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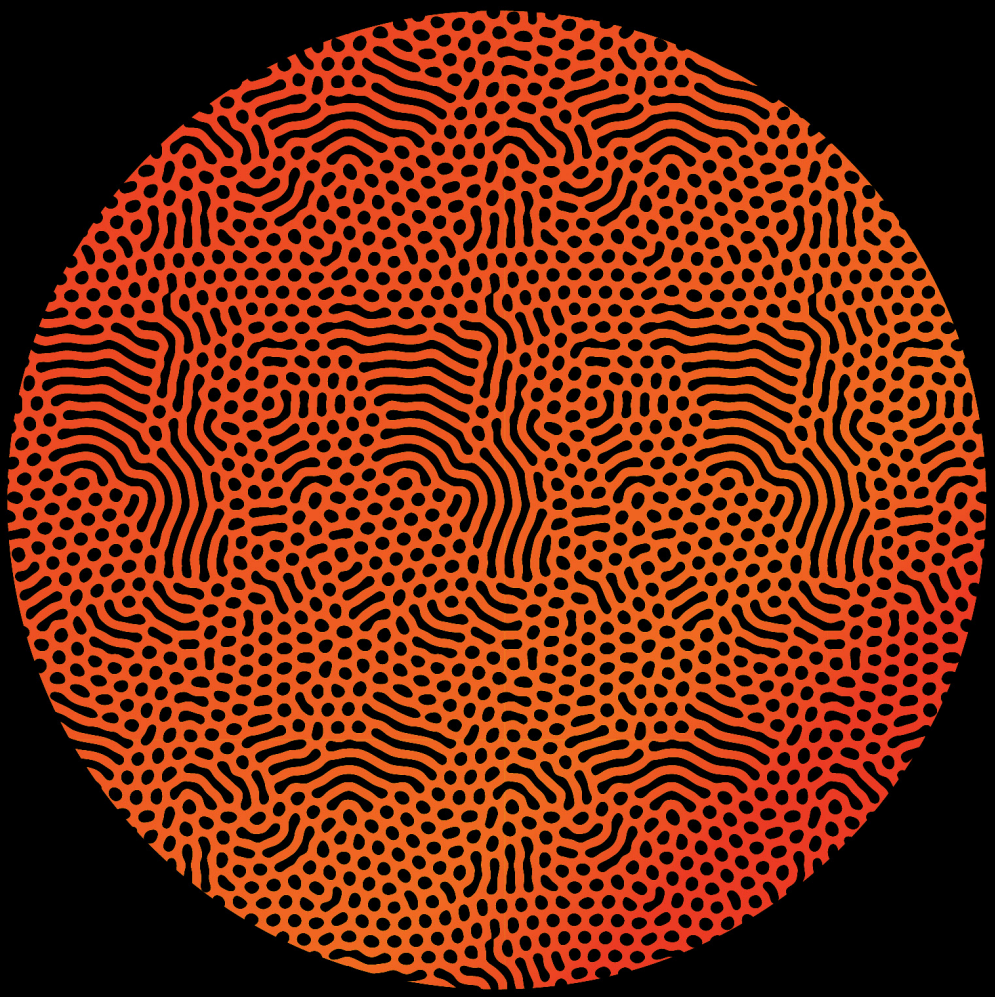

The social and economic contribution of the Menzies School of Health Research

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Deloitte Access Economics

Contents

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The improved health outcomes as a result of Menzies' research programs are estimated to generate ECONOMIC BENEFITS of:

$629.4 MILLION to Australia and

$1.6 BILLION Globally

...over 30 years

RESEARCH AREA	AUSTRALIA BENEFITS	GLOBAL BENEFITS
Malaria	$1.4m	$1,002.2m
Melioidosis	$31.7m	
Rheumatic heart disease	$17.0m	
Improved quality of primary health care	$250.1m	
Diabetes	$4.2m	
Pyoderma and scabies	$51.8m	
Lung and respiratory conditions	$161.0m	
Kidney disease	$41.9m	
Cancer	$30.4m	
Otitis Media	$39.7m	

In generating these benefits, Menzies incurs costs of $382.1 MILLION, which includes:

Research related costs	$245.4m
Non-research employee costs	$49.7m
Repairs and maintenance	$8.2m
Other expenses	$78.8m

Through its operations in 2020, Menzies contributed:

$42.7 MILLION AND 311 JOBS
to the Australian economy

$25.9 MILLION AND 186 JOBS
to the Northern Territory economy

Each dollar spent by Menzies is expected to generate **$1.65** to Australia and **$4.27** globally over 30 years

Note: All values reported are in present value 2021 dollars

Executive summary

About the Menzies School of Health Research

The Menzies School of Health Research is an Australian medical research institute and a partner of Charles Darwin University (CDU) in Darwin, Northern Territory (NT). With over 35 years of experience in scientific discovery and public health achievement, Menzies continues its endeavour to break the cycle of disease and to reduce health inequities in Australia and the Asia-Pacific region, particularly for disadvantaged populations.

Since its establishment in 1985, Menzies has expanded its role to become a multifaceted medical research institute focusing on health issues of First Nations People and tropical disease in Australia as well as the Asia-Pacific region. Menzies' research focus spans across programs in clinical science, biomedical science, medical microbiology, epidemiology and public health.

Estimating the social and economic contribution of Menzies

Deloitte Access Economics was engaged by Menzies to estimate the social and economic contribution of its activities to the NT, Australia and internationally. Menzies' social and economic contribution has been estimated according to two separate approaches, with each approach offering a distinct perspective on the value Menzies' generates through its activities. The approaches are as follows:

- **Economic contribution analysis:** This analysis measures the direct economic contribution of Menzies' activities to the NT and Australian economies, measured in full-time equivalent (FTE) employment and value added terms. The indirect economic contribution is also measured in FTE employment and value added terms, which reflects the value Menzies' creates through its supply chain based on its demand for the outputs of other sectors of the economy.
- **Cost-benefit analysis (CBA):** The CBA measures the economic benefits associated with the health outcomes expected to be realised as a result of Menzies' research programs, and compares these benefits with the cost of delivering the research programs. This approach considers the health benefits realised over time as the findings from Menzies research are implemented as changes to policy, guidelines and clinical practice. These benefits are estimated for the period 2012 to 2041 and are reported in present value terms.

Economic contribution of Menzies

Menzies' total contribution to the Australian economy in 2020 is estimated at $42.7 million in value added terms (see Table A). This includes both its direct contribution, which reflects the value added to the economy by the income earned from capital and labour, and its indirect contribution, which relates to Menzies demand for goods and services produced in other sectors of the economy.

Total employment – including both direct and indirect – provides an alternative measure of Menzies' economic contribution. Menzies' total employment contributed to the Australian economy in 2020 is estimated at 310.8 full-time equivalent (FTE) jobs.

More than half of Menzies total economic contribution in 2020 is related to its contribution to the NT economy. Menzies' contribution to the NT economy is estimated at $25.9 million in value added terms, while total employment contributed to the NT is estimated at 185.5 FTE jobs.

In cumulative terms, the total economic contribution of Menzies to the Australian economy over the period 2016 to 2020 is estimated at $216 million in value added terms. Consistent with Menzies' economic contribution in 2020, more than half of this relates to its contribution to the NT economy, which is estimated at $139 million over the same period.

Table A: Economic contribution of Menzies, 2020 calendar year

Economic contribution	Northern Territory	Australia
Value added ($ millions, 2021 dollars)		
Direct contribution	$23.9	$29.9
Indirect contribution	$2.0	$12.8
Total value added	**$25.9**	**$42.7**
Employment (FTE)		
Direct contribution	171.2	215.3
Indirect contribution	14.3	95.5
Total employment contribution	**185.5**	**310.8**

Source: Deloitte Access Economics.
Note: Numbers may not add exactly to totals due to rounding.

Cost-benefit analysis of Menzies research programs

Cost-benefit analysis approach

Menzies' research programs span a wide variety of areas, with a range of programs resulting in findings that have contributed to changes to policy, guidelines and clinical practice. These changes are expected to result in improved treatment and health outcomes over time for First Nations people, as well as the broader Australian community and people living throughout the world. The benefits of improved health outcomes as a result of Menzies' research programs over the period 2012 to 2020 are estimated as part of the CBA, with future improved health outcomes forecast over the remainder of the 30-year assessment period.

The economic benefits associated with improved health outcomes accrue to populations in both Australia – with a focus on First Nations people – and internationally, with the benefits outside of Australia related to Menzies' work in malaria treatment and management. Reflecting this, the CBA findings are expressed as two sets of results, including 'Australia only' (benefits that accrue to Australia only compared with total costs) and 'global' (benefits that accrue to Australia and the rest of the world compared with total costs).

Cost-benefit analysis findings

Table B summarises the benefits and costs estimated in the analysis in present value terms. Over the 30-year assessment period, it is estimated that the improved health outcomes as a result of Menzies' research programs will generate a total net benefit to the Australian population of $247.3 million. In addition, Menzies' research programs yield a benefit-cost ratio (BCR) of 1.65 for Australia over the assessment period. This means that for every $1.00 invested into Menzies' research programs, an economic return of $1.65 is generated for Australia. However, this BCR also reflects operating expenditure incurred by Menzies to undertake research programs that generate benefits outside of Australia, which are not included in the Australia only results.

Menzies is also having a significant impact within the NT. It is estimated that Menzies' research has generated benefits to the NT of approximately $79.4 million. This reflects 12.6% of the total benefits generated throughout Australia, although the NT accounts for less than 1% of the Australian population.

The global results also reflect the benefits of Menzies' research work into the prevention and treatment of malaria, which has led to enhancements in treatment practices in Australia and throughout the world, including in regions such as South-East Asia, Latin America and parts of Africa. Globally, the improved health outcomes attributable to Menzies' research are estimated to generate a total net benefit of $1.2 billion, and a BCR of 4.27 over the assessment period. This means that for every $1.00 invested into Menzies' research programs in Australia, an economic return of $4.27 is generated across the world, highlighting the substantial global impact and wide reach of Menzies' work.

This analysis demonstrates the strong growth in Menzies impact since the 2015 study. Over the 30-year assessment period, the total health benefits generated by Menzies for Australia have increased from $384.1 million in the 2015 study to $629.4 million – an increase of 58.9% in present value terms. In addition, the total health benefits generated by Menzies across the globe have increased from $867.0 million in the 2015 study to $1.6 billion, or an increase of 88.0%.[1]

Table B: Summary of cost-benefit analysis findings ($ million, present value terms)

Cost-benefit analysis result	Australia only	Global
Benefits	**$629.4**	**$1,630.1**
Malaria	$1.4	$1,002.2
Melioidosis	$31.7	$31.7
Rheumatic heart disease	$17.0	$17.0
Improved quality of primary health care	$250.1	$250.1
Diabetes	$4.2	$4.2
Pyoderma and scabies	$51.8	$51.8
Lung and respiratory conditions	$161.0	$161.0
Kidney disease	$41.9	$41.9
Cancer	$30.4	$30.4
Otitis media	$39.7	$39.7
Costs	**$382.1**	**$382.1**
Research related costs	$245.4	$245.4
Non-research employee costs	$49.7	$49.7
Repairs and maintenance	$8.2	$8.2
Other expenses (such as advertising)	$78.8	$78.8
NET PRESENT VALUE (NPV)	**$247.3**	**$1,248.1**
BENEFIT-COST RATIO (BCR)	**1.65**	**4.27**

Source: Deloitte Access Economics.
Note: Numbers may not add exactly to totals due to rounding.

1 Introduction

1.1 About the Menzies School of Health Research

1.1.1 The history of Menzies

Menzies was established in 1985 as a body corporate of the NT Government under the *Menzies School of Health Research Act 1985*. This Act was amended in 2004 to formalise Menzies' relationship with Charles Darwin University (CDU). Menzies is now a major partner of CDU and constitutes a school within the CDU Institute of Advanced Studies.

Since its establishment, Menzies has expanded its role to become a multifaceted medical research institute focusing on Aboriginal and Torres Strait Islander health and tropical disease in Australia as well as the Asia-Pacific region. Menzies' work addresses critical health issues such as mental health, nutrition, substance abuse, child health and development as well as chronic conditions such as cancer, kidney disease and heart disease. Menzies has also led various large-scale research initiatives over the years, including the establishment of the Cooperative Research Centre for Aboriginal Health (CRCAH) in 1997 and, more recently, its involvement in the opening of the Centre for Child Development and Education (CCDE) in 2011.

In 2015, Menzies celebrated 30 years of scientific discovery and public health achievement. Headquartered in Darwin, it has grown to have offices in Alice Springs, Brisbane, Dili (Timor Leste), and partnerships with over 60 First Nations communities across northern Australia and the Asia-Pacific region including Timika (Indonesia) and Kota Kinabalu (Malaysia).

1.1.2 Roles and activities of Menzies

Menzies is a leader in First Nations people, tropical health and medical research and a significant contributor to health education and research training within this area. Menzies' research targets the key health challenges experienced by First Nations Australians and the Asia-Pacific population across programs in clinical science, biomedical science, medical microbiology, epidemiology and public health.

In addition to educating future researchers and leading research programs itself, Menzies collaborates with a range of stakeholders including communities, policymakers and government, with the objective of increasing the capacity of health service providers, clinicians and researchers. Through its partnerships, Menzies has sought to establish evidence-based health practices that better diagnose, treat or prevent serious health conditions such as otitis media, respiratory conditions, diabetes, chronic kidney disease, mental illness, substance abuse, melioidosis, malaria and tuberculosis.

Menzies' research activities and operations are separated into four interdisciplinary divisions, including Global and Tropical Health, Wellbeing and Preventable Chronic Diseases, Child Health and the Centre for Child Development and Education. In addition, Menzies hosts four National Health and Medical Research Council (NHMRC) Centres for Research Excellence (CRE) focused on First Nations cancer, respiratory health, malaria and ear health.

1.2 Purpose of this study

Deloitte Access Economics was engaged by the Menzies School of Health Research to estimate the social and economic contribution of its activities to the Northern Territory (NT), Australia and internationally. This analysis updates previous studies undertaken by Deloitte Access Economics for Menzies in 2012 and 2015.

2 Methodology

2.1 Summary of methodology

Menzies' social and economic contribution is estimated according to two separate approaches. Each approach offers a distinct perspective on the value Menzies' generates through its activities. The approaches are as follows:

- **Economic contribution analysis:** This analysis measures the direct economic contribution of Menzies' activities to the NT and Australian economies, measured in full-time equivalent (FTE) employment and value added terms. The indirect economic contribution is also measured in FTE employment and value added terms, which reflects the value Menzies' creates through its supply chain based on its demand for the outputs of other sectors of the economy.
- **Cost-benefit analysis (CBA):** The CBA measures the economic benefits associated with the health outcomes expected to be realised as a result of Menzies' research programs, and compares these benefits with the cost of delivering the research programs. This approach considers the health benefits realised over time as the findings from Menzies research are implemented as changes to policy, guidelines and clinical practice. These benefits are estimated for the period 2012 to 2041 and are reported in present value terms.

Further details about each approach are summarised in the sections that follow.

