Deloitte Access Economics

ESSA
EXERCISE & SPORTS SCIENCE AUSTRALIA

The value of accredited exercise physiologists to consumers in Australia

Exercise & Sports Science Australia

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Deloitte.

Contents

Charts

Tables

Glossary

ABS	Australian Bureau of Statistics
ACQ	asthma control questionnaire
AIHW	Australian Institute of Health and Welfare
BCR	benefit-cost ratio
COPD	chronic obstructive pulmonary disease
CVD	cardiovascular disease
DALY	disability adjusted life year
DCBA	disease cost burden analysis
ESSA	Exercise & Sports Science Australia
HbA1c	glycated haemoglobin (A1c)
LDL	low density lipoprotein
MBS	Medicare Benefits Schedule
NHS	National Health Survey
PR	pulmonary rehabilitation
SGRQ	St George's Respiratory Questionnaire
VSL(Y)	value of a statistical life (year)
YLD	years of healthy life lost due to disability
YLL	years of life lost due to premature death

Executive summary

Introduction

In 2015, Exercise & Sports Science Australia (ESSA) engaged Deloitte Access Economics to quantify the value of accredited exercise physiologists in Australia from the perspective of society as a whole (Deloitte Access Economics, 2015). The report found benefits in terms of reduced health system costs, reduced productivity losses and wellbeing gains from lifestyle interventions delivered by accredited exercise physiologists for individuals living with type 2 diabetes, depression, chronic heart failure and other chronic diseases.

This report estimates the value of accredited exercise physiologists from the perspective of consumers in Australia. This is important given the nature of ongoing health reforms, which are increasingly being aimed at consumer directed care models. Consumer directed care models can:

- allow consumers to be invested in health care decision making, which helps enable improved outcomes for consumers, as recognised by best practice guidelines both in Australia and internationally (Department of Health, 2016b);
- reduce consumer expenditure on health care overall, primarily through reduced use of prescription drugs and general practitioner or specialist visits (Parente et al, 2004); and
- help ensure a more viable, sustainable health system overall (Department of Health, 2016b), by allowing consumers to make informed decisions about which health professional is best for their individual needs.

In Australia, the Australian Government is continuing to introduce **consumer directed care** into government-funded packaged care programs. This model typically provides individuals with an allocated budget where the consumer is able to choose which health professional they engage. These changes have already begun to be rolled out in aged care sector through My Aged Care and the disability sector through the National Disability Insurance Scheme. For the health sector, this reform is the Health Care Home (HCH) model, which is a consumer directed care model for primary health care scheduled to begin in 2017. **The HCH model, along with My Aged Care and the National Disability Insurance Scheme, will enable consumers to directly engage the services of health professionals, including accredited exercise physiologists**.

Accredited exercise physiologists provide clinical exercise training and behavioural modifications aimed at preventing and managing health conditions, which improve wellbeing for individuals. Accredited exercise physiologist interventions are exercise-based and include health and physical activity education, advice and support, and lifestyle modification with a strong focus on achieving behavioural change restoring optimal function, health or wellness.

Accredited exercise physiologist interventions have been found to be effective alone, and can improve the effectiveness of alternative medical treatments for a range of chronic conditions (Pedersen and Saltin, 2015). This report therefore evaluates the benefits of

accredited exercise physiologist interventions to consumers in Australia for selected conditions. The selected conditions include:

- type 2 diabetes;
- cardiovascular disease (CVD);
- mental illness (depression);
- chronic obstructive pulmonary disease (COPD); and
- asthma.

Brief methodology

The overall cost of illness estimates for each condition in this report are based on previous work by Deloitte Access Economics and Access Economics conducted since the mid-2000s, where each study used a relatively consistent methodology as data permitted.[1] To determine the benefits and costs for accredited exercise physiologist interventions, the cost per person of each condition discussed in this report is separated into: health system expenditure, productivity losses, and wellbeing costs. These costs are attributed to the individual via a range of cost shares.

The effectiveness of accredited exercise physiologist interventions is based on prior work by Deloitte Access Economics, and a range of literature sources measuring the impact of clinical exercise interventions on health system expenditure, productivity losses and wellbeing costs in each disease group.

Results

The **overall benefits of accredited exercise physiologist interventions for the representative consumer were estimated to be $6,562 per person in 2016, based on a conservative assumption where benefits were assumed to be half as effective as those delivered in accredited exercise physiologist interventions in the academic literature**. Benefits were mostly comprised of improved wellbeing ($6,234, or 93%). The remaining benefits were made up of improved consumer productivity ($259, or 6%) and reduced consumer health system expenditure ($69, or 1%).

Across the conditions discussed in this report, a typical accredited exercise physiologist intervention involves approximately 21 sessions based on a review of clinical exercise interventions in academic literature, with the proportion of individual to group settings varying depending on the condition. It is noted that this may be considerably higher than the average number of sessions a consumer typically has with an accredited exercise physiologist in Australia. Sessions usually go for approximately one hour.

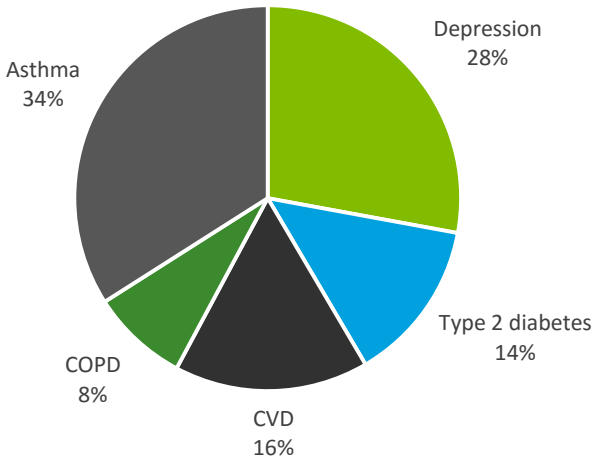
The costs of accredited exercise physiologist interventions for a representative consumer were estimated to be $880, of which the **consumer is expected to pay for approximately 71% ($623)**. This assumes that consumers with a chronic condition generally access the five Medicare rebated sessions available to them (following referral to an accredited exercise

[1] The costs for each study condition were presented in 2016 dollars, using wage inflation, the Consumer Price Index or health inflation as necessary.

physiologist by a general practitioner). For consumers with type 2 diabetes, it was assumed they would receive one individual session and eight group sessions with an accredited exercise physiologist, which attract Medicare rebates.

Out of the selected conditions, the representative consumer is most likely to have asthma, mental illness (depression), or CVD as shown in Chart i. **They are also likely to have other comorbid conditions, which would increase the value of accredited exercise physiologists in prescribing clinical exercise interventions that are evidence-based, and account for individual circumstances.**

Chart i: Selected chronic conditions of a representative consumer, by frequency, 2015



Source: Deloitte Access Economics calculations based on ABS[2] (2016).
Note: not adjusted for conditions that commonly occur together (comorbidities).

Table i shows that substantial net benefits arise from the use of accredited exercise physiologist interventions for depression, type 2 diabetes, CVDs, COPD and asthma.

The benefit-cost ratio (BCR) for these five selected conditions is favourable from the consumer's perspective as costs may be borne by other payers. **It was estimated that for every $1 a consumer spends on receiving accredited exercise physiologist interventions, they would receive $10.50 in wellbeing benefits, improved consumer productivity and reduced consumer health system expenditure**. Where consumers have access to other funding sources to pay for accredited exercise physiologist interventions, such as through private health insurance, pilot programs, or primary health network funding, the BCR from the perspective of the consumer may be higher than this (due to lower costs).

Interventions for CVD and COPD were found to have the highest net benefits – $7,606 and $6,629, respectively.

[2] Australian Bureau of Statistics.

Table i: Benefits, costs and BCR of accredited exercise physiologist interventions for selected conditions

	Depres-sion	T2D	CVD	COPD	Asthma	Avg.
Consumer benefits ($)	6,025	3,197	8,293	6,889	1,075	6,562
Consumer costs ($)	559	377	687	260	832	623
Net benefit for consumer ($)	5,467	2,820	7,606	6,629	243	5,938
BCR from consumer perspective	10.8	8.5	12.1	26.5	1.3	10.5

Source: Deloitte Access Economics analysis. T2D = type 2 diabetes.

Despite variation in the magnitude of net benefits, interventions provided by accredited exercise physiologists have been found to be beneficial for type 2 diabetes, CVD, depression, COPD, and asthma. These interventions are likely to assist a majority of the Australian population that have some type of chronic disease – now estimated to be slightly more than 50% of all Australians, based on the 2015 National Health Survey (NHS).

Given the move towards consumer directed care in the provision of health and human services in Australia and internationally, this report provides important information for consumers to better choose which service they engage to improve their health. Within Australia, a flagship consumer-focused community reform is the Health Care Homes model, scheduled to commence on 1 July 2017, which is aimed at coordinating comprehensive care for patients with chronic and complex conditions on an ongoing basis. It is noted that in the aged care sector and the disability sector, My Aged Care and the National Disability Insurance Scheme are already consumer directed models where consumers could engage the services of an accredited exercise physiologist.

Such reforms indicate that it is necessary to quantify the potential health benefits of accredited exercise physiologist interventions for individuals living with chronic conditions, as they will likely be an integral component of Health Care Homes, and the existing private health insurance, My Aged Care and National Disability Insurance Scheme consumer directed care reforms.

This report quantifies the value of accredited exercise physiologist interventions to consumers living with a chronic condition in Australia, finding large benefits from the perspective of the consumer for depression, type 2 diabetes, CVD, COPD and asthma. Given these large benefits, this report will help support better engagement by, and with consumers of, the accredited exercise physiologist workforce in Australia.

Deloitte Access Economics

1 Background

It is now estimated that chronic disease affects over 50% of Australians, based on the latest NHS (ABS, 2016). Chronic disease imposes substantial health burdens on consumers, with impacts spanning individual wellness, their productivity at work and subsequent health system costs associated with their condition.

Accredited exercise physiologists have a key role to play in the management of chronic disease, by tailoring services to the severity of disease, and other factors such as whether comorbidities exist. These factors are known to increase the burden imposed on consumers, and may alter the effectiveness of any intervention.

1.1 Accredited exercise physiologists

Accredited exercise physiologists are allied health professionals with specialised university education and training in exercise prescription and delivery. Accredited exercise physiologists specialise in clinical exercise interventions (referred to as accredited exercise physiologist interventions, or clinical exercise interventions) for a broad range of pathological populations. These people may be at risk of developing, or have existing, medical conditions and injuries. The aims of accredited exercise physiologist interventions are to prevent acute or manage subacute or chronic disease or injury, and assist in restoring one's optimal physical function, health or wellness (ESSA, 2015).

Interventions delivered by accredited exercise physiologists are exercise-based and include health and physical activity education, advice and support, and lifestyle modification with a strong focus on achieving behavioural change and restoring optimal function, health or wellness. **Importantly, accredited exercise physiologists provide effective interventions, and are likely to provide greater benefits than either unsupervised exercise, or exercise supervised by non-university qualified professionals that is not structured and individually tailored to the characteristics of the participant**. For example:

- a systematic review by Rosenbaum et al (2015) reported that there is clear evidence from trials in other clinical populations such as type 2 diabetes, and reviews in populations with mental illness demonstrating superior outcomes from structured, supervised and progressive exercise compared with non-structured, unsupervised interventions;
- Callaghan et al (2011) showed that clinical exercise interventions were significantly more effective in reducing depression than other exercise interventions. These findings have been reinforced in other reviews (e.g. Schuch et al, 2016b); and
- Chien et al (2010) concluded that clinical exercise interventions were effective for improving health related quality of life for heart failure patients, whereas home-based, non-supervised exercise was not.

Accredited exercise physiologists typically work in private clinics, workplace occupational rehabilitation, hospitals, and the community health setting. They are eligible to register with Medicare Australia, the Department of Veteran's Affairs and WorkCover, and are recognised by most private health insurers.

Accredited exercise physiologists are a self-regulating allied health profession, represented by the peak professional body, ESSA. ESSA administers functions equivalent to those of the Australian Health Practitioner Regulation Agency National Boards, including formally recognising qualifications (accrediting individuals), administering minimum entry practice standards, assurance of practice standards, providing a code of conduct and investigating complaints. The ESSA Ethics and Disciplinary Committee is an independent panel assigned to investigate complaints made against ESSA members and accredited persons.

1.2 Value of accredited exercise physiologists in Australia

In 2015, ESSA engaged Deloitte Access Economics to quantify the value of accredited exercise physiologists in Australia from the perspective of society as a whole (Deloitte Access Economics, 2015).

The report found benefits in terms of avoided health system costs, avoided productivity costs and wellbeing gains from lifestyle interventions delivered by accredited exercise physiologists. People with diabetes, mental conditions such as depression, heart failure and other chronic diseases could expect to receive these benefits.

Accredited exercise physiologists remain a largely underutilised resource in Australia. Stanton (2013) found that a large proportion of group sessions run by accredited exercise physiologists target individuals with type 2 diabetes. This means that individuals with chronic conditions, including those discussed in this report, are not accessing these services as much as they may require. It is possible that this underutilisation is a function of requiring a GP referral to be able to access services. Additionally, Rosenbaum et al (2014) concur that referrals from GPs to accredited exercise physiologists needs to become standard practice to ensure that multi-disciplinary team treatment plans are effective and individualised.

Data obtained from the *Bettering the Evaluation of Health and Care* (BEACH) initiative suggests that GPs provide exercise counselling at a rate of 1.2 per 100 encounters (Stanton et al, 2015; Britt et al, 2014). Some of these people may already meet exercise guidelines and still have a condition, or they may see their GP for other reasons such as a general check-up. That said, it is still likely that a substantial proportion of services that may benefit from exercise are not referred, due to a lack of awareness. For example, Cheema et al (2014) estimated that less than 1% of the at-risk population (overweight or obese) are referred for accredited exercise physiologist interventions.

Lifestyle interventions in Australia conducted by accredited exercise physiologists are well received by consumers. For example:

- the Life! Lifestyle modification intervention offered by accredited exercise physiologists for individuals with type 2 diabetes has been found to result in reductions in weight and waist circumference and improvements in physical activity and healthy eating (Dunbar et al, 2014); and
- accredited exercise physiologist interventions for mental health have been found to reduce the risk of mortality, improve chronic disease outcomes, lower utilisation of medications, as well as improving self-esteem, decreasing social isolation and improving overall quality of life (Lederman et al, 2016).

