C	Red Blood Cell Disders - Cscc
		Problem; Growth		
		Anaemia; Pernicious		
		Anaemia; Iron Deficiency		
		Anaemia; Folate Deficiency		
		Anaemia; Aplastic		
		Light For Date; Infant		
		Problem; Growth; Infant		
		Problem; Weight Gain		
		Retardation; Growth		
		Underweight		
		Anaemia; Chronic Disease		
		Delayed; Physiological		
		Delay; Developmental		
		Delayed; Growth		
		Excessive; Weight Loss		
		Malnutrition		
		Failure To Thrive		

HBG	HBG Name	Health Issue ICPC Term Dsc	AR-DRG4	AR-DRG4 Description
SI	Skin Infection	Dermatitis; Seborrhoeic	J08A	Oth Skn Grf&/Dbrdmnt Pr+Cscc
		Eczema; Atopic	J08B	Oth Skn Grf&/Dbrdmnt Pr-Cscc
		Ulcer; Skin; Chronic	J10Z	Skn,Subc Tis & Brst Plastic Pr
		Abscess; Skin	J11Z	Other Skin, Subc Tis & Brst Pr
		Ulcer; Skin	J60A	Skin Ulcers A>64
		Ulcer; Leg	J60B	Skin Ulcers A<65
		Scabies	J61Z	Severe Skin Disorders
		Eczema; Dyshydrotic	J64A	Cellulitis A>59 + Cscc
		Cellulitis; Pelvis; F	J64B	Cellulitis A>59 -Cscc / A<60
		Infection; Skin; Localised	J66A	Moderate Skin Disorders + Cscc
		Dermatophytosis	J66B	Moderate Skin Disorders - Cscc
		Dermatitis; Fungal	J67A	Minor Skin Disorders + Cc
		Cellulitis	J67B	Minor Skin Disorders - Cc
		Dermatomycosis		
		Cellulitis; Leg		
		Cellulitis; Finger(S)		
		Dermatitis		
		Dermatitis; Allergic		
		Incise/Drain; Abscess; Skin		

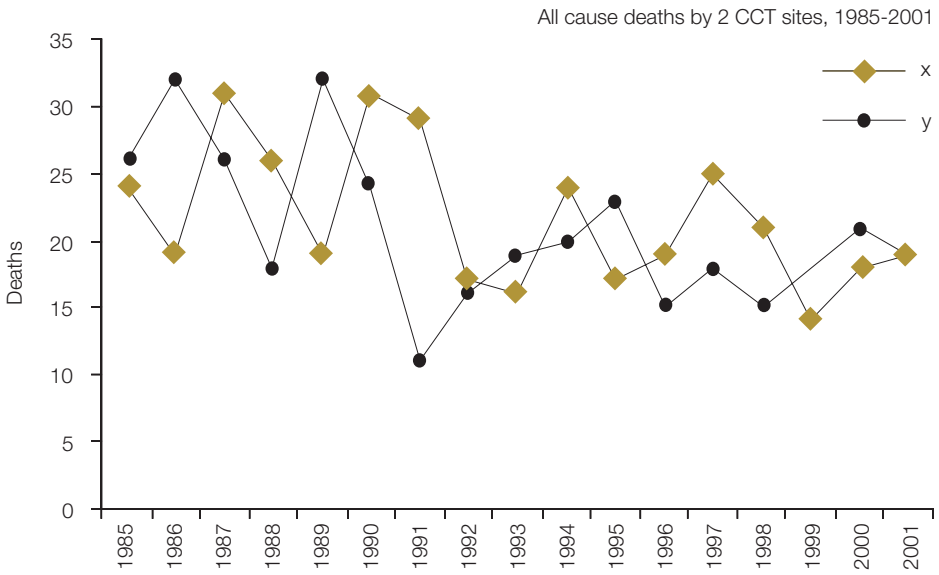
Attachment D

Background material

Decrease in mortality due to primary health care funding

The figure below shows a trend of substantial decrease in all causes mortality figures despite a population increase in two NT CCT communities (populations X and Y). The mortality decrease was partially a result of improved primary health care services and funding during CCT.

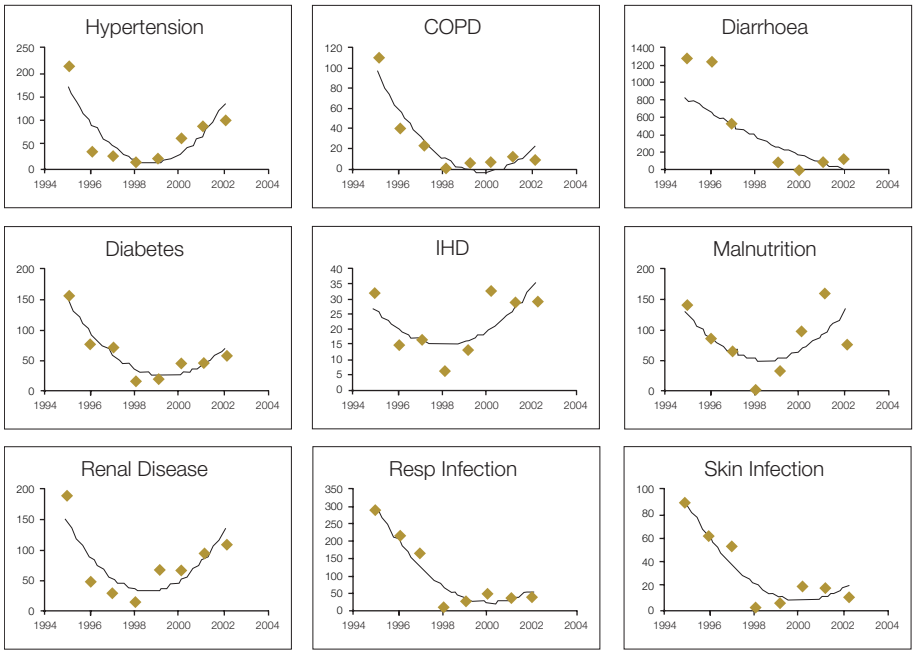
All cause deaths NT CCT communities (populations X and Y)



Local incidence trend analysis

New cases recorded in CCT data show a dive in incidence of hypertension. Similar pictures are also evident for diabetes, IHD, renal disease, COPD and malnutrition. New cases of respiratory infection, diarrhoea and skin infection appear to have decreased between 1995 and 2000 according to NT CCT data. However, it should be noted that CCT data collection is known to be incomplete. More evidence is needed to validate these short-term local trends. The high number of new cases in 1995 is likely associated with intensive screening during the early stages of the CCT.

Short-term local trends in new diagnosis of nine preventable diseases, CCT, NT (1995–2002)



Numbers of undetected cases with preventive chronic disease

Suppose 1995 figures show screening detected new cases and 2001 figures are back to clinical presentations without screening in the two CCT sites. Numbers of undetected cases in 2001 for NT Indigenous population are estimated in the table below.

Estimates for number of undetected cases of five chronic diseases, NT Indigenous Australians, 2001

Disease	Number of undetected cases
Hypertension	1 270
IHD	190
Diabetes	1 030
Renal diseases	830
COPD	1 090

9 Endnotes

[i] Note – While Type 1 diabetes is an NCD it is not a preventable disease – it is included in this analysis as it was not possible to differentiate data related to Type 1 and Type 2 service utilisation and expenditure from the available datasets.

[ii] Requiring Hospital Care includes services provided in hospital or funded by hospitals but provided in a community setting (e.g. dialysis and day surgery).

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