2.2 Economic contribution analysis

The estimates of Menzies' direct and indirect economic contribution are based on input-output (IO) modelling techniques. Deloitte Access Economics' Regional Input Output Model (DAE-RIOM) is an in-house modelling tool that derives national, state and regional level IO matrices from the Australian Bureau of Statistics published national IO tables, which are based on industry surveys. The IO tables used in the analysis were for the 2018-19 financial year.

Economic contribution analysis provides an estimation of the contribution of an entity to the economy at a point in time. For this analysis, Menzies' economic contribution is estimated with respect to the economies of the NT and Australia in the 2020 calendar year.

The measures of value added and employment are used to describe different aspects of Menzies' economic contribution. Value added measures the value of output (i.e. goods and services) generated by Menzies' factors of production (i.e. labour and capital) as measured by the income to those factors of production. The sum of value added across all entities in the economy equals gross domestic product (GDP). Given the relationship to GDP, the value-added measure can be thought of as the increased contribution to economic welfare.

Employment is a different measure of economic activity to value added. Employment measures the number of workers that are employed – both directly by Menzies, and indirectly as a result of Menzies' operations – rather than the value of the workers' output.

For each measure of economic contribution, there are two key components: the direct and indirect contribution. The direct contribution reflects the value added to the economy by income earned from capital (measured as gross operating surplus) and labour (measured as wages) employed directly by the organisation. It is measured as the sum of gross operating surplus, payments to labour in the form of wages, and taxes less subsidies on production.

The indirect contribution reflects the demand for goods and services produced in other sectors of the economy as a result of the direct economic activity of Menzies. As part of its operations, Menzies consumes a variety of resources, which are reflected in its payments to suppliers. These include laboratory and direct research costs, rent and lease costs, advertising expenses and professional services. These payments flow into other sectors of the economy, stimulating economic activity and leading to increased value added and employment through the supply chain.

Further details on the methodology for the economic contribution analysis are outlined in Appendix A.

2.3 Cost-benefit analysis

2.3.1 About cost-benefit analysis

For a given policy or program, a cost-benefit analysis (CBA) compares the total estimated costs to the community and economy with the total estimated benefits. As such, a CBA determines whether the benefits outweigh the costs, and if so, to what extent.

In undertaking a CBA, the benefits and costs expected to accrue over time are modelled using a discounted cash flow (DCF), to determine whether the benefits exceed the costs in present value terms. The net return (discounted benefits over discounted costs) is expressed in the form of a ratio, referred to as the benefit-cost ratio (BCR).

A BCR greater than one indicates that net benefits related to the policy or program are greater than net costs, suggesting value in delivering the program (or for every $1.00 of investment, a return greater than $1.00 is achieved). The reverse is true if the BCR is below one. However, invariably it is not possible to quantify and monetise all benefits that an initiative may deliver. In many cases, significant, non-quantifiable benefits are relevant and should be reported to provide a complete analysis of the value of the initiative.

2.3.2 Approach to undertaking this cost-benefit analysis

The CBA compares the costs and benefits attributable to Menzies' research programs between a 'base case' and a 'project case' scenario over a 30-year assessment period, from 2012 to 2041. Five key steps have been taken to prepare the CBA:

1. Scenario definition
2. Assessment period definition
3. Benefit specification and estimation
4. Cost specification and estimation
5. Discounted cash flow (DCF) modelling.

2.3.2.1 Scenario definition

2.3.2.1.1 Base case

In undertaking a CBA, the benefits and costs are measured as the incremental change from the base case. This ensures that only the benefits and costs that can be reasonably attributed to Menzies are included in the analysis.

For this analysis, the base case is defined as a scenario in which Menzies does not exist, and therefore its research programs – which contribute toward enhancements to policy, guidelines and clinical practice, and ultimately toward improved health outcomes – are not delivered. However, it is recognised that there are often several programs of research work which together lead to improvements in clinical practice, and so even without Menzies' research work, clinical practice will likely improve over time. To account for this, an adjustment is made to recognise only the share of benefits that can be attributed to Menzies' role in informing changes to clinical practice (see section 2.3.3.1).

2.3.2.1.2 Project case

The project case of a CBA reflects a scenario where the economic benefits and costs associated with a policy or program are realised. This analysis defines the project case as the status quo; that is, a scenario in which Menzies continues to operate and deliver its research programs. However, this analysis only measures the benefits associated with findings of Menzies' research programs that were completed between 2012 and 2021. This is because the findings of these research programs are documented and the changes to policy, guidelines and clinical practice they have informed can be ascertained and measured in economic terms.

2.3.2.2 Assessment period definition

The assessment period for this CBA is defined as a timeframe of 30 years, from 2012 to 2041. This period has been selected as it reflects the accumulation of research findings and clinical practice enhancements over a period of 10 years, and 20 years of forecast outcomes that reflect the improved health outcomes as a result of Menzies' research programs. The forecasts over the assessment period have been established by drawing on data and evidence available from the previous 10 years.

2.3.2.3 Benefit specification and estimation

The specification of benefits in a CBA involves identifying the impacts of the policy or program that result in positive or desirable effects. To be included as part of the BCR calculation, the benefits must be measurable and attributable to Menzies; that is, it must be possible to attribute each benefit with a meaningful measure of economic value.

For the purposes of this analysis, the economic benefits associated with improved health outcomes across 10 of Menzies' research areas have been identified as measurable. These are as follows:

1. Malaria
2. Melioidosis
3. Rheumatic heart disease
4. Improved quality of primary health care for chronic disease
5. Diabetes
6. Pyoderma and scabies
7. Chronic suppurative lung disease
8. Kidney disease
9. Cancer
10. Otitis media.

Chapter 4 provides a description of each of the benefits, along with the key data inputs and assumptions that have been used in estimating their value.

2.3.2.4 Cost specification and estimation

The specification of costs in a CBA takes into account all the impacts of the policy or program that produce negative or undesirable effects, including what has to be given up or forgone in order to implement the program. Importantly, all costs that are incurred in achieving the benefits must be captured within a CBA.

This analysis considers Menzies' total operating costs over the period 2012 to 2020. This primarily consists of research-related costs (62% of total operating costs), which includes wages for research staff and direct research costs, such as publishing and laboratory. Total operating costs also include repairs and maintenance, non-research employee costs and other expenses, such as advertising.

2.3.2.5 Discounted cash flow modelling

Discounted cash flow modelling is undertaken to estimate the present values of future costs and benefits. The discounting of future costs and benefits to derive present values reflects the time value of money and uncertainty of future cash flows, and the fact that people generally attribute a higher value to consumption today than consumption in the future. The BCR is calculated by dividing the total present value of benefits by the total present value of costs.

Future benefits and costs are discounted at the rate of 7.0% per annum to derive their present values. This aligns with guidance published by the Department of the Prime Minister and Cabinet on the use of CBA for policy proposals.[2] As the analysis also considers 10 years of historical benefits and costs, which occur during the period 2012 to 2021, these benefits and costs are converted to present values by adjusting them to 2021 dollars. The analysis also considers the sensitivity of the CBA results to both a lower and high discount rate (see section 5.2.1).

2.3.3 Key assumptions

A range of key assumptions and parameters underpin the CBA of Menzies' research programs. These assumptions and parameters are detailed in the following sections.

2.3.3.1 Attribution of Menzies research

Menzies' research contributes to improved health outcomes across Australia and the rest of the world by adding to the body of evidence that influences changes in policy, clinical guidelines and clinical practice. To estimate the contribution of Menzies research to improved health outcomes, two approaches are used to recognise the varying role that Menzies plays in research and translation of findings. These are as follows:

1. The attribution of Menzies research where Menzies directly contributes to changes in policy and clinical practice through additions to the evidence base
2. The attribution of Menzies research where Menzies also plays a role in implementation of programs and interventions.

These two approaches are described in the sections that follow.

2.3.3.1.1 Attribution where Menzies contributes to the evidence base

For research programs in which Menzies work contributes to changes in policy and clinical practice through additions to the evidence base, the analysis assumes that its impact is equal to the contribution of Australian research to improved health outcomes. This assumption is derived by applying the following formula:

The contribution of research to improvements in health outcomes
X
The proportion of research from Australian sources
=
Menzies' attribution to health improvements

The contribution of research to improvements in health outcomes is sourced from a study conducted by Hatfield et al, 2000. This study proposed that 33% of total health gains related to a reduction in mortality and morbidity from cardiovascular disease is the result of medical research, while a share of the remaining 67% can be linked to research since gains attributed to changes in public policy and individual behaviour depend on research-derived information. Health research, therefore, is assumed to be responsible for 50% of improvements in healthy lifespan. The remaining 50% is attributed to the other factors associated with the implementation of health research.

The proportion of health research from Australian sources was determined through bibliometric analysis conducted by NHMRC. The analysis found that over the period 2008 to 2012, approximately 3.6% of clinical science publications were from Australian sources.[3]

Applying the formula, the rate of attribution of Menzies' research to improved health outcomes estimated at 1.8% over the period 2012 to 2041. This is higher than the rate of attribution used in the 2015 study, which was 1.55%.

2.3.3.1.2 Attribution where Menzies contributes to program implementation

For research programs in which Menzies has a more active role in implementation, the analysis assumes that attribution is shared evenly between all parties involved in the research and implementation of the program or intervention. For example, in a situation where Menzies collaborates with two other independent organisations to develop and implement a screening program, the attribution of Menzies is assumed to be 33%.

2.3.3.2 Measuring burden of disease

To measure the benefits of a change in clinical intervention on the burden of disease, changes in disability adjusted life years (DALY) are estimated for each medical condition and impacted population. The DALY is a measure of the burden of disease for an individual. It includes the years of life lost due to premature mortality (YLLs) from a particular condition and the years of healthy life lost due to disability (YLDs) living with the condition.

DALYs are estimated using disability weights of conditions published in the Australian Burden of Disease Study (based on the Global Burden of Disease study by the Global Burden of Disease Collaborative Network).[4,5] Other sources of disability weights include studies by Begg et al (2007) and Romani et al (2021).[6,7] The health benefits related to a clinical intervention are measured by the change in DALYs incurred, with a decline in DALYs indicating that an intervention has reduced the burden of disease. The economic value of DALYs are estimated using the value of a statistical life year.

2.3.3.3 Estimating the value of burden of disease

Changes in DALYs are estimated by using the value of a statistical life year (VSLY). The concept of VSLY is widely used for the economic evaluation of public policies in the areas of health, environment and safety. The VSLY represents a trade-off between wealth (budgetary resources for a government decision) and a reduction in the probability of death.

For the purposes of this analysis, the VSLY and value of a statistical Life (VSL) published by the Department of the Prime Minister and Cabinet are used, which are $222,000 and $5.1 million respectively (2021 dollars).[8]

2.3.3.4 Measuring other intervention costs and benefits

In addition to measuring changes in the burden of disease, this analysis also measures other benefits and costs associated with changes in policy, guidelines and clinical practice. These include the costs of administering interventions, savings in health care spending due to reduced duration of disease, and non-monetary benefits such as reduced informal care. These benefits and costs are included in the analysis where sufficient evidence exists in the literature to attribute them to the changes in clinical practice and improved health outcomes as a result of Menzies' research.

2.3.3.5 Population forecasts

A critical component of the analysis is population forecasts over the assessment period, which stretches to 2041. These were sourced from ABS population forecasts by State and Territory, with a base year of 2017.[9] The population forecasts include disaggregation by age (in single years), gender (male and female) and First Nations status (Aboriginal and/or Torres Strait Islander and non-Indigenous).

2.3.3.6 Limitations of the cost-benefit analysis

This analysis aims to capture the total measurable economic benefits associated with the improved health outcomes as a result of Menzies' research throughout Australia and the Asia Pacific region. However, the analysis has several limitations that should be considered when interpreting the results. These include:

- The estimates of health benefits in future years are dependent on population forecasts from the ABS. However, the analysis does not consider changes in age demographics over time, which may impact incidence rates and prevalence of diseases.
- Several of Menzies' research areas were not considered in the analysis due to limited information and evidence about the impact of the research in terms of changes in clinical practice and policy.
- Even for research areas that were included in the analysis, in many cases some programs within those research areas were not included due to limited information and evidence. In these cases, the estimated economic benefits of the research areas likely present a lower bound estimate of the value of the benefits.

3 Economic contribution of Menzies

Table 3.1: Economic contribution of Menzies, 2020 calendar year

Economic contribution	Northern Territory	Australia
Value added ($ millions, 2021 dollars)		
Direct contribution	$23.9	$29.9
Indirect contribution	$2.0	$12.8
Total value added	**$25.9**	**$42.7**
Employment (FTE)		
Direct contribution	171.2	215.3
Indirect contribution	14.3	95.5
Total employment contribution	**185.5**	**310.8**

Source: Deloitte Access Economics.
Note: Numbers may not add exactly to totals due to rounding.

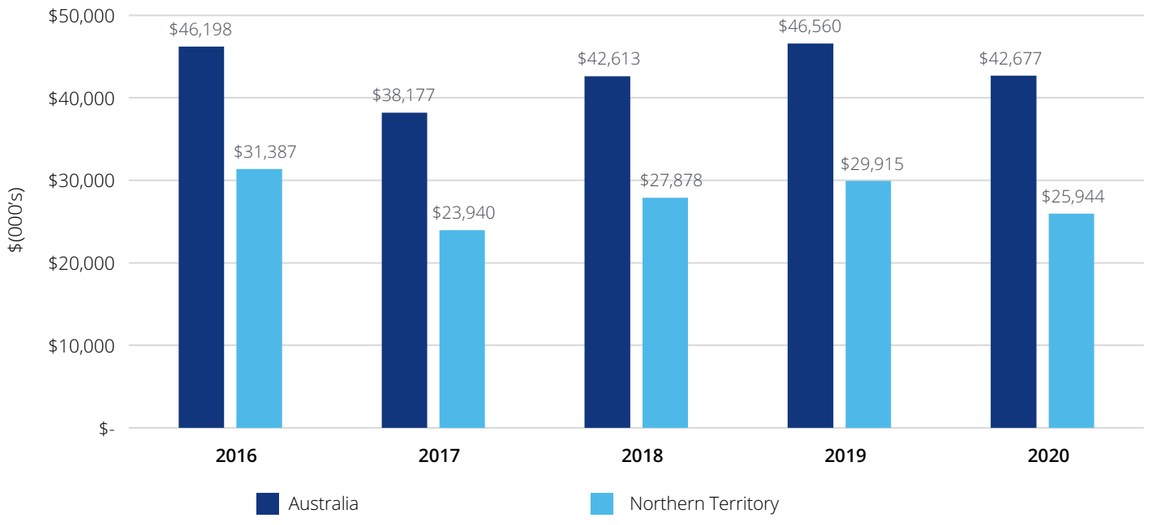
3.1 Menzies' total economic contribution

It is estimated that in the 2020, Menzies' total contribution to the Australian economy was $42.7 million in value added terms (see Table 3.1). In addition, Menzies total employment (direct and indirect) contributed to the Australian economy was 310.8 FTE jobs through its operations.

More than half of Menzies' total economic contribution was related to its contribution to the NT economy. In 2020, Menzies' contribution to the NT economy is estimated at $25.9 million in value added terms, while total employment contributed to the NT was 185.5 FTE jobs.