Briefly, the 2015 report observed a high benefit-to-cost ratio (BCR) for pre-diabetes, type 2 diabetes, mental health (depression) and CVD. The results are summarised in Table 1.1.

Table 1.1: Estimated benefits and costs of accredited exercise physiologist interventions, per person, 2016

Condition	Benefits ($)				Costs ($)	BCR
	Health system	Productivity & other financial	Wellbeing	Total benefits		
Pre-diabetes	1,977	1,520	2,617	6,115	580	6.0^
Type 2 diabetes	5,107	NE	2,860	7,967	580	≥ 8.8^
Mental health (depression)	330	1,909	NE	2,239	824	2.7^
CVD	NE	NE	11,847	11,847	1,903	6.2#

Note: NE is 'not estimated due to lack of available data', ^ BCRs for pre-diabetes, type 2 diabetes and mental health (depression) are reported as the ratio of financial benefits (health system and lost productivity savings) to costs. # the BCR for chronic disease is relative to the wellbeing gains. BCRs which contain NE elements are reported on a greater than or equal to basis, as it is assumed that the NE components would add to the benefits.
Source: Deloitte Access Economics (2015).

The 2015 report concluded that accredited exercise physiologists interventions are efficacious and highly cost effective in the Australian health care setting for people with pre-diabetes and type 2 diabetes, depression and CVD.

1.3 Value of accredited exercise physiologists to consumers in Australia

This report builds on the 2015 report, *Value of Accredited Exercise Physiologists in Australia*, providing an overview of the benefits that would accrue to consumers of accredited exercise physiologist interventions, rather than to society overall.

It is likely that the interest for any given consumer to engage an accredited exercise physiologist will be specific to their individual circumstances, including whether they have existing chronic conditions. For example, the benefits received by a person who has diabetes may be different to the benefits received by a person who has a mental illness (Table 1.1); although, as shown by Deloitte Access Economics (2015), there would be substantial benefits for both individuals.

The Australian Institute of Health and Welfare (AIHW) (2012) has reported that the top twelve chronic diseases are responsible for three quarters of the total burden of disease in Australia. Deloitte Access Economics (2015) found that **most of these conditions can be assisted by accredited exercise physiologists, so consumers are well placed to have improved wellbeing and other gains**.

As benefits of accredited exercise physiologist interventions are highly individualised, this report separately considers:

- prevalence and select characteristics of each condition – this information was sourced from the latest NHS (ABS, 2016) [3];
- evidence for the potential benefits of accredited exercise physiologist interventions, which involve clinical exercise therapy and behavioural modifications;
- the costs imposed on consumers due to the condition, and the associated benefits resulting from the intervention;
- the estimated costs of accredited exercise physiologist interventions to realise the maximum benefits; and
- a summary of the benefits, costs and the estimated return for each condition.

A range of selected conditions – which contribute a substantial proportion of Australia's health burden – were considered in this report. The selected conditions include:

- type 2 diabetes;
- CVD;
- mental illness (depression);
- COPD; and
- asthma;

After the individualised results for each condition have been discussed, the report considers the **representative consumer, which reflects a prevalence weighted approach to estimating the effectiveness of accredited exercise physiologist interventions**, the likely benefits for Australians with a chronic condition that engage their services, and the expected costs and net benefits for this representative person. Benefits are measured in terms of improved wellbeing (which is converted to monetary value using accepted guidelines – see chapter 2), and reduced health system costs and productivity losses borne by the consumer.

1.4 Shift towards increased consumer choice

In 2010, the Australian Government began piloting consumer directed care in government-funded packaged care programs such as in aged care through the home care packages reform (Department of Health, 2016a). This model is an individual budget-based program that is based on a needs assessment and administered on behalf of the individual.

The move towards consumer directed care within the Australian health, ageing and disability sectors represents a key shift in health service delivery. This is characterised by incentivising patients to reduce use of services of marginal or no value, and seek out lower-cost care

[3] The following reasons are provided for using the health survey as the primary data source:

- The survey covers a range of conditions and has a consistent sample, so no adjustments need to be made to ensure that the results in this study are consistent. This is important for the representative consumer profile which reflects a weighted average of conditions.
- The survey provides a number of additional sample characteristics, such as exercise patterns, which are most relevant to the population sampled (or an equivalent representative sample).
- It is likely that if patients self-report a condition, they may be more likely to seek help for the condition from an accredited exercise physiologist rather than someone who is unaware they have a condition, or does not want to report that they do.

providers (Davis, 2004). Primary health care is one of the sectors to be affected by these changes implemented by ongoing health reforms, noting that these changes have already commenced in the ageing and disability sectors.

For the health sector, the Health Care Home (HCH) model will enable accredited exercise physiologists to deliver comprehensive care to patients with chronic and complex conditions on an ongoing basis. To do this, accredited exercise physiologists will connect with hospitals, private health insurers and primary health networks to deliver care.

Consumer directed care can improve outcomes for individuals, and the system overall. In the United States, implementation of consumer directed care has been found to significantly reduce how much money is spent on health care. Tollen et al (2004) note that 85% of enrolled patients spent less than $1,000 on health services, compared to two-thirds of patients under other regimes. Consumer directed health care was found to initially lower spending, prescription drug use and physician visits (Parente et al, 2004).

Consumer directed care through HCHs, My Aged Care, and the National Disability Insurance Scheme will give consumers greater control and oversight of services delivered through individualised budgets. Therefore, it is necessary to quantify the potential health benefits of including accredited exercise physiologists as a key component of HCHs and also within other consumer directed care models for people with relevant chronic conditions, so that they are able to make informed decisions about the value of accredited exercise physiologist interventions.

2 Modelling methodology and key terms

This chapter provides a brief overview of the methodology used to attribute costs to each individual with a condition, as well as providing definitions used in the modelling, and supplementary material used in the modelling as necessary.

Briefly, the modelling involved 3 main steps:

1. Collating the costs associated with each condition on a per person basis. This involved detailed cost of illness studies undertaken by Deloitte Access Economics since the mid-2000s.
2. Estimating the share of each cost that would be borne by individuals. Partly, this comes from estimates published by the AIHW, and the rest stems from methodology used to undertake the cost of illness studies.
3. Determining the effectiveness of accredited exercise physiologist interventions and applying the relative improvements in key factors (including health system utilisation, quality of life measures, and productivity measures such as changes in absenteeism and presenteeism or employment rates). This provides an estimate of the potential cost reduction for individuals following accredited exercise physiologist interventions. **To be conservative, benefits were assumed to be half as effective as those observed in the academic literature – representing the potential effects of translating from a trial setting to a community setting, as noted by Deloitte Access Economics (2015).**

The effectiveness of interventions is outlined under each condition in the following chapters of the report; however, the collation of costs, and application of shares for each cost type employ a consistent methodology across the conditions. The following sections outline the methodology typically used by Deloitte Access Economics to establish the costs associated with a condition, and estimate the shares that would be borne by individuals.

2.1 Cost of illness borne by individuals

Deloitte Access Economics has undertaken a number of studies outlining the costs to society of each of the conditions included in this report, and thus each study has a relatively comparable methodology. The methodology is referred to as a disease cost burden analysis (DCBA), and is an agreed methodology to estimate the cost of health conditions (e.g. see Frick et al, 2010). Costs are broadly grouped as follows in the DCBA:

- **health system costs**, which includes hospitals, out-of-hospital medical services, other health professionals, pharmaceuticals, research and other expenditure;
- **other financial losses**, which includes productivity costs (e.g. absenteeism, presenteeism, reduced employment, premature death, and search, hiring and training costs), carer costs, aids and modifications and other costs (e.g. government programs or travel costs); and

- **burden of disease**, which refers to consumer wellbeing losses and are measured in terms of disability adjusted life years (DALYs), which are then converted to dollar amounts using the value of a statistical life year (VSLY).

A more detailed description of the methodology used in the DCBA can be found in any of the referenced reports (e.g. see Deloitte Access Economics, 2015a). Importantly for this report, each of the above costs are **partly or wholly borne by individuals with each condition**. This will differ depending on the condition, and the underlying costs. For a condition that results in hospitalisation, the cost will mostly be borne by governments; however, the cost of reduced employment would largely be borne by the individual. The methodology to establish costs borne by individuals is outlined in more detail in the following section.

2.1.1 Health system costs borne by individuals

Our scan of literature revealed that there are no official government sources that publish out-of-pocket costs at a condition level; however, a recent AIHW publication does report sufficient information to calculate out-of-pocket costs at a health subsector level (AIHW, 2016). The cost shares for each type of health service are reported in Table 2.1.

Table 2.1: Share of health system costs borne by individuals, by health subsector

Health subsector	Proportion paid by individuals (%)
Hospitals	4.9
Public hospital services	*3.1*
Private hospitals	*11.0*
Primary health care	35.2
Unreferred medical services	*6.4*
Dental services	*57.7*
Other health practitioners	*45.2*
Community health and other	*3.2*
Public health	*1.1*
Benefit-paid pharmaceuticals	*15.5*
All other medications	*92.8*
Referred medical services	15.9
Other services	27.9
Patient transport services	*12.0*
Aids and appliances	*65.2*
Administration	*0.1*
Research	0.1
Total recurrent expenditure	18.9
Capital expenditure	0.0
Medical expenses tax rebate	0.0
Total health expenditure	**17.7**

Source: Deloitte Access Economics analysis based on AIHW (2016).

For each of the conditions covered in this report, health system costs were collected from the AIHW, and reported at the most detailed level available. For example, each of the

conditions report sufficient information that health system costs can be calculated for 2016 as shown in Table 2.2.

Table 2.2: Health system expenditure by condition, per person, 2016 $

Health system expenditure	Depression	Type 2 diabetes	CVD	COPD	Asthma
Hospitals	-	6,192	4,540	470	104
OOH medical	-	1,169	1,382	69	163
Other health professionals	-	-	99	-	-
Pharmaceuticals	-	-	2,566	252	269
Research	-	-	296	-	-
Total	**1,611**	**7,361**	**8,883**	**791**	**537**

Source: Deloitte Access Economics.
Note: OOH medical (out-of-hospital medical) refers to unreferred medical services. Zero elements do not necessarily mean that there are no costs associated with this component. For various reasons, some of these components may have been excluded from the methodology, or were unavailable at the time due to a lack of data. It is recognised that there may be more up to date data available; although, it was beyond the scope of this report to provide new estimates for all components.

The health system expenditure reported in Table 2.2 is combined with the shares reported in Table 2.1 to determine the out-of-pocket component paid by individuals. The effectiveness of each intervention in terms of health system utilisation is then applied to these values, as outlined in the following chapters of the report, to obtain the value of accredited exercise physiologist interventions for health system expenditure.

2.1.2 Other financial losses borne by individuals

There are a variety of other financial losses borne by individuals, primarily including employment impacts, greater number of days of sick leave or reduce productivity while at work. There are also costs associated with aids and modifications (e.g. for mobility, or respiratory breathing devices), travel costs when attending medical appointments and the likes, employing formal carers. Detailed methodologies for calculating the other financial losses are reported in each of the respective cost of illness studies (see Deloitte Access Economics, 2015a).

Depending on the condition and government sources of funding, it is likely that the share of each financial loss will differ by condition. For example, a person with type 2 diabetes may self-fund medications to help manage blood glucose levels while a person with depression may self-fund sessions with a qualified counsellor, which depending on the duration and severity of each condition, could be vastly different. The analysis undertaken for this report assumed that the share of costs by health system sub-categories will be consistent across conditions. Similarly, for productivity losses, individuals with a condition are likely to face a fairly similar average income tax rate or have similar sick leave policies (discussed further below), and thus share a similar cost of reduced employment or absenteeism.

Table 2.3 shows the share of each other financial cost borne by individuals.

- For reduced employment and premature death, individuals receive less income which would have otherwise been taxed, so the share borne the individual is net of any average taxes (income or otherwise).
- For absenteeism, not all individuals have sick leave (e.g. casual staff or contractors), and so these costs are borne by employers (reduced output), government (reduced tax on both employers and individuals), and individuals (reduced income).
- For presenteeism, this is solely a cost for employers (reduced output) and government (reduced tax on employers) as individuals may be less productive while they are at work, but they will still be paid.[4]
- Costs that would otherwise have been borne by family members have been excluded from this analysis (i.e. brought forward funeral costs or carer productivity).
- It has been assumed that individuals would bear 100% of the costs associated with aids and modifications, travel costs and formal care. For formal care, the only study that included this was for asthma, and the results were net of any formal care payments that would be paid for by other government programs. For aids and modifications and travel costs, these are relatively minor costs (and so would not have a large impact on the findings although would greatly increase the complexity of estimating the share borne by individuals) and would generally be paid for by individuals.

Table 2.3: Share of other financial costs borne by individuals, by cost type

Health subsector	Proportion of costs borne by individuals (%)
Reduced employment	64
Absenteeism	27
Presenteeism	0
Premature death	64
Search, hiring and training	0
Lost carer productivity	0
Brought forward funeral costs	0
Aids and modifications	100
Travel costs	100
Other program costs*	0
Formal care	100
Deadweight losses	0

Source: Deloitte Access Economics analysis based on AIHW (2016).

Table 2.4 reports the other financial costs calculated by Deloitte Access Economics and updates the estimates to be in 2016 dollars. The other financial costs reported in Table 2.4 are combined with the shares reported in Table 2.3 to determine the out-of-pocket component borne by individuals. The effectiveness of each intervention in terms of reduced productivity losses, such as reduced sick days or an increase in productivity while at work, are then applied to these values to determine the benefits of accredited exercise physiologist interventions, as outlined in the following chapters of the report.

[4] Over a long period of time, employers may pass this cost on to consumers through reduced wages or other means.

Table 2.4: Other financial costs by condition, per person, 2016 $

Other financial costs	Depression	Type 2 diabetes	CVD	COPD	Asthma
Reduced employment	3,819	768	3,647	3,987	-
Absenteeism	1,248	173	160	1,018	390
Presenteeism	2,643	1,934	-	754	-
Premature death	1,433	149	2,189	1,534	46
Search, hiring and training	0.5	83	-	2.6	0.1
Lost carer productivity	76	-	4,167	-	49
Brought forward funeral costs	4	-	-	76	0.3
Aids and modifications	-	-	-	252	-
Travel costs	-	-	-	-	27
Other program costs*	-	-	-	-	76
Formal care	-	-	-	-	2
Deadweight losses	2,011	-	851	904	272
Total	**11,235**	**776**	**11,014**	**8,527**	**862**

Source: Deloitte Access Economics.
Note: zero elements do not necessarily mean that there are no costs associated with this component. For various reasons, some of these components may have been excluded from the methodology, or were unavailable at the time due to a lack of evidence. It is recognised that there may be more up to date data available; although, it was beyond the scope of this report to provide new estimates for all components.