Menzies' total economic contribution has remained relatively consistent over the past five years in Australia and the NT (see Chart 3.1). Over this period, Menzies has invested substantially in its workforce with FTE employed at Menzies increasing by 14% and real wages paid to employees growing by 15% within Australia. In addition, Menzies' workforce employed internationally has increased from approximately 1.9 FTE in 2016 to 26.4 FTE in 2020. This illustrates Menzies focus in growing its footprint across Australia and internationally. Over time, these investments may be reflected in increases in the value added contributed by Menzies to the Australian economy.

Chart 3.1: Menzies' total value added, 2016 to 2020



Source: Deloitte Access Economics.

Cumulatively, the total economic contribution of Menzies to the Australian economy over the period 2016 to 2020 is estimated at $216 million in value added terms. Consistent with Menzies' economic contribution in 2020, more than half of this relates to its contribution to the NT economy, which is estimated at $139 million over the same period.

3.2 Menzies' direct contribution

It is estimated that in 2020, Menzies directly contributed $23.9 million and $29.9 million to the NT and Australian economies respectively, in value added terms. Menzies' direct contribution to the Australian economy declined by approximately 9.0% between 2019 and 2020, despite growing by an average rate of 10% per annum between 2017 and 2019. This reflects declining revenue from government sources between 2019 and 2020, which resulted in a lower gross operating surplus.

Menzies directly employed 215.3 FTEs in Australia, of which 171.2 FTEs were based in the NT. In addition, Menzies directly employs approximately 26 FTEs who are based overseas; these are mainly located in Timor-Leste, where Menzies opened an office in 2019.[10] However, the economic contribution analysis does not consider activity that occurs outside of the Australian economy.

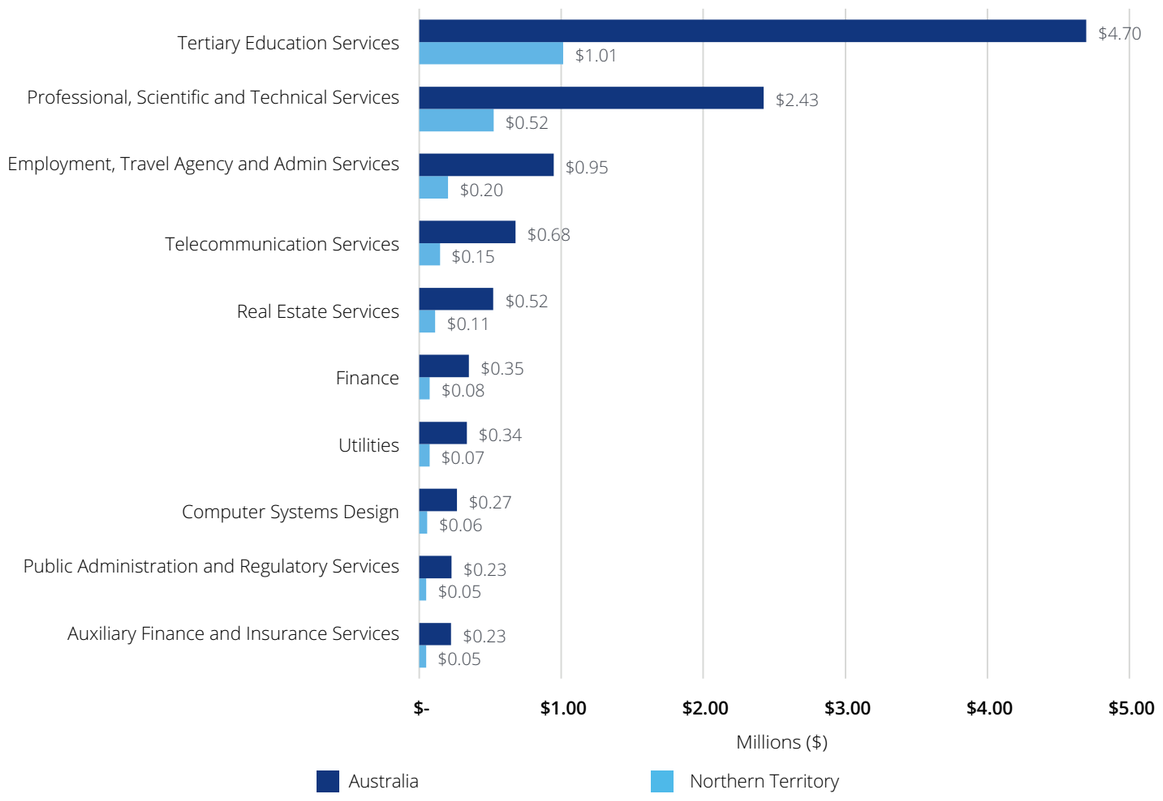
3.3 Menzies' indirect contribution

Menzies' operations generate positive flow-through effects to the wider economy. It is estimated that in 2020, Menzies indirectly contributed $2.0 million and $12.8 million to the NT and Australian economies respectively, in value added terms. In terms of employment, Menzies' operations indirectly supported 95.5 FTE jobs in the Australian economy, of which 14.3 FTEs were based in the NT (see Table 3.1).

The measures of indirect value added and indirect employment represent the demand for goods and services produced in other sectors as a result of the demand generated by Menzies' economic activity. As a result, indirect value added is driven by patterns in Menzies' expenditure on both NT and Australian-sourced goods and services.

Of the total $12.8 million in indirect value added by Menzies to the Australian economy in 2020, $4.7 million (40%) is related to the tertiary education services sector (see Chart 3.2). This primarily reflects the costs of research, including laboratory costs and publication costs. In addition, $2.4 million (20%) in indirect value added is generated in the professional, scientific, and technical services sector, while a further $0.9 million (7%) is related to the employment, travel and admin services sector.

Chart 3.2: Breakdown of Menzies' indirect value added, by sector, 2020 calendar year ($ million)



Source: Deloitte Access Economics.

4 Benefits of improved health outcomes

4.1 Summary of research area benefits

Menzies' research programs span a wide variety of areas, with a range of programs resulting in findings that have contributed to changes to policy, guidelines and clinical practice. These changes to clinical practice are expected to result in improved treatment and health outcomes over time.

Menzies' research focuses on improving health outcomes for First Nations people, as well as people living in the Asia-Pacific region. However, the broader Australian population also benefit from Menzies' research where it contributes to improvements in the understanding and management of health conditions that impact all Australians.

Where it could be established that Menzies' research has resulted in enhancements to clinical practice that are expected to generate improved health outcomes over time, these benefits have been estimated as part of the CBA. Only the accumulated research findings and clinical practice enhancements over the period 2012 to 2020 are considered in the analysis, with future improved health outcomes forecast over the remainder of the 30-year assessment period (see 2.3.2.2).

The economic benefits associated with improved health outcomes are measured with respect to the following 10 of Menzies' research areas:

1. Malaria
2. Melioidosis
3. Rheumatic heart disease
4. Improved quality of primary health care for chronic disease
5. Diabetes
6. Pyoderma and scabies
7. Chronic suppurative lung disease
8. Kidney disease
9. Cancer
10. Otitis media.

4.2 Malaria

Malaria is one of the most severe public health problems worldwide. According to the latest World Malaria Report (2020),[11] globally there were an estimated 229 million malaria cases in 2019, an annual estimate that has remained virtually unchanged since 2015.

Despite this, global malaria deaths reduced from 453,000 to 409,000 between 2015 to 2019. The malaria mortality rate reduced from about 12 deaths per 100,000 population in 2015 to 10 deaths per 100,000 population in 2019. The percentage of total malaria deaths among children aged under 5 years was 67% in 2019, with the World Health Organization (WHO) African Region accounting for about 94% of cases and deaths globally.[12]

The significant impacts of malaria disproportionately affect poorer people who have limited access to health care. While many countries – especially in temperate and sub-tropical zones – have successfully eliminated malaria, most malaria cases and deaths occur in sub-Saharan Africa, as well as the developing countries of Asia, Latin America, and to a lesser extent the Middle East and parts of Europe.[13]

Menzies' malaria research program spans a broad range of research activities aimed at both prevention and treatment, from epidemiology, diagnosis, pathophysiology, immunology, molecular parasitology, clinical trials, and evaluation of the impact and cost-effectiveness of public health interventions. Menzies' undertakes work on all five species of the plasmodium parasite that cause human malaria. Its research activities have a particular focus on the three types of plasmodium parasite that cause most disease and death in Maria-affected regions across the world, including plasmodium falciparum, plasmodium vivax and plasmodium knowlesi.

Menzies has been involved in several major research efforts that have resulted in changes in malaria treatment regimes in Australia and internationally. These include studies that have demonstrated the benefits of:

- Use of artemisinin combination therapy (ACT) for Plasmodium falciparum (Pf) and Plasmodium vivax (Pv) malaria in Indonesia, Papua New Guinea (PNG), Cambodia, Malaysia, Vanuatu, Solomon Islands)
- Use of intravenous Artesunate for severe Pf malaria
- Use of ACT in pregnancy for Pf and Pv malaria.

4.2.1 Severe malaria treatment

4.2.1.1 Summary of research undertaken by Menzies

Menzies contributed to the evidence base that supported validating the effectiveness of artesunate in reducing the mortality of severe malaria by 34.7%, compared with conventional intravenous quinine. This research has contributed to WHO guidelines, which recommend the use of artesunate to treat sever cases of malaria internationally.

4.2.1.2 Methodology and assumptions

The benefits are calculated as the reduction in malaria deaths due to the administration of artesunate. It is estimated that this medication reduces deaths by 34.7% across the Asia-Pacific region and the Americas. This reduces the disease burden associated with malaria by reducing the loss of life. The cost of the medication is deducted from the value of the benefits. Table 4.1 summarises the key inputs and assumptions used in estimating the value of the benefits.

4.2.1.3 Modelling results

Between 2021 and 2041, it is estimated that Menzies' research into the treatment of severe malaria will contribute toward avoiding 10,120 deaths across the world. Over the entire assessment period, it is estimated that Menzies' research will generate $903.7 million in health benefits internationally (present value terms), including $1.4 million to Australia.

Table 4.1: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	People living in the Asia-Pacific region and the Americas	Menzies
Annual malaria deaths in the impacted regions	2,309	WHO 2014a
Annual malaria deaths in Australia	2.5	Begg et al, 2007
Reduction in mortality from severe malaria	34.7%	Dondorp et al, 2005
Cost of drug (1 viral)	$1.62	Lubell et al, 2011
Attribution of benefits to Menzies research	1.8%	Assumption (see section 2.3.3.1)

4.2.2 Treatment of multi-drug resistant malaria

4.2.2.1 Summary of research undertaken by Menzies

Menzies' contributed to the evidence base that identified effective treatments for uncomplicated multi-drug resistant malaria using a range of methods, and across a range of geographies. The research impacts measured as part of this analysis include:

- Research into the use of DHA-piperaquine, which demonstrated that treatment results in a significantly lower parasitological failure rate than treatment with artesunate-amodiaquine. This research has influenced guidelines on the treatment of malaria in Indonesia and Cambodia.
- Research into the use of ACT, which shows that the use of ACT reduces the incidence and complications associated with Pf and Pv malaria. This research has influenced guidelines on the treatment of malaria in Indonesia, Papua New Guinea, Cambodia, Malaysia, Vanuatu, Solomon Islands.
- Research into the use of artemether-lumefantrine (AL) and chloroquine (CQ) with and without primaquine. This research shows that combining AL or CQ with primaquine reduces the recurrence of Pv. This research has influenced guidelines on the treatment of malaria in Ethiopia.

4.2.2.2 Methodology and assumptions

The benefits are calculated as the reduction in incidence of plasmodium vivax malaria due to the administration of DHA-piperaquine, ACT or a combination of AL or CQ with primaquine throughout the regions of Indonesia, Papua New Guinea, Cambodia, Malaysia, Vanuatu, Solomon Islands and Ethiopia.

Specific impacts that were modelled due to the introduction of each treatment are as follows:

- **DHA-piperaquine:** It is estimated that DHA-piperaquine medication reduces recurrent cases of malaria by approximately 70%.
- **ACT:** It is estimated that ACT medication reduces incidence of plasmodium vivax cases of malaria by approximately 40%.[14]
- **Primaquine combination treatment:** It is estimated that that combining AL or CQ with primaquine reduces the recurrence of Pv by 5-fold.[15]

These impacts are measured as a reduction in disease burden associated with malaria due to improved treatment, which is estimated as reduced DALYs. The additional cost of the medication is deducted from the value of the estimated benefits.

Table 4.2 summarises the key inputs and assumptions used in estimating the value of the benefits.

4.2.2.3 Modelling results

Over the entire assessment period, it is estimated that Menzies' research into the treatment of multi-drug resistant malaria will generate $85.9 million in health benefits to the countries of Indonesia, Papua New Guinea, Cambodia, Malaysia, Vanuatu, Solomon Islands and Ethiopia (present value terms).

Table 4.2: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	People living in Indonesia, Papua New Guinea, Cambodia, Malaysia, Vanuatu, Solomon Islands, Ethiopia	Menzies
Percentage of malaria cases from plasmodium vivax	45.8%	WHO 2014
Disease weight for malaria episodes	0.175	Mathers et al, 1999
Duration of condition (untreated, years)	0.01	Mathers et al, 1999
Cost of drug (assumed to be consistent across differing treatments)	$7.10	Kioko et al, 2016
Attribution of benefits to Menzies research	1.8%	Assumption (see section 2.3.3.1)

4.2.3 Treatment of malaria in pregnancy

4.2.3.1 Summary of research undertaken by Menzies

Research undertaken by Menzies has demonstrated that the treatment of pregnant women with DHA-piperaquine in the second and third trimesters reduces the rate of vertical transmission of malaria, as well as the proportion of babies born with low birth weight (LBW) by mothers with malaria. This leads to a reduction in the burden of disease in terms of babies born with LBW, as well as the long-term impacts associated with LBW.

4.2.3.2 Methodology and assumptions

The benefits are calculated as the reduction in LBW due to improved treatment of malaria in pregnant mothers. This leads to avoided DALYs due to a reduction in the risk of babies being born with LBW, which leads to a reduced risk of future development disabilities.

Table 4.3: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	People living in Indonesia and Cambodia	Menzies
Proportion of babies born with LBW, prior to treatment	20%	Poespoprodjo et al, 2015
Proportion of babies born with LBW, with treatment	12%	Poespoprodjo et al, 2015
Disease weighting for mild disabilities resulting from LBW	0.11	Mathers et al, 1999
Incidence of mild disability resulting from LBW	5%	Deloitte Access Economics, 2012
Life expectancy (Indonesia, child born in 2013)	71.7	World Bank, 2021
Cost of drug	$7.10	Kioko et al, 2016
Attribution of benefits to Menzies research	1.8%	Assumption (see section 2.3.3.1)

The cost of the medication is deducted from the value of the benefits. Table 4.3 summarises the key inputs and assumptions used in estimating the value of the benefits.

4.2.3.3 Modelling results

Over the entire assessment period, it is estimated that Menzies' research into the treatment of malaria in pregnancy will generate $11.2 million in health benefits to Indonesia and Cambodia (present value terms).