2.1.3 Burden of disease (wellbeing losses) borne by individuals

Life and health can be measure in terms of DALYs. The DALY approach has been adopted and applied in Australia by the AIHW. Mathers et al (1999) separately identify the premature mortality (years of life lost due to premature death - YLL) and morbidity (years of healthy life lost due to disability - YLD) associated with disability due to a condition:

DALYs = YLLs + YLDs

In any year, the disability weight of a health condition reflects a relative health state, where a weight of 0 represents a year of perfect health and a weight of 1 is equivalent to death. For example, the disability weight for a broken wrist is 0.18, which represents losing 18% of a year of healthy life because of the inflicted injury, for the duration of the condition.

The burden of disease as measured in DALYs can be converted into a dollar figure using an estimate of the **value of a statistical life** (VSL). The VSL is an estimate of the value society places on an anonymous life. As DALYs are enumerated in years of life rather than in whole lives it is necessary to calculate the **VSLY** based on the VSL. This is done using the formula:[5]

[5] The formula is derived from the definition:
VSL = ΣVSLYi/(1+r)^i where i=0,1,2….n
where VSLY is assumed to be constant (i.e. no variation with age).

$$VSLY = VSL / \Sigma_{i=0,\ldots,n-1}(1+r)^n$$

Where: n = years of remaining life, and
r = discount rate

In Australia, the Office of Best Practice and Regulation (2014) reports that the VSLY was $182,000 in 2014. The burden of disease is entirely borne by the individual with the condition as it relates to the individual's health state.

Finally, DALYs are calculated by using condition specific disability weights, and the number of premature deaths due to a condition. Disability weights are multiplied by prevalence to obtain the YLD component of DALYs, and the sum of the expected years of life lost for all premature deaths form the YLL component of DALYs.

Table 2.5 shows the estimated wellbeing costs per person reported in the studies undertaken by Deloitte Access Economics – all adjusted using wage inflation so that they are reported in 2016 dollars.

Table 2.5: Lost wellbeing by condition, per person, 2016 $

Wellbeing	Depression	Type 2 diabetes	CVD	COPD	Asthma
YLDs	20,899	9,364	128,129	53,188	10,191
YLLs	4,279	3,266	29,222	43,319	404
DALYs	**25,178**	**12,630**	**157,351**	**96,507**	**10,595**

Source: Deloitte Access Economics.

The loss of wellbeing, when combined with the effectiveness of accredited exercise physiologist interventions on the quality of life, gives the estimated benefits to consumers if they were to engage the services of an accredited exercise physiologist.

2.2 Cost inflation to state cost of illness values in 2016 dollars

Where costs were not reported for the 2016 financial years, these were brought forward to 2016 values using health inflation for health system expenditure, wage inflation for productivity losses and the consumer price index for other costs such as aids and modifications (AIHW, 2016; ABS, 2016a; ABS, 2016b). If data were unavailable – e.g. the health price index only goes to 2015, then 10 year average growth was used to impute the expected index values in missing years – as for the 2016 health price index values.

2.3 Costs of accredited exercise physiologists

ESSA regularly surveys its membership, with approximately 80% of respondents being accredited exercise physiologists. The survey asks a number of questions related to the age, gender, location and business specific questions for accredited exercise physiologists. The

ESSA workforce survey asked the following questions that help to inform the charges for clients:

- what does your employer/business charge for a client one-on-one initial private consultation lasting up to one hour in duration;
- what does your employer/business charge for a client one-on-one follow-up consultation, usually lasting 30-45 minutes in duration;
- what does your employer/business charge each individual participant attending a client group session, lasting up to one hour in duration;
- do you charge a gap fee for individual consults under Medicare; and
- do you charge a gap fee for group sessions conducted for Medicare.

The average gap fee for initial individual consultations under Medicare was $15.90 for all services, and $28.90 for services that did not bulk bill. For the follow-up consultation, these were $12.20 and $24.10 respectively. For group sessions, the average gap fee was $5.80 and $12.50 respectively. It is important to note that not all business charge gap payments:

- 45% of business reported bulk billing for Medicare individual client services; and
- 53% of businesses reported bulk billing group services under Medicare.

Businesses charged, on average, $84.00 for one-on-one initial private consultations that lasted up to one hour in duration. This was $68.80 for follow-up consultations that usually lasted 30-45 minutes in duration. Businesses charged $21.90 for each individual participant attending a client group session lasting up to one hour in duration. Employers on the other hand charged $73.80, $60.60 and $24.80 for those services, respectively.

Taking an average (weighted based on number of survey respondents), **individual sessions with an accredited exercise physiologist cost approximately $70.59**. Similarly, **group sessions with an accredited exercise physiologist cost approximately $23.99 per person**[6].

[6] These prices are inclusive of GST.

3 Mental illness

There are clear benefits of accredited exercise physiologist interventions for individuals living with depression.

Overall benefits of accredited exercise physiologist interventions to people with depression were estimated to be $6,025 per person in 2016, comprised mostly of improved wellbeing ($5,200, or 86%), improved consumer productivity ($767, or 13%) and reduced consumer health system expenditure ($59, or 1%). The costs of accredited exercise physiologist interventions were estimated to be $824, of which the consumer is expected to pay for about $559 (68%).

The benefit-cost ratio (BCR) is favourable from the consumer's perspective as costs may be borne by other payers. **It was estimated that for every $1 a consumer with depression spends on receiving accredited exercise physiologist interventions, they would receive $10.80 in wellbeing benefits, improved consumer productivity and reduced consumer health system expenditure**.

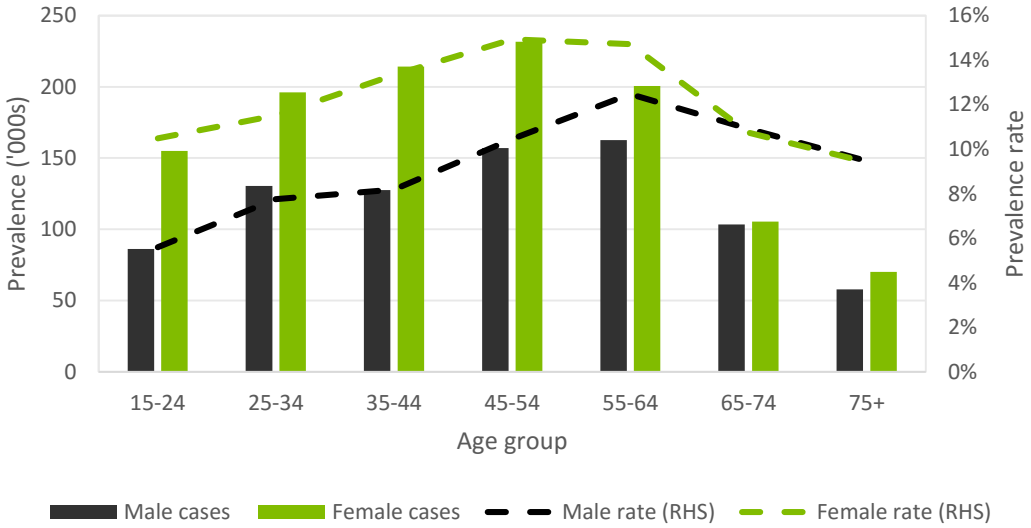
3.1 Characteristics of people with mental illness

Mental illness incorporates a wide range of conditions, involving disorders of mood, thinking and behaviour. Depression, schizophrenia, anxiety, eating disorders and addiction are all forms of mental illness. Risk factors include high levels of stress, chronic medical conditions, brain damage, traumatic experiences, alcohol and drug abuse, abuse or previous mental illness. This report will primarily focus on depression.

In 2015, based on data from the NHS, more than 2 million Australians reported being depressed or having feelings of depression. This is slightly higher than has been reported in the past health surveys, likely due to the inclusion of 'feelings of depression', which may not last more than 6 months in all cases. Despite this, it is clear that depression (and other mental illnesses) affect a large number of Australians every year.

Around 846,000 Australians with depression or feelings of depression were male and slightly more than 1.2 million were female. The average age of an Australian adult with depression or feelings of depression is approximately 47 years old. The age and gender distribution is shown in Chart 3.1.

Chart 3.1: Profile of depression in Australia, by age and gender, 2015

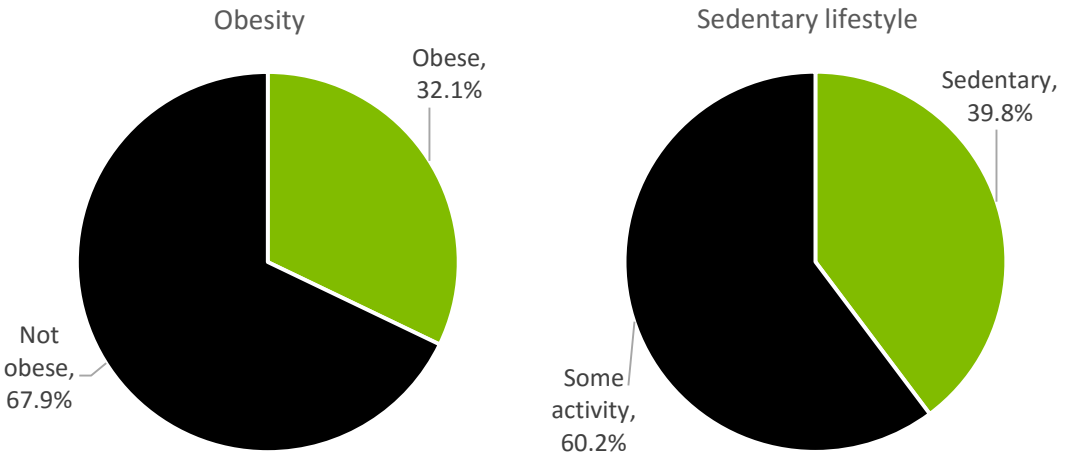


Source: ABS (2016).

Data from the NHS revealed that approximately 60% of those with depression have at least one other chronic condition, and around 31% have two or more chronic conditions. Back problems were reported as the most common chronic condition co-existing with depression. Since accredited exercise physiologist interventions provide benefits for either condition alone, it is likely that when comorbidities exist the net benefits to consumers will be higher than when only one chronic condition is present. For example, accredited exercise physiologist interventions can reduce symptoms of pain (Deloitte Access Economics, 2015), which would increase the benefits to consumers with mental illness and a back problem.

Relative to the other conditions in this report, obesity and inactivity occur less commonly; although, approximately 40% of people with depression still report having sedentary lifestyle in the past week (Chart 3.2), indicating that accredited exercise physiologists could still have large benefits in this cohort.

Chart 3.2: Prevalence of select health risk factors in Australians with depression, 2015



Source: ABS (2016).

3.2 Efficacy of intervention

Exercise has been found to have a number of beneficial effects on mental health and depression (Sharma et al, 2006; Stathopoulou et al, 2006; Strohle, 2009; Lawlor and Hopker, 2001; Schuch et al, 2016a; Schuch et al, 2016b). Sharma et al (2006) notes that exercise increases blood circulation to the brain and influences the hypothalamic pituitary adrenal axis, which improves the physiologic reaction of the brain to stress. This may then lead to anti-depressive and anxiolytic benefits (Jayakody et al, 2013; Cooney, 2013). Schuch et al (2016a) and Schuch et al (2016b) noted the following factors improved the significance of a reduction in depression symptoms:

- a mix between aerobic and anaerobic interventions;
- moderate to vigorous intensity exercise;
- group based exercise;
- combination of supervised and unsupervised interventions;
- supervised by a qualified exercise professional; and
- absence of other comorbidities.

Accredited exercise physiologists are well placed to provide exercise interventions that target individuals with various forms of mental illness. This is because accredited exercise physiologists have a sound understanding of the symptoms of mental illness, and are able to appropriately identify and manage the symptoms mental illness. Lederman et al (2016) notes that accredited exercise physiologist exercise interventions have been proven to:

- reduce the symptoms of mental illness;
- improve sleep quality;
- increase engagement with treatment and service utilisation;
- decrease social isolation;
- increase self-esteem;

- improve quality of life; and
- reduce cravings and withdrawal symptoms.

A reduction in depression and depressive symptoms has been reported through exercise interventions targeting cardiorespiratory fitness. Schuch et al (2016c) reports that individuals with low and medium cardiorespiratory fitness have a higher risk of incident depression (hazard ratio= 1.76 and 1.29 respectively). While these results are in their early stages, these findings suggest that exercise interventions to improve cardiorespiratory fitness may promote positive mental health outcomes. Stubbs et al (2016) echoes these findings by establishing that exercise results in a significant improvement in cardiorespiratory fitness for individuals with depression (g=0.64)[7].

Stubbs et al (2015) found that control groups in clinical exercise interventions typically report large improvements in depressive symptoms through alternative treatments, meaning that for exercise to be seen as effective, it must beat an already strong control arm of the study. Studies which report outcomes relative to control groups which do not receive care can overcome this problem.

Schuch et al (2016b) conducted a meta-analysis adjusting for publication bias, while also reporting the mean change in depressive symptoms for clinical exercise interventions delivered by accredited exercise physiologists. Schuch et al (2016b) reported that effect size of clinical exercise training alone was 0.99, while when adjusting for publication bias and interventions delivered by accredited exercise physiologists, the effect size would be expected to be 1.50. The baseline effect size approximately corresponded to a reduction in depressive symptoms of 4.52 points on the Hamilton Depression Rating Scale, and 6.46 points on the Beck Depression Inventory scale. **When combined with the effect size of accredited exercise physiologists (adjusted for publication bias), the relative reduction in symptoms for the depression scales was estimated to be 38% and 45%, respectively.[8] On average, this represents a 41% reduction in depressive symptoms**.

This broadly agrees with the results published in Deloitte Access Economics (2015), where it was estimated that as many as 22% of cases of depression could be averted through accredited exercise physiologist interventions (noting this has a 50% translation effect which has not yet been applied to the above 41%).

[8] This assumes that the variance for each sample is equal. In reality, there are likely to be small differences in the variances, although it was not possible to account for this with the available data. To determine the relative reductions in depressive symptoms, the effect size for accredited exercise physiologists adjusted for publication bias (1.50) was divided by the effect size of clinical exercise training (0.99), and multiplied by the reduction in depressive symptoms for each scale. The relative reduction is then estimated as the improvement (reduction) in depressive symptoms at end of the intervention compared to the start of the intervention for the exercise group.

Summary: there are benefits of accredited exercise physiologist interventions for individuals living with mental illness including depression, which has flow on improvements to their quality of life, and reduces both productivity losses and health system expenditure. It was assumed that a reduction in depressive symptoms linearly translates to reductions in productivity losses and health system expenditure. Based on the findings in Schuch et al (2016b), **it was estimated that there would be a 21% improvement in these costs for a consumer with depression after applying the 50% translation effect to benefits, as with other conditions in this report.**

3.3 Costs of mental illness and benefits of intervention

Access Economics (2009) estimated that the total cost of depression to the Australian society was $31.1 billion in 2009, of which 65% was due to wellbeing impacts (burden of disease), while health system costs including hospitals, pharmaceuticals and aged care accounted for around 13.4% of financial costs. Around 70.5% of financial costs were productivity costs, reflecting the impact of mental illness on workforce participation in Australia. The remaining costs were associated with carer costs, aids and modifications and deadweight losses. Access Economics found that individuals bear most of these costs due to the large burden of disease impacts.

Table 3.1 reports the per person costs of depression in 2016 dollars, broken down by cost type (health system, productivity or wellbeing costs). The overall cost per person was estimated to be $38,024 in 2016, of which it was estimated to directly cost consumers $29,176 in health system expenditure, productivity losses and loss of wellbeing.

Briefly, cost shares from the AIHW (2016) and the DCBA methodology are used to establish the share of costs that would be borne by individuals. These are then multiplied by the effectiveness outlined in the previous section to establish the benefits of accredited exercise physiologist interventions for the consumer. A more detailed overview of the methodology is provided in chapter 2.

Applying the relative effectiveness parameters for accredited exercise physiologist interventions, the overall benefits were estimated to be $6,025 per person with depression in 2016.

Table 3.1: Cost of depression and benefits of intervention to consumers in Australia, per person, 2016 $

Cost type	Costs per person ($)	Costs borne by consumers ($)	Benefits of intervention ($)
Health system expenditure	1,611	285	59
Productivity losses	11,235	3,713	767
Wellbeing costs	25,178	25,178	5,200
Total	**38,024**	**29,176**	**6,025**

Source: Access Economics (2009) and Deloitte Access Economics calculations.
Note: components may not sum to totals due to rounding.

3.4 Costs of accredited exercise physiologist interventions

To determine the costs of accredited exercise physiologist interventions for individuals with depression, the number of sessions with an accredited exercise physiologist was taken from Deloitte Access Economics (2015).

Deloitte Access Economics (2015) estimated that 34 sessions would need to be delivered, which represents the average number of sessions provided based on a literature review, not the number of sessions expected to be provided on average in a real world setting. The accredited exercise physiologist intervention was assumed to be provided largely on a group basis. The total cost of accredited exercise physiologist interventions for depression was estimated to be $824, given that a singular session delivered by an accredited exercise physiologist is approximately $24 for a one hour group session. To determine the share paid by individuals, it is assumed that individuals with depression will receive an initial five individual sessions through available Medicare Benefits Schedule (MBS) items which attract a rebate of $52.95 each, followed by 29 group sessions.

Removing the MBS cost from the total cost of intervention, **the remaining out of pocket amount to be paid by individuals with depression for accredited exercise physiologist interventions is $559, or 68% of the total cost.**

3.5 Summary of benefits and costs

The overall benefits of accredited exercise physiologist interventions to people with mental illness (depression) were estimated to be $6,025 per person in 2016, comprised mostly of improved wellbeing ($5,200, or 86%), followed by improved consumer productivity ($767, or 13%) and reduced consumer health system expenditure ($59, or 1%).

The costs of accredited exercise physiologist interventions were estimated to be $824, of which the consumer is expected to pay for about $559 (68%).

The BCR from the perspective of the consumer is 10.8, meaning that for every $1 the consumer spends, they would expect to receive returns of $10.80 in terms of improved wellbeing, and reduced consumer productivity losses and health system expenditure. This translates to a net benefit of $5,467 per person in 2016. This indicates that accredited exercise physiologist interventions would be highly valuable to consumers with depression.

4 Type 2 diabetes

A large number of benefits for individuals with type 2 diabetes can be derived from accredited exercise physiologist interventions.

Overall benefits of accredited exercise physiologist interventions to people with type 2 diabetes were estimated to be $3,197 per person in 2016, comprised mostly of improved wellbeing ($2,860, or 89%), but including $257 (8%) in reduced consumer health system expenditure and $80 in improved consumer productivity (2%). The costs of accredited exercise physiologist interventions were estimated to be $580, of which the consumer is expected to pay for about $377 (65%).

The benefit-cost ratio (BCR) is favourable from the consumer's perspective as costs may be borne by other payers. **It was estimated that for every $1 a consumer with type 2 diabetes spends on receiving accredited exercise physiologist interventions, they would receive $8.50 in wellbeing benefits, improved consumer productivity and reduced consumer health system expenditure**.

4.1 Characteristics of people with type 2 diabetes

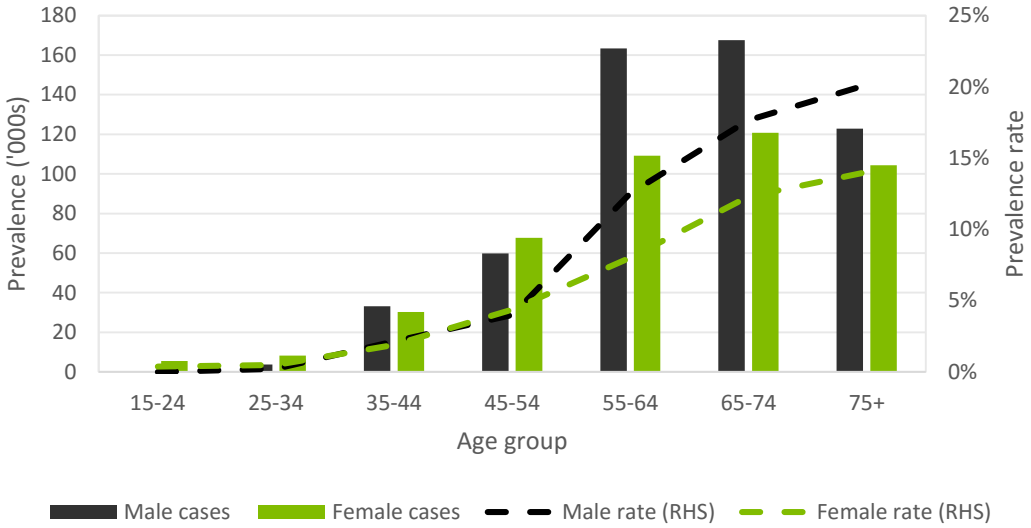
Diabetes is a chronic health condition involving an inability of the human body to manage the level of glucose in the blood. There are three main types of diabetes – type 1, type 2 and gestational diabetes. Other iterations of diabetes represent a small proportion of cases. The most common type of diabetes, type 2 diabetes, affects approximately 9 in 10 people with diabetes.

Type 2 diabetes develops when the human body becomes either (a) resistant to the normal effects of insulin, and/or (b) gradually loses the capacity to produce enough insulin in the pancreas. Risk factors for type 2 diabetes are primarily related to behavioural related factors and genetic predisposition, including unhealthy weight, physical inactivity and unhealthy diet. Physical inactivity has been estimated to contribute to almost a quarter of the burden due to type 2 diabetes in Australia (Begg et al, 2007; AIHW, 2008).

In 2015, based on data from the NHS, slightly more than 1 million Australians[9] reported having type 2 diabetes, of which around 556,000 were male and 446,000 were female. The average age of an Australian adult with type 2 diabetes is approximately 65 years old. The age and gender distribution is shown in Chart 4.1.

[9] This prevalence estimate reflects self-reported survey data from the NHS for type 2 diabetes only, which may not capture undiagnosed cases and may thus be lower than other prevalence estimates that include other forms of diabetes and are based on epidemiological sources. Prevalence estimates throughout the report all use NHS data, for consistency across conditions. As noted in section 1.3, it is likely that only those who self-report a condition will actually seek help from an accredited exercise physiologist.

Chart 4.1: Profile of type 2 diabetes in Australia, by age and gender, 2015



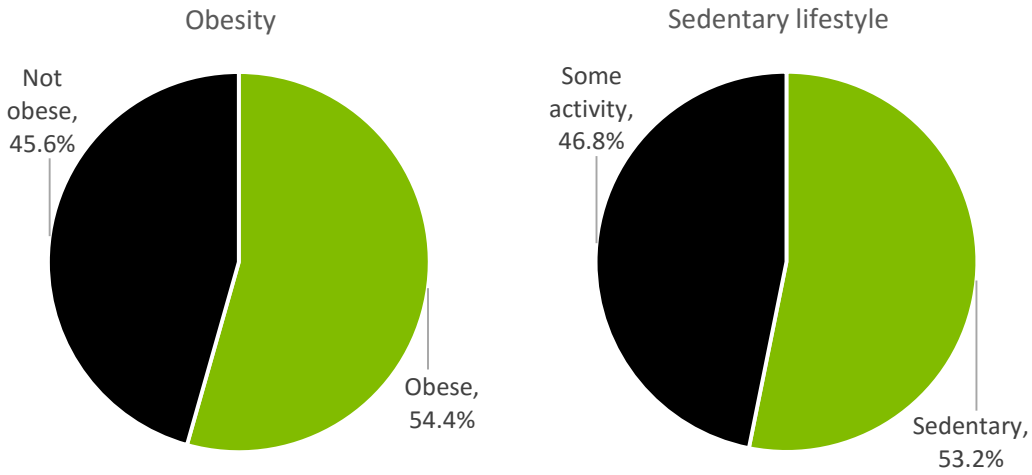
Source: ABS (2016).

Data from the NHS revealed that approximately 85% of those with type 2 diabetes have at least one other chronic condition[10], and around 55% have two or more chronic conditions. CVD (including hypertension) was the most common chronic condition co-existing with type 2 diabetes. Since accredited exercise physiologist interventions provide benefits for either condition alone, it is likely that when comorbidities exist the net benefits to consumers will be higher than when only one chronic condition is present. This is expected as the costs of complications due to comorbidities can be as high as, or even higher than, the costs of the primary condition (Deloitte Access Economics, 2015). For example, accredited exercise physiologist interventions can reduce the likelihood of complications due to CVD (section 5.2), which would increase the benefits to consumers with type 2 diabetes.

Obesity and inactivity are key health risk factors that commonly coexist for people with type 2 diabetes. **Deloitte Access Economics (2015) notes that the ability of accredited exercise physiologists to get people to be more active is one of the key benefits of engaging their services**. As shown in Chart 4.2, more than 53% of Australians with type 2 diabetes do not report undertaking exercise for fitness, sport or recreation in the last week, which appears to be closely correlated with the proportion who are obese.

[10] The NHS covers a broad range of conditions, including hypertension, allergies, back problems and other conditions which are highly prevalent in the Australian population. As such, it is common for people with one of these conditions to have at least one other long-term health condition. The characteristics of people with these conditions should be interpreted with this in mind.

Chart 4.2: Prevalence of select health risk factors in Australians with type 2 diabetes, 2015



Source: ABS (2016).

4.2 Efficacy of intervention

Accredited exercise physiologist interventions for people with type 2 diabetes can assist in preventing and managing the health burdens associated with metabolic syndrome (Bird and Hawley, 2012). Improvements are expected to relate to cardiovascular risk profile, cardiorespiratory fitness and body composition.

Recent controlled trials and systematic reviews have demonstrated the benefits of clinical exercise interventions in managing type 2 diabetes. Benefits of clinical exercise interventions for people with type 2 diabetes include improved glycaemic control (improved HbA1c levels[11]), body composition, cardiorespiratory fitness and risk, and physical functioning and wellbeing (Hordern et al, 2012).

Accredited exercise interventions are beneficial for health outcomes. For example, a study by Fiocco et al (2013) implemented a 24 week intervention which involved sessions that ran for 1.5 hours – exercise was conducted for 1 hour and the remaining half an hour was an educational component. The intervention was supervised by a multidisciplinary team including general practitioners and university qualified exercise physiologists. A stress test following the intervention revealed improved scores for cardiovascular fitness, peak heart rate and magnitude of heart rate, suggesting improved health for consumers.

Accredited exercise physiologist interventions were able to result in clinically significant reductions in HbA1c. HbA1c is the primary outcome linked to health expenditure, cost effectiveness and complication outcomes for a consumer. **The average HbA1c reduction from accredited exercise physiologist interventions was 0.63% (Deloitte Access Economics, 2015), which is sufficient to realise reductions in complications of diabetes such as CVD, vision loss, amputations or chronic kidney disease** (Thomas et al, 2006).

[11] HbA1c or glycated haemoglobin is measure of blood glucose levels over a period of time.

A more detailed overview of the effectiveness of accredited exercise physiologist interventions is provided in Deloitte Access Economics (2015). The likely benefits (and thus efficacy) of accredited exercise physiologist interventions have been taken from Deloitte Access Economics (2015) and updated to estimate the shares borne by consumers. As with Deloitte Access Economics (2015), a **50% community translation effect has been applied to these benefits** – noting that consumers are likely to receive less sessions overall than occur in trial settings, and there would be less follow-up in a real world scenario.

> **Summary:** a large number of benefits for individuals with type 2 diabetes can be derived from accredited exercise physiologist interventions. These interventions have been linked to improved quality of life, increased productivity, and a reduction in symptoms and health system costs.

4.3 Cost of type 2 diabetes and benefits of intervention

To estimate the costs of type 2 diabetes, and the benefits of accredited exercise physiologist interventions, Deloitte Access Economics (2015) used a bottom up approach to estimate the health system savings, productivity losses (and thus averted losses), and the wellbeing impacts of accredited exercise physiologist interventions. A detailed overview of the methodology is provided in Deloitte Access Economics (2015).