4.3 Melioidosis

Melioidosis is a potentially fatal, infectious disease that occurs in tropical areas throughout the world and is endemic in Southeast Asia and northern Australia.[16] The majority of infections occur when skin abrasions or wounds come into contact with wet soil or water contaminated with the bacterium, and very rarely through swallowing contaminated water or through breathing in fine droplets of such water.[17]

Most cases of melioidosis are 'acute cases' that have a sudden onset of between one day to three weeks after an apparent exposure to soil or muddy water. Cases can present as pneumonia with fever, cough and difficulty breathing or as blood poisoning with fever, confusion and shock. Acute melioidosis has a significant disease burden as it almost always requires hospital inpatient management, with deaths occurring in Australia each year as a result of the disease.

4.3.1 Supporting improved early diagnosis and treatment of melioidosis

4.3.1.1 Summary of research undertaken by Menzies

Menzies has contributed to the understanding and effective treatment of melioidosis since 1998. Since 2012, Menzies' research has continued to contribute to updated guidelines, largely through the Darwin Prospective Melioidosis study, which has been running for over 30 years and provides substantial evidence on the pathology of Melioidosis and treatment practices.

More recently, Menzies contributed to a review of the 2015 practice guidelines, which led to adjustments to treatment guidelines. This included recommendations for the provision of antibiotics to dialysis patients during the wet season, due to their vulnerability to melioidosis.

4.3.1.2 Methodology and assumptions

The benefits are calculated for two different populations, based on research that Menzies has undertaken. This includes people receiving dialysis in northern Australia and the rest of the northern Australia population.

The proportion of annual melioidosis cases that occur in people receiving dialysis is estimated at 8%, based on data provided by Menzies. By taking the antibiotics, all cases of melioidosis in people receiving dialysis are effectively avoided, reducing the deaths from melioidosis. The cost of the medication is deducted from the value of the benefits.

For all other cases of melioidosis, the observed reduction in deaths from septic shock is attributed as an impact of Menzies' research on the burden of melioidosis. It is estimated that the rate of death from septic shock has declined from 50% to 10% of melioidosis cases between 2014 and 2021 (see Table 4.4).

4.3.1.3 Modelling results

Over the entire assessment period, it is estimated that Menzies' research into the treatment of melioidosis will generate $31.7 million in health benefits to Australia (present value terms), including $10.9 million to the NT.

Table 4.4: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	People in the Northern Australia	Menzies
Annual incidence of melioidosis in northern Australia	0.025%	Currie et al, 2021
Cases of melioidosis with septic shock	21%	Currie et al, 2021
Prior rates of death from septic shock	50%	Mayr et al, 2014
New rates of death from septic shock	10%	Currie et al, 2021
Proportion of people with Melioidosis and receiving dialysis	8%	Menzies
Reduction in cases of Melioidosis due to antibiotics for people receiving dialysis	100%	Menzies
Cost of antibiotics	$20.38	PBS, 2021
Attribution of benefits to Menzies research	1.8%	Assumption (see section 2.3.3.1)

4.4 Rheumatic heart disease

Acute rheumatic fever (ARF) is an autoimmune disease triggered in some children and young adults caused by a bacterial pathogen called Group A streptococcus (GAS). GAS infection risk is associated with socio-economic factors, such as household crowding. Repeated or severe ARF leads to rheumatic heart disease (RHD).

The incidence of ARF, although rare in most industrialised countries, remains high in many populations living in poverty. RHD remains the major cardiac disease of children and young adults in many less developed countries. This is because ARF is more often seen in people who live in poor, crowded conditions, and first episodes of ARF most commonly occur between the ages of 5 and 15 years.[18]

The disease burden rates of ARF and RHD among Australian First Nations people, especially in rural or remote settings, are amongst the highest in the world. Prevalence estimates for definite RHD in Australian children range from <1 per 1,000 population in low risk children to 333-504 per 1000 people in high risk populations.[19,20] High rates of disease also occur among Māori and Pacific Islander populations in Australia.[21]

Prevention of recurrent episodes of ARF is important to minimise further valve damage, worsening of RHD and preventing the heart valves from becoming severely defective. Recurrent Strep A infections and episodes of ARF can cause further damage to the heart valves, making RHD progressively worse over time. More than half of the people with ARF will develop RHD with 10 years. These recurrent episodes may cause heart failure, other complications such as stroke and endocarditis, and lead to the need for cardiac surgery or result in early death.[22]

4.4.1 Contribution to the reduction in incidence of RHD across Australia

4.4.1.1 Summary of research undertaken by Menzies

Efforts supported by Menzies researchers have resulted in the introduction of the Rheumatic Heart Disease Control Program in the NT. This work subsequently led to the National Rheumatic Fever Strategy, which includes funding for control programs in the NT, Queensland, Western Australia and South Australia. The national peak body, RHD Australia, is hosted within Menzies. This program contributes to lowering the disease burden of RHD in Australia by preventing cases of RHD through improved understanding of the disease and its pathology in remote regions in Australia, and improved community education.

4.4.1.2 Methodology and assumptions

The benefits are calculated by observing the reduction in the incidence rate of RHD across Australia. Data from AIHW indicates that incident rates of RHD have approximately halved since 2000.[23] This reduction is considered attributable to the Rheumatic Heart Disease Control Program in Queensland, South Australia, Western Australia and the NT. The program has resulted in a reduced burden of RHD across the country, which is estimated as avoided DALYs. Table 4.5 summarises the key inputs and assumptions used in estimating the value of the benefits.

4.4.1.3 Modelling results

It is estimated that Menzies research has contributed to the reduction in incidence of RHD across Australia's First Nation people. Over the assessment period, it is estimated that Menzies' work in supporting reduced incidence of RHD will generate $17.0 million in health benefits to Australia (present value terms), including $2.7 million to the NT.

Table 4.5: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	People in QLD, SA, WA and NT	Menzies
Reduction in the rate of RHD per decade	50%	Deloitte Access Economics, 2012
Incidence of RHD without intervention	0.15%	AIHW, 2000
Incidence of RHD with intervention	0.06%	AIHW, 2019
Proportion of RHD	0.76	Katzenellenbogen et al, 2020
Proportion of Severe RHD	0.24	Katzenellenbogen et al, 2020
Disease weight for RHD	0.083	Watkins et al, 2017
Disease weight for Severe RHD	0.179	Watkins et al, 2017
Attribution of benefits to Menzies research	1.8%	Assumption (see section 2.3.3.1)

4.5 Improved quality of primary health care for chronic disease

The prevalence rates of chronic diseases such as asthma, ear disease, hearing loss, heart disease and diabetes are all significantly higher among Australia's First Nation's people compared to the non-Indigenous population.[24] Reducing the incidence of these illnesses within the First Nations population is identified as a major challenge in advancing the health of First Nations communities by the Australian Government.

Best practice in chronic disease management is linked to the implementation of multidisciplinary, cross-cultural teams skilled in health education, clinical care and health promotion. However, such practice does not yet occur in many parts of rural and remote Australia where there are specific challenges such as limitations in policy frameworks, high staff turnover, limited preventative activity targeted toward adults and limited infrastructure.[25]

4.5.1 Contribution of Menzies to improvements in primary health care for chronic disease

4.5.1.1 Summary of research undertaken by Menzies

Menzies instituted the Audit and Best Practice for Chronic Disease Project National Partnership, which established One21Seventy, a National centre for Quality Improvement in First Nations Primary Health Care. One21Seventy is a not-for-profit organisation that promotes quality improvement in the First Nation's community-controlled health sector. To date, the improvement in the delivery of primary health care services from One21Seventy has resulted in improvements in diabetes management across First Nation's communities in NT and the rest of Australia.

Table 4.6: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	First Nations people with diabetes	Menzies
Prevalence of diabetes among First Nations people	12.6%	ABS, 2019
Reduction in HbA1c levels in First Nations population due to improved systems	4%	Bailie et al, 2007
Reduction in HbA1c levels that leads to 25% reduction in complications	11%	UKPDS, 1998
Disease weight – retinopathy	0.134	AIHW, 2018
Disease weight – neuropathy	0.133	AIHW, 2018
Disease weight – kidney disease	0.280	AIHW, 2015
Attribution of benefits to Menzies research	1.8%	Assumption (see section 2.3.3.1)

4.5.1.2 Methodology and assumptions

The benefits are calculated in terms of the impact of the initiative on improving blood glucose levels and the reduction in complications associated with diabetes, such as kidney disease and kidney failure. The initiative is estimated to have reduced readings of HbA1c levels by approximately 4%. This is based on evidence from Bailie et al (2007), which demonstrated the impact of improved management systems on improved patient management of blood glucose levels.[26]

Improved control of blood glucose levels is linked to a reduced risk of complications associated with diabetes, such as kidney disease.[27] This leads to a reduced disease burden over time and longer life expectancy for Australia's First Nations people with diabetes.

Table 4.6 summarises the key inputs and assumptions used in estimating the value of the benefits.

4.5.1.3 Modelling results

Over the assessment period, it is estimated that Menzies' work related to the improved primary health care management of diabetes will generate $250.1 million in health benefits to Australia (present value terms), including $20.9 million to the NT.

4.6 Diabetes

Australia's First Nations people have a high rate of incidence of diabetes, including increasing numbers of women with diabetes in pregnancy.[28] In addition, a major concern is the intergenerational nature of the condition, with the prevalence of youth-onset type 2 diabetes (T2D) increasing worldwide.[29] Youth-onset T2D also has implications in terms of current and future pregnancies as a result of exposure to high blood sugar levels experienced in-utero and the risk of future cardiovascular events.

Since 2011, Menzies' has led *The DIABETES across the LIFECOURSE: Northern Australia Partnership.* This has enabled researchers, policymakers and health service providers to collaborate and improve systems of care and services for people with diabetes in remote northern Australia. The partnership aims to draw attention to the intergenerational effects of diabetes and the importance of prevention across the life course, by working to improve the care and outcomes for First Nations youths with diabetes and women with diabetes in pregnancy and their babies.

Menzies' research has demonstrated that there are increasing numbers of women with diabetes in pregnancy. For example, Kirkham et al (2017) found an 80% increase in rates of gestational diabetes between 2012 and 2014, noting that the increased rates are also related to increased awareness and screening among the target cohort. Diabetes in pregnancy is associated with an increase both in short and long-term health risks for mothers and their babies. Children exposed to diabetes in-utero are more likely have several health risk factors – including developing type 2 diabetes early in life – compared to children who are not exposed to diabetes in-utero.

More young children are now being diagnosed with type 2 diabetes. As a result, Menzies' work has shifted toward addressing this intergenerational cycle in First Nations people with a focus on early-life prevention, including pre-conception, pregnancy and during childhood.

4.6.1 Supporting the development of screening guidelines for T2D in youth

4.6.1.1 Summary of research undertaken by Menzies

Menzies' has contributed to the understanding of the prevalence of T2D in young First Nations people and the increased risks of kidney disease for early-onset diabetes. The research conducted by Menzies has led to changes to national guidelines related to screening for early onset T2D in First Nations youth, which has led to an increase in the number of youths diagnosed with T2D and hence those accessing treatment in a more timely manner.

4.6.1.2 Methodology and assumptions

The benefits are calculated by estimating the number of people that have an 'early' diagnosis of T2D due to the updated national guidelines, and the subsequent reduction in health care spending, morbidity and mortality over a person's lifetime. The cost of additional screening due to the updated guidelines is deducted from the value of the benefit. The following assumptions are used in measuring the benefits:

- The number of people that receive an 'early' diagnosis is calculated based on data provided by Menzies
- The value of an 'early' diagnosis is estimated at $57,183 per person over their lifetime, which is a result of reduced health care expenditure, improved life expectancy and reduced morbidity over a person's lifetime
- It is estimated that 18% of Australia's First Nations people aged under 24 years will be screened for T2D per year, with each screening estimated to cost $57.[30]

Table 4.7 summarises the key inputs and assumptions used in estimating the value of the benefits.

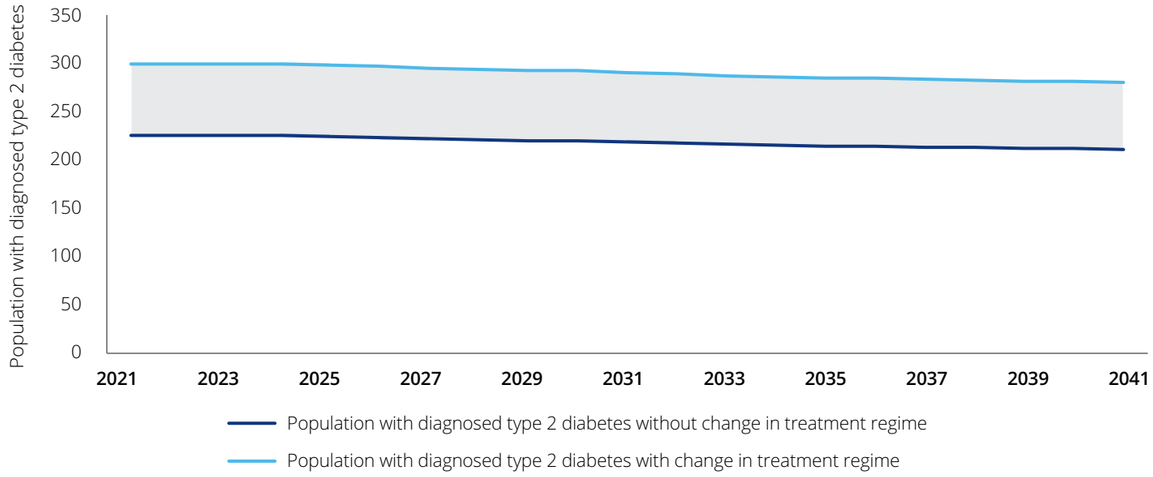
4.6.1.3 Modelling results

As a result of the screening program, it is estimated that approximately 25% of people with T2D will receive an 'early' diagnosis (see Chart 4.1). Due to the increase in early diagnosis, it is estimated that over the assessment period Menzies' research will generate $0.8 million in health benefits to the NT (present value terms).

Table 4.7: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	All First Nations people living in the NT under 25 years	Menzies
Prevalence of T2D in First Nations youths (0-24 years)	0.67%	Titmuss et al, 2021
Impact of Menzies youth diabetes partnership on the number of people diagnosed in the NT	33%	NT diabetic network
Cost of screening for T2D	$57	Hoerger et al, 2007
The proportion of First Nations children considered at risk of diabetes	18%	ABS, 2013
Lifetime discounted cost of a delayed diagnosis of T2D	$57,183	Deloitte Access Economics calculations using Adler et al. 2003
Attribution of benefits to Menzies research	1.8%	Assumption (see section 2.3.3.1)

Chart 4.1: Change in the number of people diagnosed with T2D, 2021-2041



Source: Deloitte Access Economics.

4.6.2 Supporting the management of patient care for women with gestational diabetes and diabetes during pregnancy

4.6.2.1 Summary of research undertaken by Menzies

Menzies has undertaken three streams of work as part of its NT Diabetes in Pregnancy Partnership Project, which commenced in 2012. These include:

- Pregnancy and Adverse Neonatal Diabetes Outcomes in Remote Australia (PANDORA), a detailed research project that focuses on assessing the rates, characteristics and outcomes of women with diabetes in pregnancy (including type 2 diabetes in pregnancy and Gestational diabetes mellitus (GDM)
- The development of a clinical register for use by health professionals
- A complex health systems intervention to enhance current models of care to improve health service delivery and health outcomes for women with diabetes in pregnancy (including type 2 diabetes in pregnancy and GDM).