Health system savings of accredited exercise physiologist interventions were estimated by comparing health service utilisation for those implementing exercise into their daily routine to help manage their diabetes with those that do not. For consumers, accredited exercise interventions were effective at reducing the chance of being admitted to hospital or visiting an emergency department, and they also resulted in a reduced number of visits to a general practitioner (Deloitte Access Economics, 2015). The total health system benefits were estimated to be $5,107 per person from the perspective of society.

The **productivity impacts** associated with type 2 diabetes are substantial. Type 2 diabetes may result in a consumer having more sick days, being less productive while they at work, or may cause a consumer to leave the workforce entirely. On average, these costs have been observed to be as high as 13.2 days of lost wage income per person per year (Deloitte Access Economics, 2015). The consumer will bear most, but not all, of these costs – as they would have been taxed some proportion of their earnings either directly (income taxes) or indirectly (e.g. goods and services tax). For the consumer, accredited exercise physiologist interventions have been shown to reduce working days lost by as much as 25%. This may be conservative compared to the results reported by Wolf et al (2009), which found that clinical exercise interventions were able to reduce risk of lost work days by as much as 64%. As outlined in section 4.2, **a 50% community translation effect is applied to the 25% benefit** (reduced productivity impacts).

Finally, the **wellbeing** of a consumer is expected to be lower than someone without type 2 diabetes, through lower perceived general health, feeling unwell, or being anxious about the condition amongst other reasons. Accredited exercise physiologist interventions can help manage type 2 diabetes, resulting in improved health outcomes and overall wellbeing. Studies by Coyle et al (2012) and Colagiuri and Walker (2008) estimated that accredited

exercise physiologist interventions would result in **0.23 DALYs averted per person with type 2 diabetes over a period of 15 years**, or approximately $2,860 per person with type 2 diabetes annually.

Table 4.1 reports the per person costs of type 2 diabetes in 2016 dollars, broken down by cost type (health system, productivity or wellbeing costs). The overall costs per person were estimated to be $23,096 in 2016.

Briefly, cost shares from the AIHW (2016) and the DCBA methodology are used to establish the share of costs that would be borne by individuals. These are then multiplied by the effectiveness outlined in the previous section to establish the benefits for the consumer. An overview of this methodology is provided in chapter 2.

Applying the relative effectiveness parameters for accredited exercise physiologist interventions, the overall benefits were estimated to be $3,197 per person with type 2 diabetes in 2016.

Table 4.1: Cost of type 2 diabetes and benefits of intervention to consumers in Australia, per person, 2016 $

Cost type	Costs per person ($)	Costs borne by consumers ($)	Benefits of intervention ($)
Health system expenditure*	7,361	377	257
Productivity losses	3,106	636	80
Wellbeing costs	12,630	12,630	2,860
Total	**23,096**	**13,642**	**3,197**

Source: Deloitte Access Economics (2015) and Deloitte Access Economics calculations.
Note: components may not sum to totals due to rounding. * Health system expenditure per person has not been adjusted for the presence of other conditions, and may be lower than this. It was not possible to adjust for other conditions with the available data.

4.4 Cost of accredited exercise physiologist interventions

To determine the cost of accredited exercise physiologist interventions that would be borne by individuals with type 2 diabetes, it is necessary to know how many sessions would be required, and the cost of those sessions. The costs of one-on-one and group sessions were taken from the 2015 ESSA Workforce Survey (see chapter 2). Deloitte Access Economics (2015) estimated that the total costs for people with type 2 diabetes is $580, which was based on the average sessions provided in the Life! and Healthy Eating Activity and Lifestyle interventions for people with type 2 diabetes. The Life! intervention provides 9 individual sessions, while the Healthy Eating Activity and Lifestyle intervention provides 16 group sessions and 2 individual sessions. The cost was based on the average of the two interventions, although it is noted that this many sessions would not typically be delivered in real world settings as the MBS only provides either 5 individual sessions for chronic disease or 8 group sessions for type 2 diabetes each year.

Under the MBS, individuals with type 2 diabetes are entitled to 1 assessment and up to 8 group sessions with an accredited exercise physiologist each year, and are eligible to receive a rebate of $67.90 and $16.95 for each, respectively. Individuals would therefore receive rebates of $203.50, while the rest is assumed to be paid for out of pocket.

Removing the MBS cost from the total cost, **the remaining out of pocket amount to be paid by individuals with type 2 diabetes for accredited exercise physiologist interventions would be $377, or 65% of the total cost.**

4.5 Summary of benefits and costs

The overall benefits of accredited exercise physiologist interventions to people with type 2 diabetes were estimated to be $3,197 per person in 2016, comprised mostly of improved wellbeing ($2,860, or 89%), followed by reduced consumer health system expenditure ($257, or 8%) and improved consumer productivity ($80, or 2%).

The costs of accredited exercise physiologist interventions were estimated to be $580, of which the consumer is expected to pay for about $377 (65%).

The BCR from the perspective of the consumer is 8.50, meaning that for every $1 the consumer spends they would expect to receive returns of $8.50 in terms of improved wellbeing, and reduced consumer productivity losses and health system expenditure. This translates to a net benefit of $2,820 per person in 2016. This indicates that accredited exercise physiologist interventions would be highly valuable to consumers with type 2 diabetes.

5 Cardiovascular disease

Accredited exercise physiologist interventions result in improved outcomes for patients with CVD.

Overall benefits of accredited exercise physiologist interventions to people with CVD were estimated to be $8,293 per person in 2016, comprised mostly of improved wellbeing ($8,079, or 97%). The costs of accredited exercise physiologist interventions were estimated to be $952, of which the consumer is expected to pay for about $687 (72%).

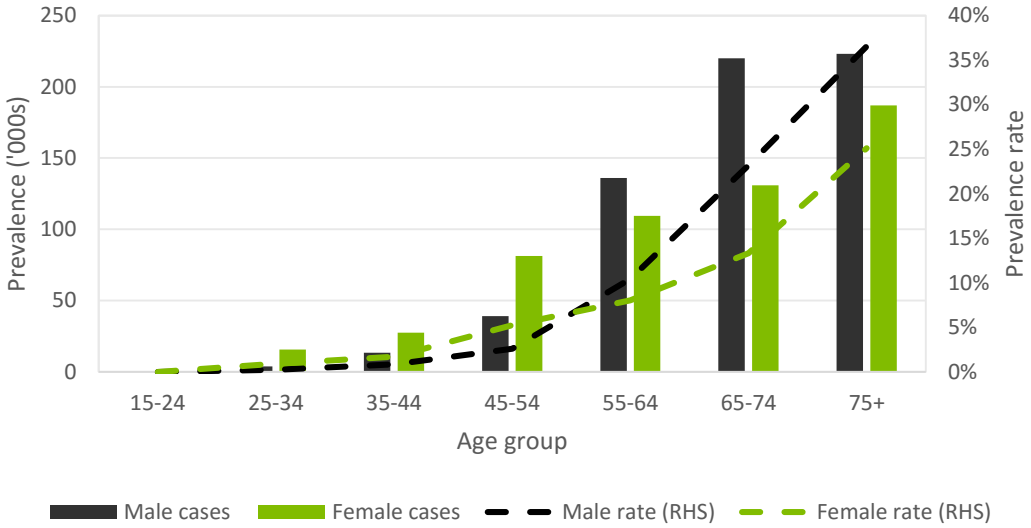
The benefit-cost ratio (BCR) is favourable from the consumer's perspective as costs may be borne by other payers. **It was estimated that for every $1 a consumer with CVD spends on receiving accredited exercise physiologist interventions, they would receive $12.10 in wellbeing benefits, improved consumer productivity and reduced consumer health system expenditure**.

5.1 Characteristics of people with CVD

CVD collectively relates to diseases of the heart and blood vessels. The conditions commonly result in blocked or narrowed blood vessels, increasing the risk of heart attack, angina or stroke. CVD commonly refers to coronary heart disease, heart failure, congenital heart disease, cardiomyopathy or peripheral vascular disease. Primary risk factors include high blood pressure, cholesterol, being overweight, regular smoking, and lack of exercise.

In 2015, based on data from the NHS, almost 1.2 million Australians reported that they had CVD (as defined above), of which around 638,000 were male and 555,000 were female. The average age of an Australian adult with CVD is approximately 69 years old. The age and gender distribution is shown in Chart 5.1.

Chart 5.1: Profile of CVD in Australia, by age and gender, 2015

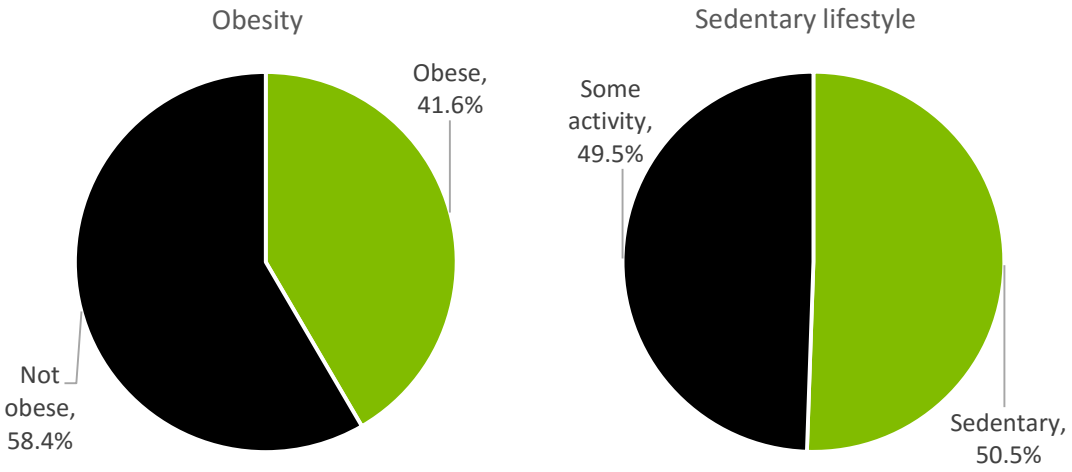


Source: ABS (2016).

Data from the NHS revealed that approximately 73% have at least one other chronic condition, and around 38% have two or more chronic conditions. Arthritis was the most common chronic condition co-existing with CVD. Since accredited exercise physiologist interventions provide benefits for either condition alone, it is likely that when comorbidities exist the net benefits to consumers will be higher than when only one chronic condition is present. For example, Fransen et al (2015) has observed that accredited exercise physiologist interventions are able to reduce pain symptoms in osteoarthritis of the knee by as much as 27%, which would result in lower consumer costs due to arthritis as well as CVD.

Inactivity is a key health risk factor that commonly coexists for people with CVD. As shown in Chart 5.2, more than 50% of Australians with CVD do not report undertaking exercise for fitness, sport or recreation in the last week, which can increase risk factors for a range of health conditions, and lead to worse outcomes in terms of treatment, wellbeing and other costs for CVD related conditions.

Chart 5.2: Prevalence of select health risk factors in Australians with CVD, 2015



Source: ABS (2016).

5.2 Efficacy of intervention

Regular, moderate intensity exercise, as would be prescribed and delivered by accredited exercise physiologists, has been noted to result in the following beneficial effects (Exercise is Medicine Australia, 2014):

- **anti-atherosclerotic:** prevents further narrowing of blood vessels;
- **anti-thrombotic:** prevents blood clotting;
- **anti-ischaemic:** helps to deliver blood to the heart; and
- **anti-arrhythmic:** helps to maintain a normal heart rhythm.

These changes result in a number of benefits pertaining to reduced load on the heart both at rest and during exercise. This improvement in physical functioning, psychological wellbeing, improved blood pressure, cholesterol and insulin sensitivity leads to reduced symptoms and risk of death from CVD (Exercise is Medicine Australia, 2014).

Rigorous diet and exercise interventions have been linked to improvements in patient metabolism, nitric oxide availability, blood pressure and oxidative stress in as little as three weeks following the start of the intervention (Roberts et al, 2002).

Supervised exercise based cardiac rehabilitation, as would be delivered by accredited exercise physiologists, can reduce cardiovascular mortality and hospital admissions in the short term. These interventions have been linked with reducing all-cause mortality by up to 27% over an average of 2.4 years for the interventions (Jolliffe et al, 2001).

A Cochrane systematic review conducted by Rees et al (2004) found that supervised exercise-based interventions improve short term exercise capacity for people with heart failure. This can lead to improvements in quality of life (Tol et al, 2006).

Stefanick et al (1998) implemented a supervised diet and exercise intervention that resulted in an average 17.4 mg/dL (0.5 mmol/L) decrease in low density lipoprotein (LDL) for both

men (n=197) and post-menopausal women (n=180). Seron et al (2014) also notes that LDL can be reduced through exercise interventions, with one study finding an even larger effect; however, they did not report the effect of the interventions due to limited evidence.

Lowering LDL is linked to reduced cardiovascular events (Baigent et al 2005; Bouillion et al, 2011). Baigent et al (2005) report that a 0.2 mmol/L reduction in LDL is linked to 48 fewer individuals having a major vascular event per 1000 persons with a pre-existing cardiovascular condition.

Based on the 0.5mmol/L decrease in LDL following a clinical exercise intervention as reported by Stefanick (1998) and the 0.21mmol/L reduction in LDL leading to 48 fewer cases referenced in Baigent et al (2005):

- total averted major vascular events for those with a pre-existing cardiovascular condition is 102 individuals; and
- total reduction in major vascular events based on the average decrease in LDL cholesterol is 9.4% compared with the baseline.

Summary: benefits of accredited exercise physiologist interventions relate to improved quality of life, reduced number of cardiovascular events, and reduced productivity and health system costs. A 9.4% reduction in major vascular events is expected to result in subsequent benefits for health system expenditure, productivity losses and wellbeing. **As with other conditions, a 50% community translation effect is applied to these values**.

5.3 Cost of CVD and benefits of intervention

Access Economics (2005) estimated that the total cost of CVD to the Australian society was $108.2 billion in 2004, of which around 87% was due to wellbeing impacts (burden of disease), while health system costs including hospitals, pharmaceuticals and aged care accounted for around 7%. Around 3% of total costs were productivity losses, reflecting the impact of CVD on workforce participation in Australia. The remaining costs were associated with carer costs, aids and modifications and deadweight losses. Access Economics found that individuals bear most of these costs due to the large burden of disease impacts.

Table 5.1 reports the per person costs of CVD in 2016 dollars, broken down by cost type (health system, productivity or wellbeing costs). The overall cost per person was estimated to be $177,248 in 2016, of which it was estimated to directly cost consumers $161,893 in health system expenditure, productivity losses and loss of wellbeing.

Briefly, cost shares from the AIHW (2016) and the DCBA methodology are used to establish the share of costs that would be borne by individuals. These are then multiplied by the effectiveness outlined in the previous section to establish the benefits of accredited exercise physiologist interventions for the consumer. A more detailed overview of the methodology is provided in chapter 2.

Applying the relative effectiveness parameters for accredited exercise physiologist interventions, the overall benefits were estimated to be $8,293 per person with CVD in 2016.

Table 5.1: Cost of CVD and benefits of intervention to consumers in Australia, per person, 2016 $

Cost type	Costs per person ($)	Costs borne by consumers ($)	Benefits of intervention ($)
Health system expenditure	8,883	751	36
Productivity losses	11,014	3,791	179
Wellbeing costs	157,351	157,351	8,079
Total	**177,248**	**161,893**	**8,293**

Source: Access Economics (2005) and Deloitte Access Economics calculations.
Note: components may not sum to totals due to rounding.

5.4 Cost of accredited exercise physiologist interventions

To determine the cost of accredited exercise physiologist interventions that would be borne by individuals with CVD, it is necessary to know how many sessions would be required, and the cost of those sessions. To receive the optimal benefits from accredited exercise physiologist interventions, Deloitte Access Economics (2015) estimated a total of 39 sessions would be required, which reflected the average number of sessions across a range of accredited exercise physiologist interventions reported in the literature. The total cost for these sessions was estimated to be $952. To estimate the share paid by individuals, it is assumed that individuals with CVD will receive five individual sessions with a partial rebate from the MBS, and the rest will be paid for by the individual.

Under the MBS, individuals with chronic conditions are entitled to 5 sessions (valued at $52.95 each), meaning that the total benefit provided under the MBS scheme for these five sessions is $265.

Removing the MBS cost from the total cost, **the remaining out of pocket amount to be paid by individuals with CVD for accredited exercise physiologist interventions is $687, or 72% of the total cost.**

5.5 Summary of benefits and costs

The overall benefits of accredited exercise physiologist interventions to people with CVD were estimated to be $8,293 per person in 2016, comprised mostly of improved wellbeing ($8,079, or 97%), followed by improved consumer productivity ($179, or 2%) and reduced consumer health system expenditure ($36, or 0.4%).

The costs of accredited exercise physiologist interventions were estimated to be $952, of which the consumer is expected to pay for about $687 (72%).

The BCR from the perspective of the consumer is 12.1, meaning that for every $1 the consumers spends they would expect to receive returns of $12.10 in terms of improved wellbeing, and reduced consumer productivity losses and health system expenditure. This translates to a net benefit of $7,606 per person in 2016. This indicates that accredited exercise physiologist interventions would be highly valuable to consumers with CVD.

6 Chronic obstructive pulmonary disease

The relative improvement in COPD outcomes due to accredited exercise physiologist led pulmonary rehabilitation (PR) interventions have been found to result in improved wellbeing.

Overall benefits of accredited exercise physiologist interventions to people with COPD were estimated to be $6,889 per person in 2016, comprised mostly of improved wellbeing ($6,435, or 93%) and improved consumer productivity ($447, or 6%). The costs of accredited exercise physiologist interventions were estimated to be $525, of which the consumer is expected to pay for about $260 (50%).

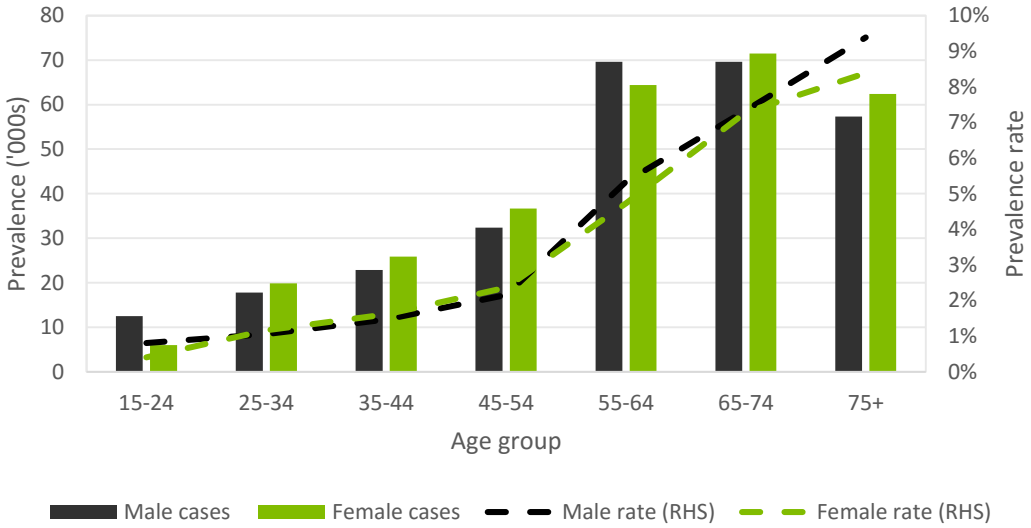
The benefit-cost ratio (BCR) is favourable from the consumer's perspective as costs may be borne by other payers. **It was estimated that for every $1 a consumer with COPD spends on receiving accredited exercise physiologist interventions, they would receive $26.50 in wellbeing benefits, improved consumer productivity and reduced consumer health system expenditure**.

6.1 Characteristics of people with COPD

COPD covers a range of progressive lung diseases such as emphysema, refractory asthma, chronic bronchitis and some forms of bronchiectasis. Risk factors include exposure to tobacco smoke, fumes, air pollution, genetic predisposition and age.

In 2015, based on data from the NHS, approximately 600,000 Australians reported having COPD defined as emphysema or bronchitis, of which around 51% were male and 49% were female. The average age of an Australian adult with COPD is approximately 61 years old. The age and gender distribution is shown in Chart 6.1.

Chart 6.1: Profile of COPD in Australia, by age and gender, 2015

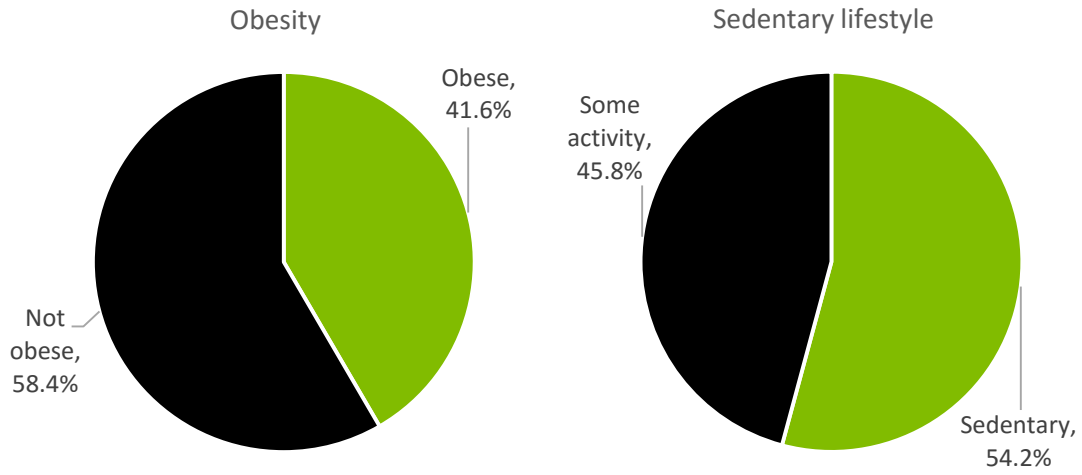


Source: ABS (2016).

Data from the NHS revealed that approximately 90% of those with COPD have at least one other chronic condition, and around 70% have two or more chronic conditions. For males with COPD, CVD (including hypertension) was the most common chronic condition co-existing with COPD. For females, the most common comorbid chronic condition was arthritis. Since accredited exercise physiologist interventions provide benefits for either condition alone, it is likely that when comorbidities exist the net benefits to consumers will be higher than when only one chronic condition is present. For example, accredited exercise physiologist interventions can reduce symptoms of pain in arthritis (Fransen et al, 2015), and reduce primary endpoints of CVD (section 5.2), which would increase the benefits to consumers with COPD and arthritis or CVD.

Sedentary lifestyle is a key health risk factor that commonly coexists for people with COPD. PR – an exercise intervention delivered by accredited exercise physiologists or other appropriately qualified allied health professionals – is commonly prescribed to help manage COPD. As shown in Chart 6.2, more than 54% of Australians with COPD do not report undertaking exercise for fitness, sport or recreation in the last week.

Chart 6.2: Prevalence of select health risk factors in Australians with COPD, 2015



Source: ABS (2016).

6.2 Efficacy of intervention

Puhan et al (2005) reports that COPD can result in skeletal muscle dysfunction, which is linked to reduced quality of life and premature death. These effects can be reversed by physical exercise that may be administered by an accredited exercise physiologist. Clinical exercise interventions have been found to benefit patients presenting with COPD (McCarthy et al, 2015).

Exercise interventions may include respiratory rehabilitation and PR methods. A trial of respiratory rehabilitation (n=230) was found to reduce the risk of hospital admissions and mortality significantly, suggesting this is an effective method of treating COPD in patients following an acute exacerbation. This was also linked to lowering the costs associated with COPD (Puhan et al, 2005a).

PR has been gaining increased attention as the best-practice method of COPD management. Typically COPD follows a pathway of difficulty breathing (dyspnoea), a reduction in physical activity, body deconditioning and social isolation. By better managing the symptoms of COPD, PR is able to stop or slow this pathway progression. Primarily this is achieved by reducing symptoms (dyspnoea) and improving exercise tolerance. This has been found to improve wellbeing, reduce health system expenditure and improve overall physical activity for individuals with COPD (Corhay et al, 2014).

The hospitalisation rate and length of stay one year prior to (pre-) and one year after (post-) PR enrolment was studied by Cote and Celli (2005). Cote and Celli (2005) reported significant differences between the control and intervention group, favouring better outcomes for individuals with COPD undergoing supervised PR intervention. Individuals with COPD that had received a PR intervention had 3.17 fewer hospital days one year prior to enrolment in the study. Table 6.1 highlights how the hospitalisation rate for patients with COPD receiving PR intervention improved by 47% between the pre- and post- study measures. For the control group, there was a 25% improvement in the hospitalisation rate. Overall, **the relative improvement in hospitalisation rates for COPD following PR intervention, as would be**

delivered by accredited exercise physiologists, is expected to be 22%.[12] The 22% reduction in hospitalisation rates is assumed to translate to **similar reductions in productivity losses** (e.g. there would be a similar reduction in absenteeism due to reduced sick-days).

Table 6.1: Hospitalisation rates for people with COPD immediately before PR and following PR

Timeframe	Control (no PR)	Intervention (PR)
One-year before PR	0.56	0.49
Following PR	0.42	0.26
Relative improvement	**25%**	**47%**

Source: Cote and Celli (2005), Deloitte Access Economics calculations.

To determine the effectiveness of PR on COPD, the St George's Respiratory Questionnaire (SGRQ) – a measure of quality of life in people with COPD – is used to compare baseline outcomes with outcomes following a PR intervention. To determine the relative improvement in quality of life, it is necessary to know the baseline SGRQ score for people with COPD.

The average baseline SGRQ of the intervention arm was derived from 16 studies[13] which reported the effectiveness of a PR intervention. The average baseline SGRQ for individuals with COPD who receive PR intervention was 51.66. The change in SGRQ following the PR intervention was estimated to be 6.89 (McCarthy et al, 2015). **The relative improvement in quality of life for people with COPD following exercise intervention, as would be delivered by accredited exercise physiologists, was estimated to be 13%.**

Summary: the relative improvement in COPD outcomes due to PR interventions, as would be delivered by accredited exercise physiologists, result in improved quality of life, reduced COPD symptoms and reduced productivity losses and health system costs.

It is estimated that there would be a 13% improvement in quality of life (improved wellbeing) and there would be a 22% reduction in health system utilisation and productivity losses. **As with other conditions, a 50% community translation effect is applied to these values**.

6.3 Costs of COPD and benefits of intervention

Access Economics (2008) estimated that the total cost of COPD to the Australian society was $98.2 billion in 2008, of which around 91% was due to wellbeing impacts (burden of disease), while health system costs including hospitals, pharmaceuticals and aged care accounted for around 9.7% of total financial costs. Around 76.6% of total costs were productivity costs, reflecting the impact of COPD on workforce participation in Australia. The remaining costs

[12] Calculated as the change in net improvement between the control and treatment groups.

[13] (Baumann et al, 2012; Boxall et al, 2005; Deering et al, 2011; Deepak et al, 2014; Griffiths et al, 2000; Elçi et al, 2008; Engström et al, 1999; Fernandez et al, 2009; Finnerty et al, 2001; Gurgun et al, 2013; Karapolat et al, 2007; Paz-Diaz et al, 2007; Ringbaek et al, 2010; Theander et al, 2009; van Wetering et al, 2010; Wootton et al, 2014).

were associated with carer costs, aids and modifications and deadweight losses. Access Economics found that individuals bear most of these costs due to the large burden of disease impacts.

Table 6.2 reports the per person costs of COPD in 2016 dollars, broken down by cost type (health system, productivity or wellbeing costs). The overall cost per person was estimated to be $105,825 in 2016, **of which it was estimated to directly cost consumers $100,649 in health system expenditure, productivity losses and loss of wellbeing**.

Briefly, cost shares from the AIHW (2016) and the DCBA methodology are used to establish the share of costs that would be borne by individuals. These are then multiplied by the effectiveness outlined in the previous section to establish the benefits of accredited exercise physiologist interventions for the consumer. A more detailed overview of the methodology is provided in chapter 2.

Applying the relative effectiveness parameters for accredited exercise physiologist interventions, the overall benefits were estimated to be $6,889 per person with COPD in 2016.