As part of its work in developing a clinical register and improving models of care, Menzies' efforts have resulted in more women being diagnosed with GDM. This has allowed for earlier intervention in the treatment and management of diabetes, resulting in better maternal and neonatal outcomes in both the NT and Upper North QLD.

4.6.2.2 Methodology and assumptions

The benefits are calculated by estimating the increase in the number of expectant mothers diagnosed with gestational diabetes prior to giving birth due to the registry, and the subsequent reduction in the risk of complications, such as pre-eclampsia and caesarean deliveries. Table 4.8 summarises the key inputs and assumptions used in estimating the value of the benefits.

4.6.2.3 Modelling results

Over the assessment period, it is estimated that Menzies' research into diabetes in pregnancy will generate $3.4 million in health benefits to Australia (present value terms), including $0.4 million to the NT.

Table 4.8: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	Expectant mothers aged 15 to 40 years, living in NT and Far North Queensland	Menzies
Prevalence of GDM – Aboriginal and/or Torres Strait Islanders	8.7%	Kirkham et al. 2017
Prevalence of GDM after Menzies raised awareness – Aboriginal and/or Torres Strait Islanders	15.7%	Kirkham et al. 2017
Reduction in pre-eclampsia	6%	Crowther et al, 2005
Reduction in caesarean delivery	8%	Landon et al, 2009
Disability weight of hypertension	0.117	Begg et al, 2007
Disability weight of caesarean delivery	0.349	Begg et al, 2007
Cost of caesarean delivery	$16,465	The Lancet, 2016
Attribution of benefits to Menzies research^	33%	Assumption (see section 2.3.3.1)

Notes: ^Menzies is involved in the implementation and management of this program with two other independent parties, in addition to improving the evidence base associated with gestational diabetes. See section 2.3.3.1 for a greater discussion on how attribution rates are calculated.

4.7 Pyoderma and scabies

Pyoderma is a generic term used to describe a clinical diagnosis of superficial bacterial skin infection, whereas scabies is an infestation of the skin by the scabies mite Sarcoptes scabiei. In high-prevalence areas, poverty and overcrowded living conditions are important underlying social determinants of these conditions. Pyoderma generally arises as primary infections of the skin known as impetigo, or as secondary infections of other lesions, such as scabies or insect bites.[31]

4.7.1 Contributing to a reduction in the prevalence of scabies and pyoderma

4.7.1.1 Summary of research undertaken by Menzies

Menzies has contributed to the increased understanding of the prevalence and treatment of scabies throughout Australia and internationally. Along with its research partners, Menzies conducted a systematic review of 66 publications (89 studies) spanning published and grey literature from 1970 to 2014 and estimated that 167 million children have pyoderma worldwide at any one time.[32]

Menzies also conducted research into the effectiveness of oral antibiotic treatment in children with pyoderma. A randomised control trial of three alternative approaches to scabies control from 2012 to 2013 demonstrated an oral ivermectin-based mass drug administration (MDA) program achieved a 94% reduction in scabies prevalence.[33]

4.7.1.2 Methodology and assumptions

The benefits are calculated as the reduced prevalence of scabies and pyoderma due to the administration of the oral antibiotic. This leads to a reduced prevalence and hence a reduced disease burden of the condition. The cost of the antibiotic is deducted from the value of the benefit. Table 4.9 summarises the key inputs and assumptions used in estimating the value of the benefits.

4.7.1.3 Modelling results

Over the assessment period, it is estimated that Menzies' research related to scabies and pyoderma will generate $51.8 million in health benefits to Australia (present value terms), including $3.6 million to the NT.

Table 4.9: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	First Nations children living in disadvantaged areas	Menzies
Percentage of First Nations people living in disadvantaged areas	33%	ABS, 2016
Percentage of First Nations children with pyoderma	19.4%	Bowen et al, 2015
Incidence of pyoderma after intervention, assuming 80% oral treatment uptake and 84.7% efficacy	6.3%	Andrews et al, 2009; Bowen et al, 2014
Percentage of First Nations children with scabies	16%	Bowen et al, 2015
Incidence of scabies after intervention, assuming 83% efficacy at 12 months following ivermectin-based MDA	2.7%	Romani et al, 2014; Andrews et al, 2009
Disease weight of scabies	0.027	Romani et al, 2021
Cost of antibiotic treatment	$29.66	PBS, 2021
Attribution of benefits to Menzies research	1.8%	Assumption (see section 2.3.3.1)

4.8 Chronic suppurative lung disease

Chronic suppurative lung disease (CSLD) is a term that is used to describe the clinical features of bronchiectasis when the radiographic features needed to make a diagnosis of bronchiectasis are absent.[34] Bronchiectasis is a chronic lung condition where the elastic and muscular tissue of the bronchi become damaged by acute or chronic inflammation and infection. This damage impairs the natural drainage of bronchial secretions which can become chronically infected and result in mild to moderate airway obstruction.

Approximately 735 per 100,000 First Nations Australian children living in central Australia are diagnosed with CLSD each year. CSLD can result in a significant burden of disease on young children, with high rates of hospitalisation. Evidence from New Zealand suggests that 7-year mortality rates could be as high as 7% for children diagnosed with CSLD by the age of 6 years.[35]

The most common early symptom of CSLD is chronic cough.[36] Therefore, appropriately diagnosing and treating chronic cough is vital to reducing the burden of CSLD to First Nation people across Australia.

4.8.1 Improving the treatment of protracted bacterial bronchitis

4.8.1.1 Summary of research undertaken by Menzies

Protracted bacterial bronchitis (PBB) is a common disease amongst the paediatric population that is caused by the chronic infection of the conducting airways and impairment of muco-ciliary clearance.[37] PBB is the most common cause of chronic wet cough and can be characterised by persistent coughing, wheezing, noisy breathing and interrupted sleep. Due to similarities between symptoms of PBB and asthma, PBB has often been misdiagnosed as the latter and overlooked in both treatment and research.[38]

Menzies' work in respiratory paediatrics in the Child Health Division has been pivotal to increased awareness and treatment of this disease. Menzies was responsible for diagnostically categorising PBB in 2006 and identifying a cure for the condition. Menzies' work has since contributed to national management of PBB. Menzies' diagnosis of PBB in 2006 has helped to raise national awareness of the disease. Menzies' research has also made a valuable contribution to the treatment of the disease, identifying that a two-week course of antibiotics, amoxicillin clavulanate, can be administered to patients with PBB to resolve the condition.[39]

4.8.1.2 Modelling methodology and assumptions

The benefits associated with Menzies' research related to PBB are calculated as the impact of its research on the resolution of PBB through the treatment with amoxicillin clavulanate. This is model as a reduced burden of disease. Longer-term impacts of the treatment have not been modelled due to insufficient data on the long-term impacts of the treatment. The cost of treatment has been deducted from the benefits (see Table 4.10).

4.8.1.3 Modelling results

Over the assessment period, it is estimated that Menzies' research related to the screening and management of chronic cough will generate $129.9 million in health benefits to Australia, including $2.3 million to the NT (present value terms).

Table 4.10: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	All children living in Australia under 15 years	Menzies
Increase in resolution of PBB	32%	Marchant et al, 2012
Prevalence of PBB in children	7.2%	Carter et al, 2006
Disability weight for acute bronchitis	0.132	Begg et al, 2007
Attribution of benefits to Menzies research	1.8%	Assumption (see section 2.3.3.1)

4.8.2 Supporting evidence for effective treatment of chronic wet cough

4.8.2.1 Summary of research undertaken by Menzies

Menzies' has conducted several studies into the pathology and management of chronic wet cough. This includes a meta-analysis to understand the use of antibiotics in treated chronic wet cough in children, which found that antibiotics were highly effective in increasing the cure rate of children with chronic wet cough. This research has contributed towards the development national guidelines for preventative health assessment for First Nation Australians.[40]

4.8.2.2 Methodology and assumptions

The benefits are calculated by estimating the number of cases of CSLD avoided due to the administration of antibiotics in children with chronic wet cough, and the subsequent avoided life years lost due to avoidance of CSLD cases.

The cost of the antibiotic treatment is deducted from the value of the benefit. Table 4.11 summarises the key inputs and assumptions used in estimating the value of the benefits.

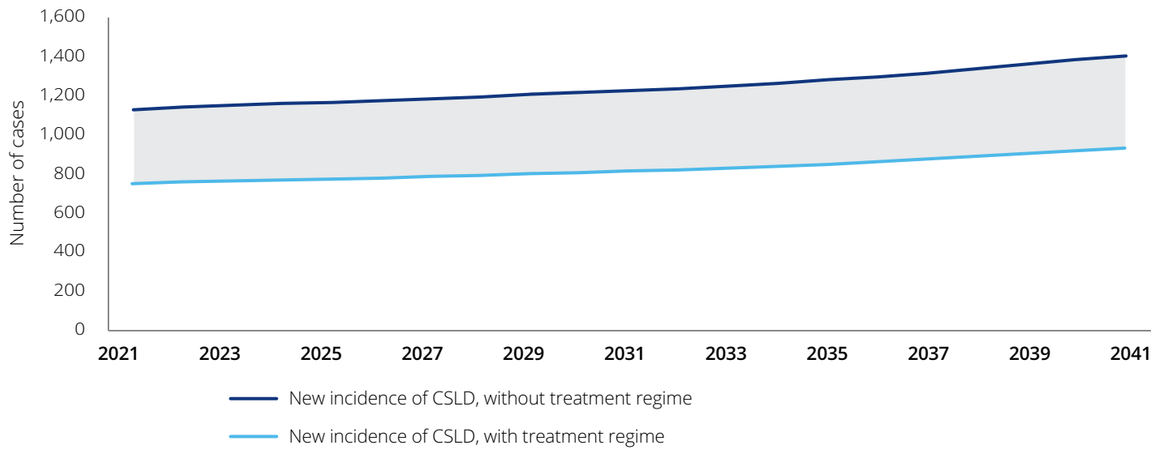
4.8.2.3 Modelling results

It is estimated that the incidence rate of CSLD will decline by 33% per annum – from 1,242 cases per annum to 825 cases per annum – over the period 2021 to 2041, due to improved cure rates of chronic wet cough, which is attributed to the impact of the antibiotic intervention. This is estimated to lead to 1.37 years (discounted) in DALY saved per avoided CSLD incidence (see Chart 4.2). Over the assessment period, it is estimated that Menzies' research related to the treatment of chronic wet cough will generate $31.1 million in health benefits to Australia (present value terms), including $2.3 million to the NT.

Table 4.11: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	All First Nations children living in Australia under 15 years	Menzies
Incidence rate of CSLD per annum	775 in 100,000	McCallum et al, 2017
Cost of antibiotics (amoxicillin)	$110	PBS, 2021
Odds ratio of the proportion of people not cured after use of antibiotics	0.15	Marchant et al, 2018
Discounted life-years gained due to avoided CSLD	1.37	Deloitte Access Economics calculations based on McCallum and Binks 2017
Attribution of benefits to Menzies research	1.8%	Assumption (see section 2.3.3.1)

Chart 4.2: Change in the incidence rate of CSLD, 2021-2041



Source: Deloitte Access Economics.

4.9 Kidney disease

Chronic kidney disease affects many Australians. However, First Nations people living in remote areas experience an especially high disease burden, with mortality rates of eight to 10 times higher than those of other Australians.[41] First Nations people also tend to be affected at a younger age, are more likely to present late for dialysis, are less likely to receive a transplant, and in comparison to non-Indigenous people, will die younger.[41]

First Nations patients also face particular problems, such as high costs of management – the majority of those on dialysis receive haemodialysis, the most expensive form of dialysis – and housing issues caused by the need to relocate from their homes in remote areas to urban areas to receive treatment.[41]

Menzies has been involved with research into improving disease management for First Nations patients with a particular focus on preventative intervention and improving the quality of health service delivery. In this analysis, Menzies' contribution to improvements in health outcomes for kidney disease patients is estimated by measuring its impact from two key initiatives:

- The development of an MBS item supporting the delivery of dialysis in very remote settings
- The development of a clinical decision support tool to improve the management of people with kidney disease across the NT.

4.9.1 Supporting the delivery of dialysis in rural and remote health care settings

4.9.1.1 Summary of research undertaken by Menzies

Australians with renal disease living in rural and remote areas often face significant barriers to accessing appropriate health care and renal treatments. This includes significant travel costs, re-location costs and impacts on quality of life due to receiving care away from their home and disconnection from support networks.[42]

Menzies supported the Australian Government to undertake a study on renal disease in central Australia. The study aimed to understand the disease burden, healthcare access and potential models to improve health care access for people in remote regions with renal disease. It supported action for the feasibility of an MBS item through the establishment of the MBS Taskforce. This research was instrumental in informing the development of a new MBS item for staffed dialysis in very remote areas. This item has since been implemented and used over 25,000 times over the period 2018 to 2021, resulting in improved access to dialysis care for people in remote regions of Australia.

4.9.1.2 Methodology and assumptions

The benefits are calculated by estimating the impact of the new MBS item for the delivery of dialysis in remote settings on health outcomes and health care expenditure of people with kidney disease. The uptake of the program is measured by estimating the prevalence of end stage renal disease in remote Australia using the Menzies CA Renal Study, and the use of the MBS item over the period 2019 to 2021. The uptake rate is assumed to reach 50% of remote-located dialysis patients by 2042.

The MBS item reduces the risk of hospitalisations and death due to improved compliance to dialysis treatment.[43] This leads to reduced disease burden and a longer life expectancy for people accessing the item in remote areas. In addition, the MBS item reduces travel expenditure by people who need to relocate to health care settings that provide dialysis. In addition, the use of rural-located dialysis services decreases overall health service costs associated with dialysis use.

Table 4.12 summarises the key inputs and assumptions used in estimating the value of the benefits.

4.9.1.3 Modelling results

Over the assessment period, it is estimated that Menzies' research related to the delivery of dialysis in rural settings will generate $8.1 million in health benefits to Australia (present value terms), including $1.8 million to the NT.

Table 4.12: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	People with end stage renal disease living in remote Australia	Menzies
Percentage of population impacted that access MBS item	Up to 50% of people living in remote areas by 2042	Assumption based on current uptake rates
Odds ratio of increased risk of death for rural located people, in absence of new MBS item	1.11	Rucker et al, 2011
Odds ratio of increased risk of hospitalisation for rural located people, in absence of new MBS item	1.91	Howard et al, 2021
Reduction in hospital service costs associated with use of rural dialysis centre	-9%	Gill et al, 2021
Annual relocation costs for people living in remote areas, in absence of new MBS item	$14,037	Deloitte Access Economics calculations, based on methodology used by Thaker et al, 2013
Disability weight for end stage renal disease	0.54	AIHW, 2018
Disability weight for end stage renal disease with hospitalisations	0.57	AIHW, 2018
Attribution of benefits to Menzies research	1.8%	Assumption (see section 2.3.3.1)

4.9.2 Supporting the improvement in the management of people with kidney disease in the NT

4.9.2.1 Summary of research undertaken by Menzies

Menzies research found that opportunities exist to design systems to support primary health services with timely, targeted and evidence-based specialist care in the identification and management of people with kidney disease. This research has resulted in the implementation of Territory Kidney Care (TKC), a clinical information system that uses analytics to assist with the early identification and best-practice management of kidney disease.

Menzies developed TKC in partnership with the NT Department of Health, the Aboriginal Medical Services Alliance Northern Territory (AMSANT) – the peak First Nation health representative body – and local First Nations community-controlled health services. TKC utilises a service-orientated architecture that connects to existing health platforms, automatically and securely transferring the clinical information of selected patients based on agreed criteria. Algorithms applied to the consolidated records stratify patients according to risk and disease stage, enter patients into surveillance loops and initiate triggers to alert the tertiary clinical support team of actions required.

TKC enhances health care through the integration of clinical information systems and the implementation of evidence-based protocols. Based on published literature, TKC is the only system worldwide that can seamlessly consolidate primary and tertiary care information and derive clinically relevant summaries based on dynamic algorithm-based phenotyping.

4.9.2.2 Methodology and assumptions

The benefits are calculated by estimating the impact of the information management system on reducing the number of late referrals to dialysis, which is estimated at approximately 50% based on Menzies data. Reductions in late referrals are associated with increased odds of gaining a kidney transplant, as well as reduced one-year mortality rates related to dialysis treatment. These impacts result in reduced disease burden and reduced health care costs over a person's lifetime.[44]

The coverage of the initiative is assumed to be equal to the coverage in 2021, according to progress reports.[45] This uptake rate is assumed to remain constant over time. Table 4.13 summarises the key inputs and assumptions used in estimating the value of the benefits.

4.9.2.3 Modelling results

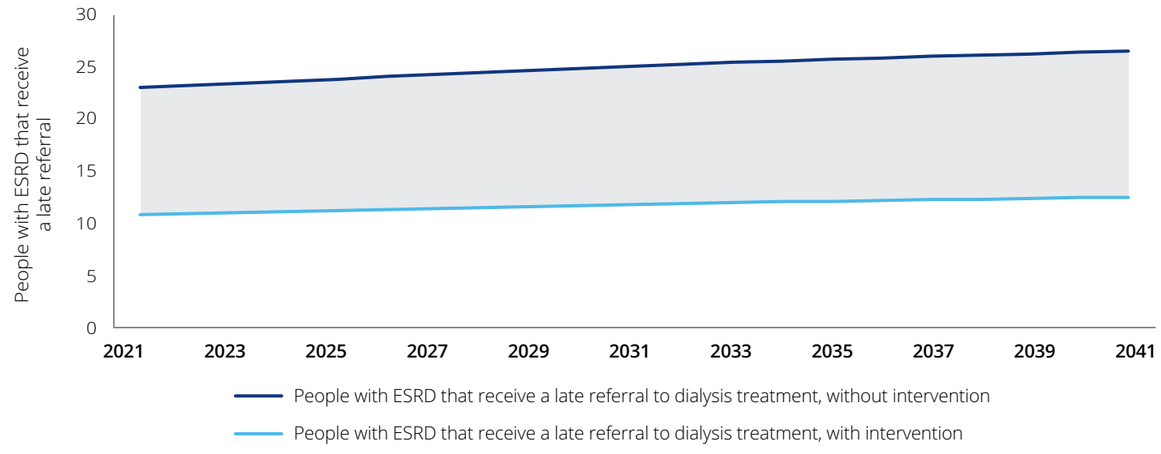
The health benefits associated with this initiative are expected to result from a reduction in late referrals to dialysis treatment by approximately 50% (see Chart 4.3) and earlier diagnosis of kidney disease. Over the assessment period, it is estimated that Menzies' work related to the TKC clinical information system will generate $30.4 million in health benefits to the NT (present value terms).

Table 4.13 : Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	People with kidney disease living in the NT	Menzies
Coverage of the NT population	90%	Menzies
Odds ratio of decreased risk of late referrals to dialysis due to the intervention	0.5	Menzies
Reduction in patients with kidney disease that require dialysis	5%	Menzies
Odds ratio decreased chance of receiving a transplant due to a late referral to dialysis	0.65	Cass et al, 2003
Discounted lifetime health care costs for people with end stage renal disease that do not receive a transplant	$498,839	Deloitte Access Economics estimates using Victorian Government 2011
Discounted lifetime health care costs for people with end stage renal disease that do receive a transplant	$270,477	Deloitte Access Economics estimates using Victorian Government 2011
Disability weight for end stage renal disease	0.54	AIHW, 2018
Disability weight for end stage renal disease with hospitalisations	0.57	AIHW, 2018
Disability weight for end stage renal disease with a transplant	0.024	AIHW, 2015
Attribution of benefits to Menzies research^	33%	Assumption (see section 2.3.3.1)

Notes: ^Menzies is involved in the implementation and management of this program with two other independent parties, in addition to improving the evidence base associated with kidney disease. See section 2.3.3.1 for a greater discussion on how attribution rates are calculated.

Chart 4.3: People with ESRD that receive a late referral to dialysis treatment, 2021 to 2041



Source: Deloitte Access Economics.

4.10 Cancer

Cancer is the second most prevalent cause of death among Fist Nations Australians. First Nations Australians were 1.1 times more likely to be diagnosed with cancer and 1.4 times more likely to die from cancer than non-Indigenous Australians. Further, cancer prevalence has been increasing for First Nations people, despite declining for non-indigenous Australians over the same time period.[46]

4.10.1 Contribution of Menzies to the broad body of cancer literature

4.10.1.1 Summary of research undertaken by Menzies

Menzies has conducted research on the treatment and management of cancer for First Nations Australians. Between 2012 and 2020, Menzies received over $12 million (in 2021 dollars) in grant funding from the NHMRC to undertake research into a range of areas. These include the impact of co-morbidities on cervical cancer in First Nations women, improving systems and quality of cancer care in First Nations primary health care settings, and the social and system determinants of First Nation health.

Menzies has led two major First Nations cancer-focused initiatives. These include:

- DISCOVER-TT: This initiative is aimed at addressing knowledge gaps relating to First Nations-specific models of cancer care, health services and cancer care needs
- The Strategic Research Priority program: This program aims to improve cancer control for First Nations Australians, consolidating DISCOVER-TT's capacity via additional funding and bringing together researchers, advocates and policymakers through strategic research and funding partnerships.

Since 2015, Menzies' research has emphasised a greater recognition of cancer as a health issue for First Nations Australians. Menzies is continuing its work with the current NHMRC-funded Centre of Research Targeted Approaches to Improve Cancer Services for Aboriginal and Torres Strait Islander Australians (TACTICS).

TACTICS is currently funded from 2019 to 2023, and aims to achieve the following objectives:

- Increase cancer prevention and early detection through immunisation and screening
- Improve diagnosis and treatment through health service innovation
- Provide appropriate care to enhance psychosocial wellbeing of First Nations cancer survivors, their partners, and carers across the cancer continuum.

4.10.1.2 Methodology and assumptions

A study by Glass (2008) found that for each dollar invested in cancer research in Australia between 1980 and 2005, a return of $2.39 in economic benefits was realised. To estimate the benefits related to all Menzies cancer research programs, it is assumed that Menzies cancer research will generate a return that aligns with other cancer research programs in Australia, using the findings from the Glass (2008) study.

Therefore, the analysis assumes that Menzies' cancer research programs will achieve a return on investment of 239% (see Table 4.14). This approach does not consider the economic benefits related to improved health outcomes as a result of specific cancer research programs in which Menzies has been involved. Nonetheless, it provides an estimate of the economic benefits that may be realised across all Menzies cancer research programs.

4.10.1.3 Modelling results

Over the period 2012 to 2020, Menzies received $12.7 million in grants for cancer research from the NHMRC. Over the 30-year assessment period, it is estimated that Menzies cancer research will generate $30.4 million in health benefits to Australia (present value terms), including $2.7 million to the NT.

Table 4.14: Summary of key inputs and assumptions

Parameter	Value	Source
Grants received for Menzies' cancer research	$12.7 million^	NHMRC, 2021
Estimate for return on investment in cancer research	239%	Glass et al, 2008

Notes: ^This is the sum of cancer research grants over the period 2012-2020. NHMRC data relating to research grants was unavailable for 2021.

4.11 Otitis media

Otitis media is a condition that is distinguished by bacterial or viral infection and inflammation of the middle ear. It encompasses a spectrum of disease, ranging from mild (otitis media with effusion) to severe (chronic suppurative otitis media, or CSOM). The condition most commonly occurs in young children between the ages of 3 months and 3 years and is often accompanied by symptoms of earache, fever, nausea, vomiting and diarrhoea.[47] Hearing loss may also occur if there is fluid in the middle ear space and, while temporary, may increase in duration and severity if otitis media becomes chronic in the patient.

Although otitis media commonly occurs in the Australian population, First Nations children are particularly vulnerable to developing the condition. According to Verhoeff et al (2006),[48] the medical literature reports some of the highest rates of CSOM for First Nations children in Australia.

4.11.1 Supporting treatment and management of Otitis Media

4.11.1.1 Summary of research undertaken by Menzies

Menzies has undertaken significant research into improved management and treatment options for otitis media in First Nations communities. For example, Menzies' research contributed to the development of improved clinical care guidelines on the management of otitis media,[49] guidelines for the prevention of hearing loss in First Nations populations,[50] and the identification of potential for an improved vaccination schedule for otitis media in children.[51]

However, only the impact of Menzies' research on an improved vaccination schedule for otitis media in children is measured in this analysis.

4.11.1.2 Methodology and assumptions

The benefits are calculated as the avoided disease burden associated with improved vaccination rates among First Nations youths aged under 15 years. Vaccination against otitis media is estimated to decrease the incidence of the disease by 7% (see Table 4.15). This results in a decline in the disease burden of otitis media, as well as avoided hearing loss associated with the disease. There are also significant direct and indirect costs avoided due to the avoided disease, such as the cost of treatment and avoided productivity losses for parents who need to stay home from work to care for their sick child.

4.11.1.3 Modelling results

Over the assessment period, it is estimated that Menzies' research related to otitis media vaccination efficacy will generate $39.7 million in health benefits to Australia (present value terms), including $3.0 million to the NT.

Table 4.15: Summary of key inputs and assumptions

Parameter	Value	Source
Population impacted	First Nations children in Australia	Menzies
Reduction in prevalence	7%	Menzies
Percentage of otitis media cases resulting in CSOM	12%	Menzies
Percentage of cases of CSOM resulting in hearing loss	100%	Menzies
Disability weight for chronic otitis media	0.01	AIHW, 1999
Disability weight for deafness associated with otitis media	0.11	AIHW, 1999
Direct and indirect costs of condition (3 months post diagnosis)	$4,295	Alsarraf et al, 1999
Attribution of benefits to Menzies research	1.8%	Assumption (see section 2.3.3.1)

5 Cost-benefit analysis findings

5.1 Summary of cost-benefit analysis findings

The findings of Menzies' research programs may lead to changes to policy, guidelines and clinical practice, which over time are expected to result in improved health outcomes. The economic benefits associated with improved health outcomes accrue to populations in both Australia – with a focus on First Nations people – and internationally, with the benefits outside of Australia related to Menzies' work in malaria treatment and management.

The CBA findings are expressed as two sets of results:

- **Australia only:** This presents the net benefit and BCR as derived by considering only the benefits that accrue to Australia compared with total costs. These results provide information about the return generated for the Australian community and economy from funding invested in Menzies' research programs. The benefits that accrue to populations outside of Australia are excluded from these results.
- **Global:** This presents the net benefit and BCR derived by considering both the benefits that accrue to Australia and internationally compared with total costs. These results reflect the total return generated from funding invested in Menzies' research programs, including both the return for the Australian community and economy and the return for populations across the globe.

Over the 30-year assessment period, it is estimated that the improved health outcomes as a result of Menzies' research programs will generate a total net benefit to the Australian population of $247.3 million (see Table 5.1). In addition, Menzies' research programs yield a benefit-cost ratio (BCR) of 1.65 for Australia.

This means that for every $1.00 invested into Menzies' research programs, an economic return of $1.65 is generated for Australia. However, this BCR also reflects operating expenditure incurred by Menzies to undertake research programs that generate benefits outside of Australia, which are not included in the Australia only results.

Menzies is also having a significant impact within the NT. It is estimated that Menzies' research has generated benefits to the NT of approximately $79.4 million. This reflects 12.6% of the total benefits generated throughout Australia, although the NT accounts for less than 1% of the Australian population.

Menzies' research into the prevention and treatment of malaria has resulted in changes in treatment practices in Australia and internationally. The economic benefits from the improved health outcomes across this much larger population are considered in the global results. Across both Australia and internationally, the improved health outcomes as a result of Menzies' research are estimated to generate a total net benefit of $1.2 billion, and a BCR of 4.27. This suggests that for every $1.00 invested into Menzies' research programs, an economic return of $4.27 is generated across the globe (see Table 5.1).

This analysis demonstrates the strong growth in Menzies impact since the 2015 study. Over the 30-year assessment period, the total health benefits generated by Menzies for Australia have increased from $384.1 million and a BCR of 0.86 in the 2015 study to $629.4 million and BCR of 1.65 – an increase of 58.9% in present value terms. In addition, the total health benefits generated by Menzies across the globe have increased from $867.0 million and BCR of 1.94 in the 2015 study to $1.6 billion and a BCR of 4.27, or an increase of 88.0%.[52]

Table 5.1: Summary of cost-benefit analysis findings ($ million, present value terms)

Cost-benefit analysis result	Australia only	Global
Benefits	**$629.4**	**$1,630.1**
Malaria	$1.4	$1,002.2
Melioidosis	$31.7	$31.7
Rheumatic heart disease	$17.0	$17.0
Improved quality of primary health care	$250.1	$250.1
Diabetes	$4.2	$4.2
Pyoderma and scabies	$51.8	$51.8
Lung and respiratory conditions	$161.0	$161.0
Kidney disease	$41.9	$41.9
Cancer	$30.4	$30.4
Otitis media	$39.7	$39.7
Costs	**$382.1**	**$382.1**
Research related costs	$245.4	$245.4
Non-research employee costs	$49.7	$49.7
Repairs and maintenance	$8.2	$8.2
Other expenses (such as advertising)	$78.8	$78.8
NET PRESENT VALUE (NPV)	**$247.3**	**$1,248.1**
BENEFIT-COST RATIO (BCR)	**1.65**	**4.27**

Source: Deloitte Access Economics.
Note: Numbers may not add exactly to totals due to rounding.

5.2 Sensitivity testing

The CBA results are underpinned by a range of assumptions, which have been informed by available literature and data provided by Menzies. Changes to the assumptions would impact the CBA results, including the net benefit and the BCR. Recognising this, two sensitivity tests were undertaken by varying the key assumption in the analysis. This allows the relative impact that these assumptions have on the net benefit and the BCR to be evaluated. The two sensitivity tests undertaken include:

- Varying the discount rate
- Varying the attribution rate.

5.2.1 Test 1: Varying the discount rate

As noted in section 2.3.2.5, this analysis applies a discount rate of 7.0% to discount all future costs and benefits to derive their present values. This sensitivity test investigates the impact of varying the discount rate on the net benefit and the BCR. Alternative discount rates of 4.0% and 10% are tested. As shown in Table 5.2, decreasing the discount rate to 4.0% causes the Australia only BCR to increase to 2.00, while increasing the discount rate to 10.0% causes the Australia only BCR to decrease to 1.41.