Table 6.2: Cost of COPD and benefits of accredited exercise physiologist interventions to consumers in Australia, per person, 2016

Cost type	Costs per person ($)	Costs borne by consumers ($)	Benefits of intervention ($)
Health system expenditure	791	66	7
Productivity losses	8,527	4,075	447
Wellbeing costs	96,507	96,507	6,435
Total	**105,825**	**100,649**	**6,889**

Source: Access Economics (2008) and Deloitte Access Economics calculations.
Note: components may not sum to totals due to rounding.

6.4 Cost of accredited exercise physiologist interventions

An application to list PR interventions on the MBS is currently being reviewed. Under this protocol, individuals with COPD would be eligible to receive 16 group sessions, and an individual pre- and post- assessment. Based on the costs reported in chapter 2, the total cost of accredited exercise physiologist interventions for COPD was estimated to be $525.

Given that these changes have not yet taken effect, the share paid by individuals was estimated by assuming that individuals with COPD will receive an initial five individual sessions through available MBS items which attract a rebate of $52.95 each.

Removing the MBS cost from the total costs of accredited exercise physiologist interventions, **the remaining out of pocket amount to be paid by individuals with COPD was estimated to be $260, or 50% of the total cost.**

Under the proposed listed for the MBS, individuals with COPD would receive rebates of $21.25 for group sessions, and $55.25 for individual sessions. Removing the MBS cost from the total cost, **the remaining out of pocket amount to be paid by individuals with COPD for a PR intervention delivered by an accredited exercise physiologist would be approximately $74, or 14% of the total cost.**

Results are presented for both costs faced by the consumer.

6.5 Summary of benefits and costs

The overall benefits of accredited exercise physiologist interventions to people with COPD were estimated to be $6,889 per person in 2016, comprised mostly of improved wellbeing ($6,435, or 93%), followed by improved consumer productivity ($447, or 6%) and reduced consumer health system expenditure ($7, or 0.1%).

The costs of accredited exercise physiologist interventions were estimated to be $525, of which the consumer is expected to pay for about $260 (50%). Under proposed MBS listings, the consumer would be expected to pay only $74 (14%) of the estimated cost.

The BCR from the perspective of the consumer was estimated to be 26.5, meaning that for every $1 the consumer spends, they would expect to receive returns of $26.50 in terms of improved wellbeing, and reduced consumer productivity losses and health system expenditure. This translates to net benefits of $6,629 per person in 2016 dollars. Under the proposed MBS changes, the net benefit would be approximately $6,816 per person in 2016 dollars, and the BCR would be expected to be approximately 93.7[14].

This indicates that accredited exercise physiologist interventions are highly valuable to consumers with COPD.

[14] There is a slight discrepancy in this BCR relative to $6,889/$74, due to rounding off the cents.

7 Asthma

The overall benefits of accredited exercise physiologist interventions to people with asthma were estimated to be $1,075 per person in 2016, comprised mostly of improved wellbeing ($1,047, or 97%). Improved consumer productivity and reduced consumer health system expenditure make up the remaining $28 (3%). Costs of accredited exercise physiologist interventions were estimated to be $1,097, of which the consumer is expected to pay for about $832 (76%).

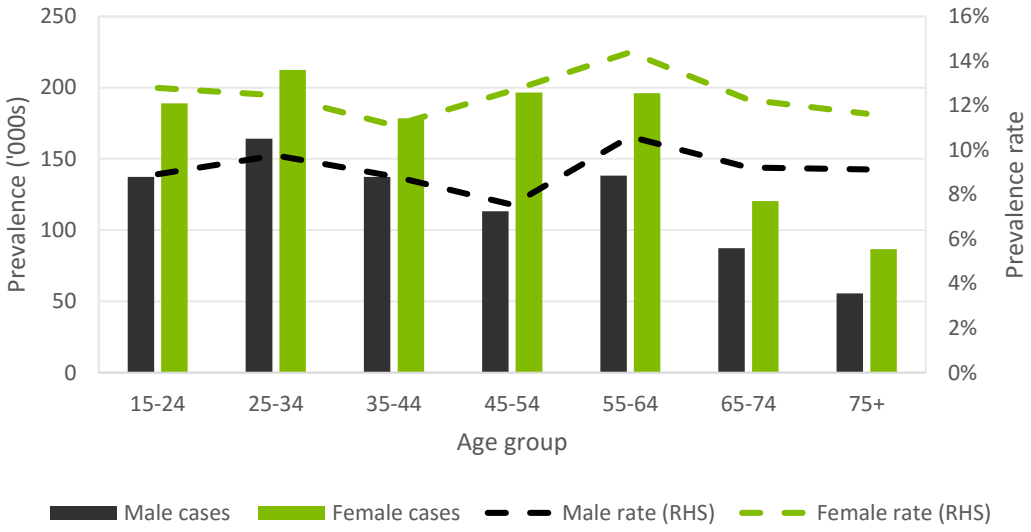
The benefit-cost ratio (BCR) is favourable from the consumer's perspective as costs may be borne by other payers. **It was estimated that for every $1 a consumer with asthma spends on receiving accredited exercise physiologist interventions, they would receive $1.30 in wellbeing benefits, improved consumer productivity and reduced consumer health system expenditure**.

7.1 Characteristics of people with asthma

Asthma is a chronic lung condition characterised by sensitive lung tissue that swells and becomes narrow in response to certain triggers. Combined with an increased production of mucus, this can make it difficult for the individual to breathe. Risk factors for asthma include genetic predisposition, allergies, being overweight, smoking (including second hand smoking), and exposure to pollution, fumes and other chemicals.

In 2015, based on data from the NHS, almost 2.5 million Australians reported having asthma, of which around 1.1 million were male and 1.4 million were female. The average age of an Australian adult with asthma is approximately 46 years old. The age and gender distribution is shown in Chart 7.1.

Chart 7.1: Profile of asthma in Australia, by age and gender, 2015

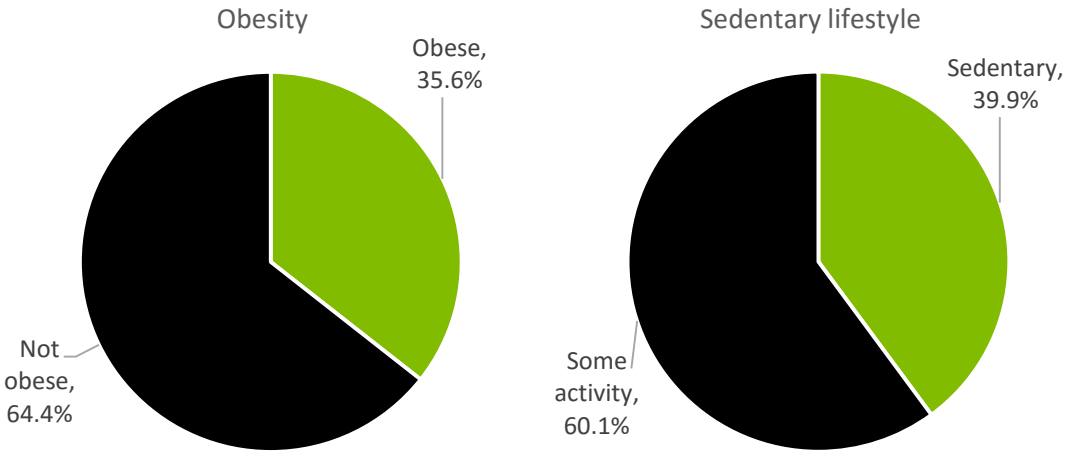


Source: ABS (2016).

Data from the NHS revealed that approximately 58% of those with asthma have at least one other chronic condition, and around 30% have two or more chronic conditions. The most common condition that co-exists with asthma was reported to be either a mental illness or behavioural condition – likely due to the similar age and gender profiles of the conditions. Since accredited exercise physiologist interventions provide benefits for either condition alone, it is likely that when comorbidities exist the net benefits to consumers will be higher than when only one chronic condition is present. For example, accredited exercise physiologist interventions can reduce symptoms of depression (section 3.2), which would increase the benefits to consumers with asthma and a mental illness.

As shown in Chart 7.2, almost 40% of Australians with asthma do not report undertaking exercise for fitness, sport or recreation in the last week. This compares with approximately 28% of Australians who do not report a long-term condition in the NHS (ABS, 2016).

Chart 7.2: Prevalence of select health risk factors in Australians with asthma, 2015



Source: ABS (2016).

7.2 Efficacy of intervention

Exercise interventions delivered by accredited exercise physiologists are an effective means to help control asthma, despite the risk that exercise may exacerbate asthmatic symptoms (Morton and Fitch, 2011). Morton and Fitch (2011, p. 312) note:

> *"With adequate control of the hyper-responsive airways obtained with inhaled corticosteroids and inhaled beta 2 agonists, used as both a pre-exercise preventive agent and a reliever if necessary, all asthmatics should benefit from an exercise program. Some have realised this benefit with such success as to become Olympic and world champions in many sports."*

Dinsmore (2012) notes that exercise improves respiratory function, self-management and overall quality of life while decreasing medication use, symptoms, hospitalisation rates and asthma severity.

Dogra et al (2011) assessed the effects of a 12-week exercise intervention delivered by accredited exercise physiologists, which involved follow-up over another 12-week period with prescribed exercise during that period. Dogra et al (2011) found that there was a significant improvement in asthma control in the exercise group – **which has been shown to be strongly associated with health care expenditures and quality of life** (Sullivan et al, 2016).

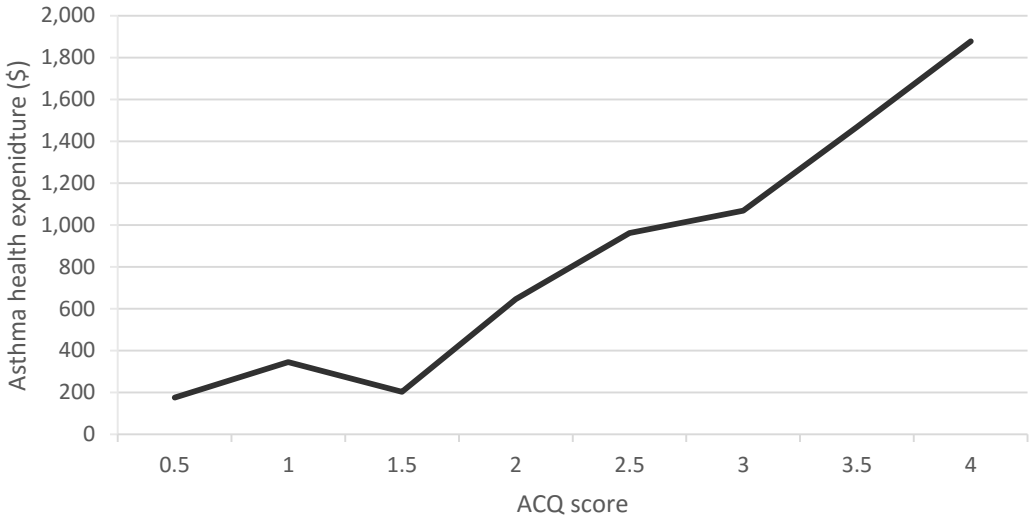
Dogra et al (2011) **observed a 20% significant improvement in both the quality of life** (measured on the asthma quality of life questionnaire), and the mean control measured on the asthma control questionnaire (ACQ) at the end of the 24 week follow-up was 0.72 (standard error = 0.17) compared with 1.30 (standard error = 0.19) at baseline. Both changes were clinically significant.

The former can be readily applied in the modelling to determine the expected benefits resulting from accredited exercise physiologist interventions; however more work needs to be done to determine expected changes in health system expenditures and productivity costs associated with asthma. This is done using the ACQ scores, and associations established between ACQ and the other cost components.

The Global Initiative for Asthma (2016) indicates that ACQ scores of 0 to 0.75 are considered to be well controlled, while scores between 0.75 and 1.5 are a 'grey zone', or partially controlled. Scores above 1.5 are poorly controlled. While the difference may not seem too large, the context is important. For example, Antonicelli et al (2004) previously identified that asthma severity (closely aligned with measures of control) is strongly associated with increasing cost.

To determine the **expected improvement in health system expenditure**, Sullivan et al (2016) conducted multivariate regression analysis to determine the impact of rising ACQ scores on asthma health expenditures. For every 0.5 point rise in the ACQ score, Sullivan et al (2016) found that the expenditure for people with asthma increased by $487, on average (Chart 7.3). When this is applied to the ACQ score changes observed by Dogra et al (2011), **the health system expenditure is expected to decrease by approximately 46% following intervention from an accredited exercise physiologist**.

Chart 7.3: Association between asthma control and health expenditure



Source: Sullivan et al (2016).

For productivity gains, the Global Initiative for Asthma measures of control have previously been applied to determine differences in work hours lost – in terms of both presenteeism (reduced productivity while at work) and absenteeism (days absent from work due to asthma. Sadatsafavi et al (2014) observed that the mean number of work days lost was 6.2 for people with partially controlled asthma, and 5.1 days for people with well controlled asthma. The mean change in the ACQ score reported by Dogra et al (2011) corresponds closely with these categories. As such, it is expected that **accredited exercise physiologist interventions will result in approximately an 18% reduction in productivity losses due to asthma**.

The findings of Dogra et al (2011) have been reinforced in the literature previously. For example, Eichenberger et al (2013) conducted a systematic review and meta-analysis of the effects of clinical exercise interventions on air hyper-reactivity in asthma. Eichenberger defined the inclusion criteria for clinical exercise interventions as training for at least 1 week, at least twice a week, and involved at least 5 training sessions in total. The review assessed outcomes for quality of life, and other clinical measures such as expiration volume and flow. There were 67 studies that met the inclusion criteria, with more than 2,000 participants combined. The review observed a 17% relative improvement in quality of life, which triangulates well with the 20% improvement reported by Dogra et al (2011).

Summary: accredited exercise physiologist interventions can improve quality of life and reduce asthma symptoms, which leads to reduced productivity losses and health system expenditure for people with asthma.

There is expected to be a 46% reduction in health system expenditure, 18% reduction in productivity losses and a 20% improvement in wellbeing. **As with other conditions, a 50% community translation effect is applied to these values**.

7.3 Costs of asthma and benefits of intervention

Deloitte Access Economics (2015a) estimated that the total cost of asthma to the Australian society was $27.9 billion in 2015, of which around 89% was due to wellbeing impacts (burden of disease), while health system costs including hospitals, pharmaceuticals and aged care accounted for around 36% of total financial costs. Around 33% of total financial costs were productivity costs, reflecting the impact of asthma on workforce participation in Australia. The remaining costs were associated with carer costs, aids and modifications and deadweight losses. Deloitte Access Economics found that individuals bear most of these costs due to the large burden of disease impacts.