Varying the discount rate does not alter the total costs measured in the CBA, as only costs related to Menzies' research undertaken over the period 2012 to 2020 is considered in the analysis.

5.2.2 Test 2: Varying the attribution rate

As discussed in section 2.3.3.1, the rate of attribution of Menzies' research to improvements in health outcomes is a key assumption that drives the value of the benefits from a Menzies' research programs. This analysis uses an assumption that 1.8% of the improvement in health outcomes realised over time can be attributed to Menzies' research. This attribution rate is applied for all Menzies' research areas.

This sensitivity test investigates the impact on the net benefit and BCR of applying both a lower and a higher attribution rate. As shown in Table 5.3, decreasing the attribution rate to 1.35% causes the Australia only BCR to decrease to 1.28, while increasing it to 2.25% causes the Australia only BCR to increase to 2.01.

Table 5.2: Test 1 - Varying the discount rate ($ million, present value terms)

	Discount rate: 4.0%		Discount rate: 7.0%		Discount rate: 10.0%	
CBA result	**Australia only**	**Global**	**Australia only**	**Global**	**Australia only**	**Global**
Total benefits	$763.9	$1,921.7	$629.4	$1,630.1	$539.6	$1,433.2
Total costs	$382.1	$382.1	$382.1	$382.1	$382.1	$382.1
NET PRESENT VALUE (NPV)	**$381.9**	**1,539.7**	**$247.3**	**$1,248.1**	**$157.6**	**$1,051.1**
BENEFIT-COST RATIO (BCR)	**2.00**	**5.03**	**1.65**	**4.27**	**1.41**	**3.75**

Source: Deloitte Access Economics.
Note: Numbers may not add exactly to totals due to rounding.

Table 5.3: Test 2 - Varying the attribution rate ($ million, present value terms)

	Attribution rate: 1.35%		Attribution rate: 1.8%		Attribution rate: 2.25%	
CBA result	**Australia only**	**Global**	**Australia only**	**Global**	**Australia only**	**Global**
Total benefits	$490.1	$1,240.7	$629.4	$1,630.1	$768.6	$2,019.6
Total costs	$382.1	$382.1	$382.1	$382.1	$382.1	$382.1
NET PRESENT VALUE (NPV)	**$108.0**	**$858.6**	**$247.3**	**$1,248.1**	**$386.6**	**$1,637.5**
BENEFIT-COST RATIO (BCR)	**1.28**	**3.25**	**1.65**	**4.27**	**2.01**	**5.29**

Source: Deloitte Access Economics.
Note: Numbers may not add exactly to totals due to rounding.

6 Qualitative benefits

6.1 Summary of qualitative benefits

Menzies' social and economic contribution extends beyond the benefits that have been measured in economic terms as part of this study. This chapter identifies several programs delivered by Menzies which deliver benefits that could not be reliably quantified as part of this study. This is mostly due to the early stage of these research programs, where the outcomes are expected to be realised over time. The following benefits are discussed:

- Improved contact screening for tuberculosis in Indonesia
- Treatment of staphylococcus aureus for First Nations patients
- Improved communication between staff and First Nations patients
- Chronic disease education in remote communities
- Improved public health system strategies in Timor-Leste
- Improved social policy response from data linkage insights
- Improved diagnosis and management of Hepatitis B in the NT
- Delivery of postgraduate education.

6.2 Improved contact screening for tuberculosis in Indonesia

In addition to severe malaria and multidrug-resistant malaria (see section 4.2), tuberculosis (TB) is a significant public health challenge in the Asia-Pacific region. TB is a serious bacterial disease that commonly affects the lungs. According to the WHO, around 45% of HIV-negative cases who do not seek treatment die from the disease, and this increases to 100% for HIV-positive cases. The disease is the leading infectious cause of death globally.[53]

Between 2012 and 2019, the incidence of TB increased from around 5.8 million cases per year to around 7 million cases per year. The majority of the global increase in case numbers was driven by just two countries: India and Indonesia.[54] In the four years to 2019, the number of annual new and relapse TB cases in Indonesia increased by 69%, from 330,000 to over half a million.[55]

Children in high burden countries typically have poor access to diagnosis and preventative treatment. In 2019, children aged less than 15 years old accounted for 12% of all global HIV-negative TB cases. However, they accounted for a higher proportion (16%) of global HIV-negative TB deaths.[56]

To prevent TB outbreaks, the WHO recommends that people in close contact with TB patients should be screened for TB and appropriately managed to detect active cases and prevent the disease from spreading. In addition, preventative therapies exist, such as isoniazid preventative therapy, which reduces the risk of TB episodes occurring for people exposed to the infection.[57]

Implementation of TB contact screening for children is particularly limited in high-burden settings such as Indonesia, where health infrastructure, equipment and resources remain poor. In Java, the evaluation of a child contact program found that only 8% of children were reported for screening within three months of an adult index case diagnosis (34 out of 437 cases).[58] One reason for the low uptake is the passive surveillance system, whereby contact management systems rely on different institutions to provide central agencies with data to monitor the community's health rather than government-led programs collecting data themselves. This system can limit the accuracy and timeliness of information provided to central agencies to monitor disease outbreaks, including TB.

To address the increasing presence of TB in Indonesia, Menzies researchers developed a mixed-methods intervention study to ensure high-risk contacts of TB cases complete preventive therapy.[59] The overarching objective of the research is to reduce TB rates in a high disease burden setting through effective implementation of contact management, with a focus on infants and children. The initiative is part of Menzies' The *Stronger Health Systems for multi-drug resistant tuberculosis and malaria program*, which was established in 2018 to test health system and policy strategies for multi-drug resistant malaria and TB.

Preventative therapy using drugs such as isoniazid and rifampicin has consistently demonstrated effective prevention of TB worldwide. A meta-analysis of TB preventative therapy found that 61 studies – 41 of which were undertaken in low and middle income countries – confirmed that therapies were effective at preventing the disease.[60] Preventing TB can have significant economic benefits, such as improved quality and longevity of life. The value of preventative TB treatment relative to an absence of preventative TB treatment in Indonesia was estimated at US$162.9 billion over a 10-year period, compared to a cost of just $1 billion.[61]

6.3 Treatment of staphylococcus aureus for First Nations patients

Staphylococcus aureus (golden staph) is a bacterial infection acquired in the community or in hospital. Infections range from minor skin infections, such as skin sores to severe invasive bloodstream infections, such as endometriosis (a life-threatening infection of the inner heart lining).

Across Australia, the incidence of golden staph among First Nations Australians is six times greater compared to non-Aboriginal Australians. On average, 11 in 100,000 non-Aboriginal patients are admitted to hospital with golden staph, compared to 62 in 100,000 First Nations patients annually.[62]

Methicillin-resistant staphylococcus aureus (MRSA) is an antibiotic-resistant form of golden staph that is more difficult to treat. MRSA infections can be life-threatening, for example, in the case of a severe invasive bloodstream infection. Severe MRSA infections have a mortality rate of between 20% and 30%, despite the administration of antibiotic treatment.[63]

In the NT, Menzies researchers have identified that the between 46% and 57% of golden staph infections in First Nations communities are MRSA infections, which is amongst the highest rate in the world.[64] Around 34% of these infections occur in NT First Nations children less than 15 years-old, higher than the share of NT First Nations children of this age group (30%, according to the 2016 Census).[65,66] These patients often develop large boils and abscesses that require surgical treatment.[67]

Menzies researchers have participated in clinical trials involving antibiotics to treat MRSA. Some progress has been made in determining success and safety of treatments. However, no breakthroughs have been made to achieve a reduction in MRSA among First Nations patients in the NT.

6.4 Improved communication between staff and First Nations patients

A key barrier to achieving improved health outcomes for any medical condition is the effectiveness of communication between the patient and medical staff. Effective communication is fundamental to ensuring the quality and safety of health services. The ability of medical staff to understand symptoms and concerns communicated by patients is critical to enabling an accurate diagnosis of medical conditions, which is required to administer the most appropriate treatment.[68]

Effective communication is difficult to achieve when medical staff and their patients do not share the same language and cultural background. In the NT, around 60% of First Nations patients speak a language other than English at home.[69] Meanwhile, the majority of medical consultants at the Royal Darwin Hospital (RDH), the largest hospital in the NT, only speak English, and 90% of these are non-Indigenous.[70]

Previous reviews identified that a greater use of interpreters in health care could reduce communication barriers and improve patient outcomes.[71] The Aboriginal Interpreter Service at RDH provides face-to-face and video interpreter services in 17 Aboriginal languages. However, the uptake of the Aboriginal Interpreter Service has been low; despite 25,000 First Nations patients presenting to the hospital annually, only 700 were referred to the service in 2015. Moreover, 20% of these referrals were not completed due to cancellations by either the patient or interpreter.[72] This is largely because interpreter services were not co-located with the hospital and therefore could not be provided in a timely manner.[73]

Menzies leads the *Communicate Study,* which was designed to improve the quality of communication between First Nations people and medical staff at RDH. Since the study commenced in 2015, Top End Health Service (RDH's health service provider) has employed an Aboriginal Interpreter Coordinator and has created roles for additional Aboriginal medical practitioners. The evaluation of this phase of the program is ongoing; however, a study from the pilot program found that the availability of face-to-face interpreters at the hospital has improved. A key finding is that 230 additional First Nations patients had access to an interpreter at RDH in 2016, compared to the 10-year average.[74]

The study also found that the interpreters allocated by Aboriginal Interpreter Service reduced frustrations experienced by First Nations patients, who were able to understand the explanation of complex medical procedures and treatments. This enabled First Nations patients to respond to medical consent forms with full knowledge of the medical treatment or procedure, reducing the likelihood of self-discharge. This in turn enabled First Nations patients to complete their treatment, reducing the likelihood of readmission from further health complications.[75]

In addition to the health benefits provided to First Nations patients from completion of their treatment, the program also provides employment and training for First Nations participants to become specialist interpreters in the region. A key offering of the program is to provide mentoring to the Aboriginal Interpreter Coordinators during the course of their training. It is well-established in the literature that effective training and qualification programs lead to employment benefits, such as increased earnings for trainees.[76] Higher levels of income also has important social benefits for First Nations Australians, including better access to health services, improved nutrition and overall wellbeing.[77]

6.5 Chronic disease education in remote communities

Chronic disease is particularly prevalent in First Nations communities across Australia and the NT. First Nations people in the NT are 2.7 times more likely to be admitted to hospital from a chronic condition than the average Australian. The burden of disease is similar across select chronic diseases (see Table 6.1).[78]

Smoking, poor nutrition, alcohol misuse and physical inactivity are known risk factors of chronic disease, and these are also prevalent in First Nations communities. For example, First Nations people are 4.6 times more likely to use tobacco or have a higher body mass than the levels outlined in Australian health guidelines. First Nations people are also 3.3 times more likely to be physically inactive and are 3.1 times more likely to have more than two standard drinks per day compared to the non-ASTI average annual age-specific rate (ASR) for each condition (see Table 6.2).[79]

Table 6.1: Average annual age-specific rate per 100,000 for a selection of chronic diseases

Chronic disease hospital admission	First Nations People (NT)	First Nations People (Australia)		Australia^	
All chronic conditions	3,643	2,143	1.7x	1,328	2.7x
Select chronic conditions					
Chronic congestive cardiac failure	448	248	1.8x	199	2.3x
Chronic obstructive pulmonary disease	1,125	626	1.8x	283	4.0x
Chronic diabetes complications	527	443	1.2x	209	2.5x

Notes: ^Australian annual averages excludes data from Queensland, the NT, Tasmania and the Australian Capital Territory; Source: Torrens University Australia, PHIDU (2021).

Table 6.2: Average annual age-specific rate per 100,000 for a selection of risk factors

Risk factor	First Nations people	Non-Indigenous	Difference
Tobacco use	72.5	15.6	4.6x
High body mass	44.1	9.5	4.6x
Alcohol use	29.1	9.4	3.1x
Physical inactivity	28.8	8.8	3.3x

Source: AIHW (2011).

To encourage preventative action against and reduce the prevalence of chronic disease in regional, remote and very remote NT communities, Menzies developed HealthLAB. Commencing in 2014, HealthLAB travels around the NT and provides an opportunity for participants to measure their own biomedical risk factors for chronic diseases and to learn how to reduce their lifetime and intergenerational risk of disease.

HealthLAB is structured as a face-to face experience, with interactive stations that cover a variety of health themes. HealthLAB staff demonstrate the use of technology to each participant so that they can collect their own biomedical measurements, learn what they mean, and the implications for their current and future health. Staff then discuss preventive measures with participants, promote healthy lifestyles, and offer support in overcoming hurdles to healthy lifestyles.

Over 11,000 First Nations patients have participated in HealthLab in NT towns and remote communities since the program commenced, or between 2,500 and 3,000 participants per year. The majority of participants are children under 18 years old (around 8,000 of the total 11,000 participants).[80]

6.6 Improved public health system strategies in Timor-Leste

Menzies researchers are involved in a number of programs in Timor-Leste that focus on improving the public health system through operational research programs. Timor-Leste faces a double burden of disease. Its tropical climate remains a breeding ground for communicable disease such as tuberculosis and dengue fever. However, it also faces a significant burden of noncommunicable diseases such as cardiovascular and chronic obstructive pulmonary diseases, which are among the ten leading causes of death globally.[81]

Timor-Leste's health system faces challenges to combat these burdens. While the system has experienced improvements in evidence-based planning in recent years, the health system remains underfunded, as the Government of Timor-Leste's health spending as a share of GDP is below international benchmarks.[82] Moreover, the distribution of health professionals is inequitable, in favour of metropolitan regions. Poor skill levels of new medical staff exist in some clinical areas.[83]

To address these challenges, Menzies has implemented a number of projects in Timor-Leste, focusing on health system management. These projects investigate the management of communicable diseases (such as tuberculosis), COVID-19, scabies and rheumatic heart disease (see Table 6.3).

Table 6.3: Menzies projects that aim to improve public health strategies in Timor-Leste

Project	Description	Outcomes
STRONG TL[a]	The project improves the communicable disease surveillance system in Timor-Leste. The program seeks to: • Improve capacity for clinical-based communicable disease surveillance • Implement national guidelines for clinical responses to infectious diseases • Promote collaboration and training within the health system.	Identification and timely reporting are integral to successful disease control, enabling public health agencies to: • Identify contacts who are infected • Determine the incidence and prevalence of the disease • Assist physicians and hospitals in evaluating illnesses • Assist the public to improve decision making.
COVID-19 public health response[a]	Menzies supported Timor-Leste's COVID-19 response by providing 40 staff to establish laboratory testing for COVID-19 as part of the STRONG TL project.	Similar to the outcomes of the STRONG TL project, effective disease surveillance enables public health agencies to respond to disease outbreaks in a timely manner and manage disease cases according to national guidelines.
Scabies and impetigo study[b]	The study administered a cross-section survey to determine the prevalence of scabies and impetigo at six primary schools in rural and semi-rural settings.	The study found that the prevelance of scabies and impetigo infections was amongst the highest estimates reported worldwide, at 30.6% and 11.3% respectively. The study provides strong evidence supporting the need for scabies and impetigo control strategies.
Pedrino study and Rapid Echocardiography for Congenital And Rheumatic heart Disease—Investigating a New Approach (RICARDINA)[c]	The programs train health workers in rapid echo screening techniques to screen children for Rheumatic Heart Disease (RHD) and were implemented in Timor-Leste schools. Screening is supplemented by active case finding and community awareness initiatives.	Children with RHD were able to receive penicillin injections to reduce the risk of developing acute rheumatic fever (ARF). ARF can cause long lasting heart damage and lead to chronic cardiovascular disease. The program also resulted in the implementation of new guidelines for identification and diagnosis of RHD in Timor-Leste schools.

Source: (a) Menzies (2020), (b) Francis et al. (2020) and (c) Matthews et al. (2021).

Improved health system management of communicable and non-communicable diseases could lead to reduced prevalence of, and therefore reduced burden of tuberculosis and dengue fever in Timor-Leste. A good example of the benefits of improved health responses to communicable diseases in recent years is Timor-Leste's progress in malaria control; the nation successfully eliminated the disease over 10 years.[84]

The benefits from malaria eradication include increased quality of life and avoided productivity losses from ill health to Timor-Leste citizens.[85] The value of these benefits is significant. For example, a systematic review determined the economic benefit of malaria eradication ranges from US$2.4 to US$145 for every dollar spent to control and eliminate the disease.[86]

6.7 Improved social policy response from data linkage insights

Data is a new form of capital for 21st-century knowledge economies. Spill-over benefits of public- sector data across the economy have enabled data-driven innovation and policy development. Data linkage – linking records for the same individual across multiple data sets – are key to this innovation, providing 'super additive' insights that are greater than the sum of data silos.[87]

The rise of advanced computing power and analytic methods has encouraged nation-wide efforts to link data within and across Australian jurisdictions. From 2009, the Australian Government has expanded investment into data linkage capability to improve cross-jurisdictional linkages.[88] Use of linked data continues to be a priority outlined in the National Collaborative Research Infrastructure Strategy, in which the Australian Government agreed to invest $4 billion into national research infrastructure to 2029.[89]

Data linkage not only provides deeper insights, it is less intrusive and costly than collecting the same information from other sources, such as large-scale surveys. It also allows entire populations to be studied, reducing bias errors commonly encountered in survey-based designs.[90]

Leveraging the nation-wide interest and efficiencies realised from linked data, Menzies partnered with the NT Government to develop a repository of de-identified linked data. The Child and Youth Development Research Partnership (CYDRP) data repository has evolved through iterative stages and now contains 24 datasets detailing records of 370,000 individuals. These records provide data across health, education, child protection, and youth justice outcomes over time.

The body of research built through the CYDRP has been used to inform a deeper understanding of the relationship between health outcomes, maltreatment, education and youth justice in NT children and young people. Recent studies using this data have been able to gain deeper insights into the effect of maltreatment on the risk of self-harm in Aboriginal adolescents,[91] the impact of hearing impairment on the risk of youth offending in Aboriginal children,[92] and risk profiles for self- harm amongst young people.[93]

Each of these studies have important implications for the NT Government in terms of its policy and service responses to complex health and social issues. For example, a key finding of a Menzies study using CYDRP linked data was the need to intervene at key developmental periods to reduce the risk of Aboriginal adolescent children inflicting self-harm. To reduce the incidence of self-harm, the study suggests implementing interventions in early childhood and at the beginning of primary school and reinforcing interventions in middle school. For the middle school intervention, the study identified that there is a need for psychosocial interventions that target specific health-related behaviours such as peer and early sexual relations, and alcohol and substance misuse.[94]

6.8 Improved diagnosis and management of Hepatitis B in the NT

Hepatitis B is a significant issue among Australia's First Nation population, particularly in the NT. The prevalence of chronic Hepatitis B among First Nation people is 6.08%, in comparison to less than 1% for the broader Australian population.[95] The burden of Hepatitis B is significant and can lead to liver cancer with poor management and untimely diagnosis. In the NT, there remains a substantial portion of First Nation people with Hepatitis B that remain undiagnosed, and therefore at risk of serious complications. Without timely access to treatment, it is estimated that 15% of women and 40% of men die from Hepatitis B induced liver cancer.

Menzies has engaged in a broad scope of research focused on broadening the evidence base and understanding of Hepatitis B in First Nation people's communities. Research has contributed to an improvement in the understanding of the disease burden of Hepatitis B in the NT, pathology and genome of the hepatitis B virus in First Nation's people, and health care barriers and service gaps that limit people from optimally being diagnosed and receiving treatment for their condition.

Recently, Menzies has been working in partnership with the NT Government, Katherine West Health Board, Miwatj Health Aboriginal Corporation, ASHM and NT Aids and Hepatitis Council, to develop and implement the Hep B PAST – Partnership Approach to Sustainability eliminating Chronic Hepatitis B in the NT. The objective of this partnership is to eliminate chronic Hepatitis B from Indigenous Australians in the NT.

Since 2018, Menzies' partnership approach has supported the development of Australia's first Hepatitis B clinical register, supporting the diagnosis and management of Hepatitis B into primary care. This effort successfully led to the increase of Hepatitis B diagnosis in First Nation people, as well as an increase in the proportion of patients receiving care and treatment. Menzies has also designed and implemented the Hep B Story, an education app designed to substantially improve community health literacy.

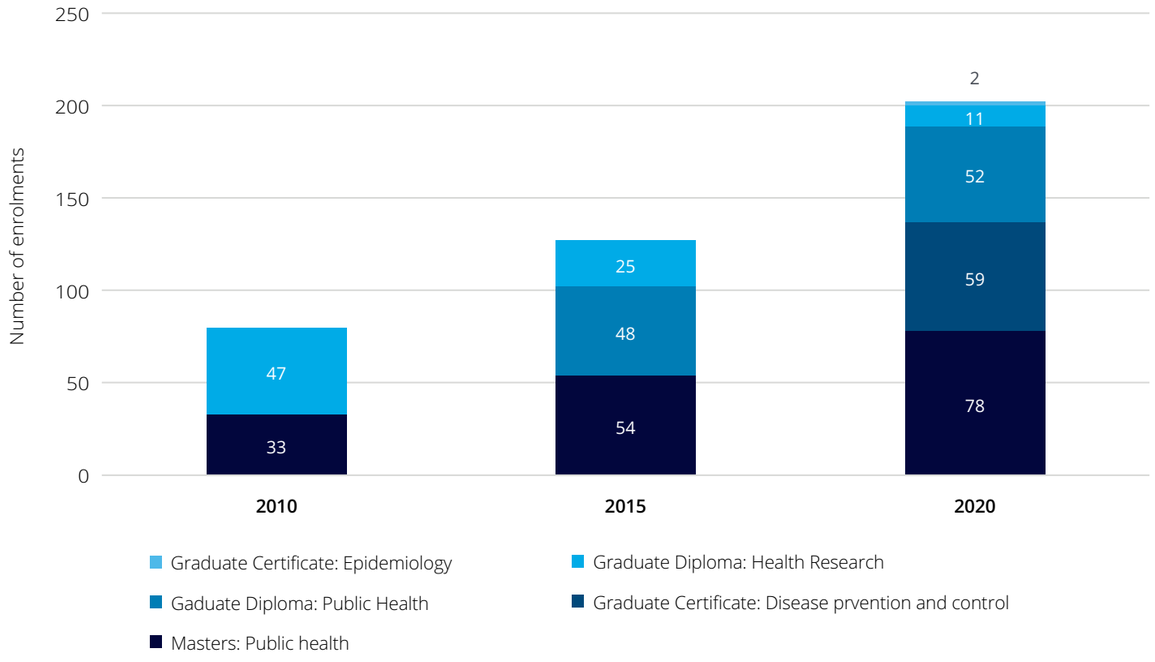
6.9 Delivery of postgraduate education

In addition to the health benefits generated by Menzies' research, Menzies plays an important role in supporting the development of knowledge and skills amongst postgraduate researchers and health professionals. Between 2010 to 2020, total postgraduate enrolments at Menzies increased from 80 enrolments to 202 enrolments, or an increase of 152% (see Chart 6.1).

Postgraduate courses taught at Menzies vary from Graduate Certificate qualifications through to the Doctor of Philosophy (PhD) at Charles Darwin University. Menzies currently teaches the following postgraduate courses:

- Graduate Certificate of Infectious Disease Prevention and Control
- Graduate Certificate of Epidemiology
- Graduate Diploma of Public Health
- Graduate Diploma of Health Research
- Master of Health Research
- Master of Public Health
- Master of Public Health/Master of Health Research (Double Degree).[96]

Chart 6.1: Postgraduate enrolments at Menzies, 2010 to 2020



Source: Menzies. Note: Grad Cert Disease Prevention and Control only introduced in 2020; Grad Cert Epidemiology introduced in 2019 and Grad Dip Health Research in 2015.

Appendix A: **Economic contribution analysis**

Economic contribution studies are intended to quantify measures such as value added, exports, imports and employment associated with a given industry or firm, in a historical reference year. The economic contribution is a measure of the value of production by a firm or industry.

A.1. Value added

Value added is the most appropriate measure of an industry's economic contribution to GDP at the national level, or GSP at the state level.

Other measures, such as total revenue or total exports, may be easier to estimate than value added but they 'double count'. That is, they overstate the contribution of and entity or industry to economic activity because they include, for example, the value added by external firms supplying inputs or the value added by other industries.

A.2. Measuring the economic contribution

There are several commonly used measures of economic activity, each of which describes a different aspect of an industry's economic contribution:

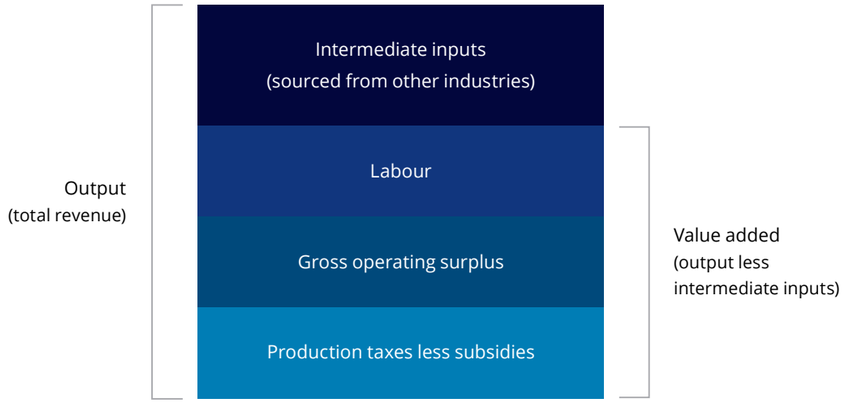
- Value added measures the value of output (i.e. goods and services) generated by the entity's factors of production (i.e. labour and capital) as measured in the income to those factors of production. The sum of value added across all entities in the economy equals gross domestic product.

  Given the relationship to GDP, the value added measure can be thought of as the increased contribution to welfare. Value added is the sum of:

  - Gross operating surplus (GOS). GOS represents the value of income generated by the entity's direct capital inputs, generally measured as the earnings before interest, tax, depreciation and amortisation (EBITDA)
  - Labour income. It represents the value of output generated by the entity's direct labour inputs, as measured by the income to labour
  - Tax on production less subsidy provided for production. This generally includes company taxes and taxes on employment. Note: given the returns to capital before tax (EBITDA) are calculated, company tax is not included or this would double count that tax.
- Gross output measures the total value of the goods and services supplied by the entity. This is a broader measure than value added because it also includes the value of intermediate inputs used by the entity that flow from value added generated by other entities.
- Employment is a fundamentally different measure of activity. It measures the number of workers that are employed by the entity, rather than the value of the workers' production.

Figure A.1 shows the accounting framework used to evaluate economic activity, including all components that make up the gross output of an entity.

Figure A.1: Economic activity accounting framework



Source: Deloitte Access Economics.

A.3. Direct and indirect contributions

The direct economic contribution is a representation of the flow from labour and capital within the sector of the economy in question.

The indirect contribution is a measure of the demand for goods and services produced in other sectors as a result of demand generated by the sector in question. Estimation of the indirect economic contribution is undertaken in an input-output (IO) framework using ABS input-output tables, which report the inputs and outputs of specific sectors of the economy (ABS 2020).

The total economic contribution to the economy is the sum of the direct and indirect economic contributions.

A.4. Input-output analysis

Input-output modelling is a statistical approach to measuring the indirect economic contribution (indirect value added and indirect employment) of an industry. IO tables trace the industries a particular entity or industry purchases inputs from and the industries to which it sells its outputs. These linkages are used to estimate the multiplier effect of expenditure.

A widely used measure of the spillover of activity from one sector to another is captured by the ratio of the total to direct change in economic activity. The resulting estimate is typically referred to as 'the multiplier'. A multiplier greater than one implies some indirect activity, with higher multipliers indicating relatively larger indirect and total activity flowing from a given level of direct activity.

The IO matrix used for Australia is derived from the ABS IO tables. The industry classification used for input-output tables is based on Australian and New Zealand Industry Classification (ANZSIC), with 111 sectors in the modelling framework.

A.5. Limitations of economic contribution studies

While describing the geographic origin of production inputs may be a guide to a firm's linkages with the local economy, it should be recognised that these are the type of normal industry linkages that characterise all economic activities.

Unless there is significant unused capacity in the economy (such as unemployed labour) there is only a weak relationship between a firm's economic contribution as measured by value added (or other static aggregates) and the welfare or living standard of the community.

Indeed, the use of labour and capital by demand created from the industry comes at an opportunity cost as it may reduce the amount of resources available to spend on other economic activities. This is not to say that the economic contribution, including employment, is not important.

In a fundamental sense, economic contribution studies are simply historical accounting exercises. No 'what-if', or counterfactual inferences — such as 'what would happen to living standards if the firm disappeared?' — should be drawn from them.

The analysis — as discussed in the report — relies on a national input-output table modelling framework and there are some limitations to this modelling framework. The analysis assumes that goods and services provided to the sector are produced by factors of production that are located completely within the state or region defined and that income flows do not leak to other states.

The IO framework and the derivation of the multipliers also assume that the relevant economic activity takes place within an unconstrained environment. That is, an increase in economic activity in one area of the economy does not increase prices and subsequently crowd out economic activity in another area of the economy. As a result, the modelled total and indirect contribution can be regarded as an upper-bound estimate of the contribution made by the supply of intermediate inputs.

Similarly, the IO framework does not account for further flow-on benefits as captured in a more dynamic modelling environment like a Computable General Equilibrium model.

Limitation of our work

General use restriction

This report is prepared solely for the use of the Menzies School of Health Research. This report is not intended to and should not be used or relied upon by anyone else and we accept no duty of care to any other person or entity. The report has been prepared for the purpose of estimating the social and economic contribution of the Menzies School of Health Research. You should not refer to or use our name or the advice for any other purpose.

Endnotes

1. Total health benefits generated for Australia and globally are used to compare the growth in Menzies impact since the 2015 study. This approach is used due to adjustments in the way the CBA results are reported in this study, which limit the ability to compare results on a like-for-like basis. The value of the benefits estimated in the 2015 study have been adjusted to 2021 dollars for comparability.
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