Table 7.1 reports the per person costs of asthma in 2016 dollars, broken down by cost type (health system, productivity or wellbeing costs). The overall cost per person was estimated to be $11,994 in 2016, of which it was estimated to directly cost consumers $10,818 in health system expenditure, productivity losses and loss of wellbeing.

Briefly, cost shares from the AIHW (2016) and the DCBA methodology are used to establish the share of costs that would be borne by individuals. These are then multiplied by the effectiveness outlined in the previous section to establish the benefits of accredited exercise physiologist interventions for the consumer. A more detailed overview of the methodology is provided in chapter 2.

Applying the relative effectiveness parameters for accredited exercise physiologist interventions, the overall benefits were estimated to be $1,075 per person with asthma in 2016.

Table 7.1: Cost of asthma and benefits of accredited exercise physiologist interventions to consumers in Australia, per person, 2016

Cost type	Costs per person ($)	Costs borne by consumers ($)	Benefits of intervention ($)
Health system expenditure	537	57	13
Productivity losses	862	165	15
Wellbeing costs	10,595	10,595	1,047
Total	**11,994**	**10,818**	**1,075**

Source: Deloitte Access Economics (2015a) and Deloitte Access Economics calculations.
Note: components may not sum to totals due to rounding.

7.4 Cost of accredited exercise physiologist interventions

To determine the cost of accredited exercise physiologist interventions for individuals with asthma, the total number of sessions is based on the intervention described in Dogra et al (2011). Overall, the participants met with the accredited exercise physiologist 36 times over 12 weeks. It is unlikely that people will pay to attend these sessions alone, but it may be feasible to do so as part of a group. The total cost of accredited exercise physiologist

interventions for asthma was estimated to be $1,097, by assuming that individuals will attend 5 sessions individually (which attract MBS rebates), and the rest as part of a group. In a real world setting, the number of sessions with the accredited exercise physiologist is likely to be lower than this, and so the cost would also likely be lower.

Under the MBS, individuals with chronic conditions are entitled to 5 sessions (valued at $52.95 each), meaning that the total benefit provided under the MBS scheme for these five sessions is $265.

Removing the MBS cost from the total cost, **the remaining out of pocket amount to be paid by individuals with asthma for accredited exercise physiologist interventions is $832, or 76% of the total cost.**

7.5 Summary of benefits and costs

The overall benefits of accredited exercise physiologist interventions to people with asthma were estimated to be $1,075 per person in 2016, comprised mostly of improved wellbeing ($1,047, or 97%), followed by reduced consumer health system expenditure and reduced consumer productivity losses which collectively represent savings of $28 (3%).

The costs of accredited exercise physiologist interventions were estimated to be $1,097, of which the consumer is expected to pay for about $832 (76%).

The BCR from the perspective of the consumer is 1.3, meaning that for every $1 the consumer spends, they would expect to receive returns of $1.30 in terms of improved wellbeing, and reduced consumer productivity losses and health system expenditure. This translates to a net benefit of $243 per person in 2016. This indicates that accredited exercise physiologist interventions would be valuable to consumers with asthma.

8 Representative consumer

Accredited exercise physiologist interentions have been found to be effective in reducing health system costs and productivity losses while improving wellbeing outcomes for the representative consumer.

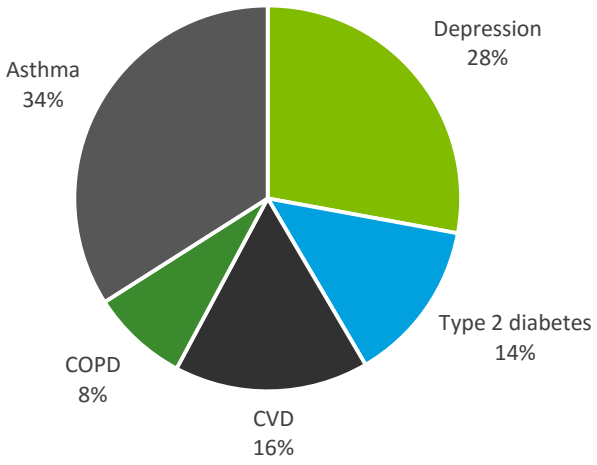
The overall benefits of accredited exercise physiologist interventions for the representative consumer were estimated to be $6,562 per person in 2016, comprised mostly of improved wellbeing ($6,234, or 95%), improved consumer productivity ($259, or 4%) and reduced health system expenditure ($69, or 1%). Costs of accredited exercise physiologist interventions were estimated to be $880, of which the consumer is expected to pay for about $623 (71%).

The benefit-cost ratio (BCR) is favourable from the consumer's perspective as costs may be borne by other payers. **It was estimated that for every $1 a consumer spends on receiving accredited exercise physiologist interventions, they would receive $10.50 in wellbeing benefits, improved consumer productivity and reduced consumer health system expenditure**.

8.1 Characteristics the representative consumer

A representative consumer was also developed for the purposes of this report. The representative consumer is a weighted average of the conditions outlined above. This person can expect to receive the weighted average benefits of all conditions. This person is most likely to have asthma, depression, or CVD as shown in Chart 8.1. It is important to note that this may not reflect the profile of clients currently seen by accredited exercise physiologists, and is only an indication as there is no adjustment for comorbidities.

Chart 8.1: Most common selected chronic conditions of a representative consumer, 2015



Source: Deloitte Access Economics calculations based on ABS (2016).
Note: not adjusted for conditions that commonly occur together (comorbidities).

The representative consumer is likely to be around 50 years old. Approximately two-thirds of representative consumers are also likely to have another chronic condition, and more than one-third would be expected to have two or more chronic conditions. This is most likely to be CVD (including hypertension), and arthritis – which may make it difficult for some people to exercise.

When comorbid conditions exist, it is likely that the net benefits of accredited exercise physiologist interventions for the consumer will be even higher than when the consumer has one chronic condition. For example, CVD may be a complication of type 2 diabetes. Deloitte Access Economics (2015) estimated that the costs of coronary heart disease, myocardial infarction or stroke could be as high as $2,733, $809 or $112 in 2015, respectively. Given that accredited exercise physiologist interventions are effective at managing both type 2 diabetes and CVD, it is likely that the value to the consumer will be higher.

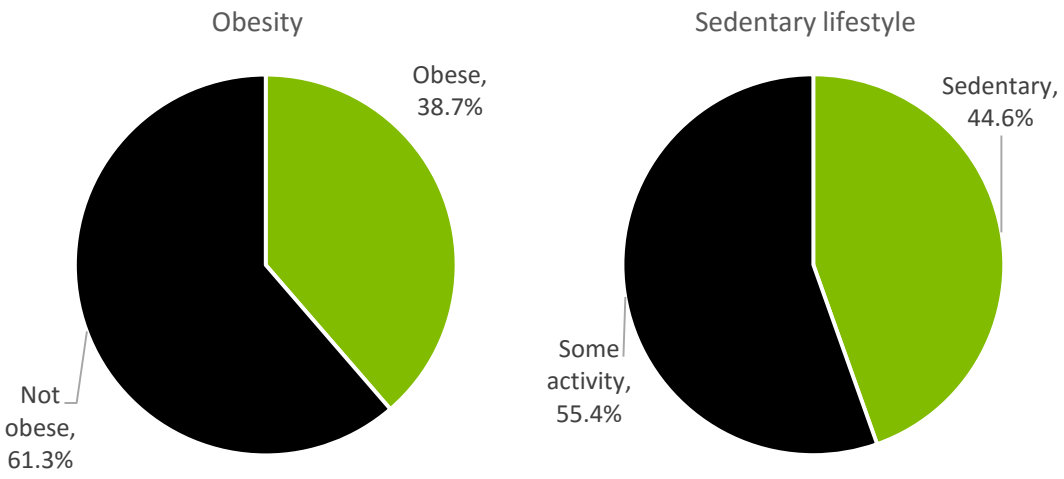
Table 8.1: Characteristics of selected conditions, Australia, 2015

Characteristics	Depression	T2D	CVD	COPD	Asthma	Avg.
No. of people (million)	2.0	1.0	1.2	0.6	2.5	-
Average age	46	64	67	58	38	50
1 other condition (%)	60%	85%	73%	90%	58%	67%
2 other conditions (%)	31%	55%	38%	70%	30%	38%
Obesity (%)	32%	54%	42%	42%	36%	39%
Sedentary lifestyle (%)	40%	53%	51%	54%	40%	45%

Source: Deloitte Access Economics analysis based on ABS (2016). T2D = type 2 diabetes.

As with the individual conditions, obesity and inactivity are key health risk factors that commonly coexist for this consumer. As shown in Chart 8.2, almost 45% of representative consumers would not report undertaking exercise for fitness, sport or recreation on a regular basis, and approximately 39% would be expected to be obese.

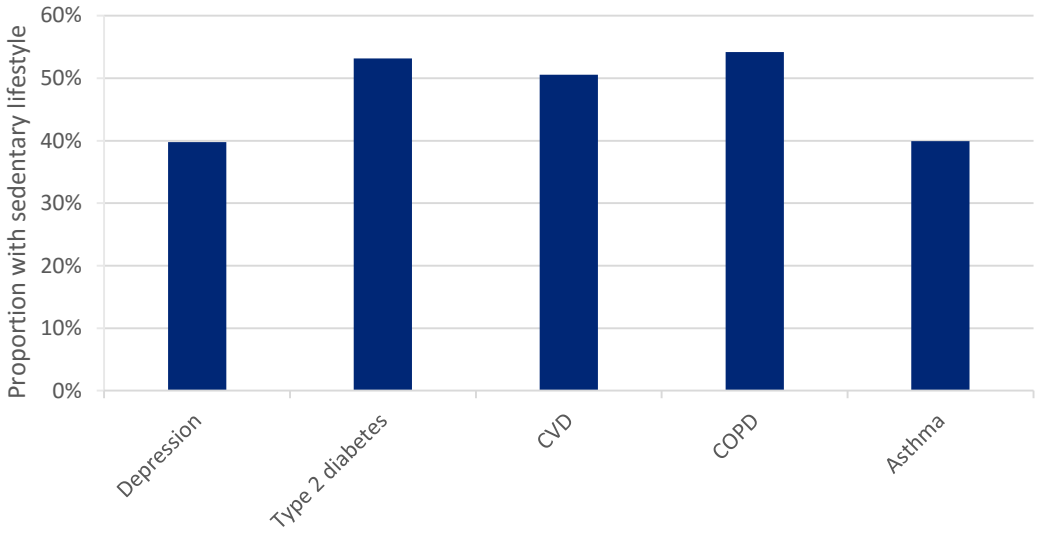
Chart 8.2: Prevalence of select health risk factors of a representative consumer, 2015



Source: Deloitte Access Economics calculations based on ABS (2016).
Note: not adjusted for conditions that commonly occur together (comorbidities).

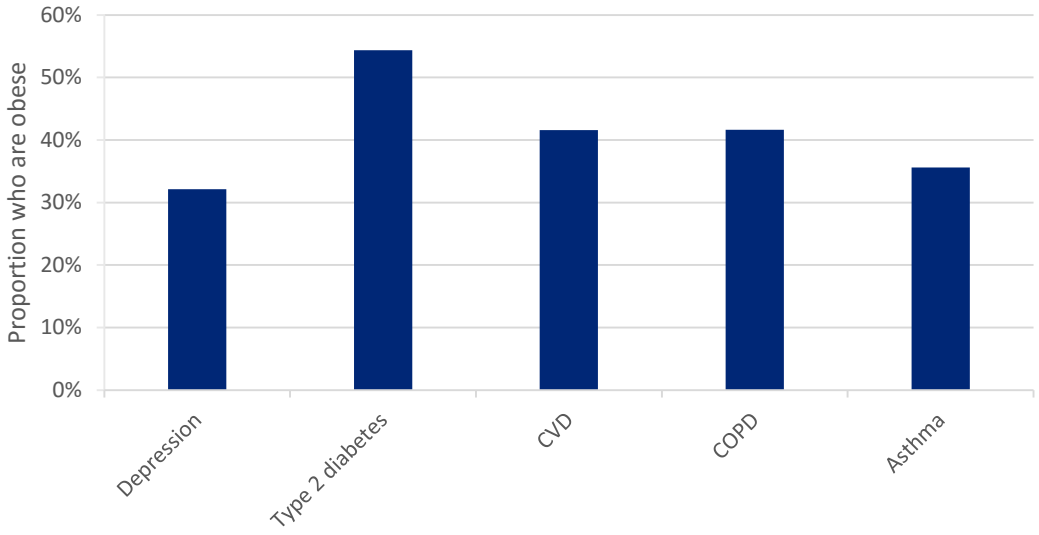
Individuals with COPD, type 2 diabetes and CVD are most likely to lead a sedentary lifestyle, with over 50% of individuals with these conditions not undertaking exercise for fitness, sport or recreation on a regular basis (see Chart 8.3). Additionally, these three conditions also make up the top three conditions likely to have the highest proportion of individuals being obese. Individuals with type 2 diabetes are significantly more likely to be obese than any other illness group (see Chart 8.4).

Chart 8.3: Prevalence of sedentary lifestyle by detailed conditions, 2015



Source: Deloitte Access Economics calculations based on ABS (2016).

Chart 8.4: Prevalence of obesity by detailed conditions, 2015



Source: Deloitte Access Economics calculations based on ABS (2016).

These factors, combined with the high prevalence of comorbidities may indicate the immense value of utilising accredited exercise physiologists. Deloitte Access Economics (2015) noted that the key benefits of accredited exercise physiologist interventions is in

understanding how best to treat each condition, and the interdependencies between the additional conditions.

8.2 Efficacy of intervention

As highlighted by Pedersen and Saltin (2015) clinical exercise interventions can be as efficacious as medical treatment, or in some cases, more effective or additional to pre-existing effects of other treatments for a range of chronic conditions.

The efficacy of accredited exercise physiologist interventions for each condition has been discussed throughout this report. **Importantly, accredited exercise physiologist interventions are expected to reduce health system expenditures and productivity losses, and improve wellbeing for all conditions covered in this report** (see Table 8.2).

Table 8.2: Effectiveness of accredited exercise physiologist interventions for selected conditions

Effectiveness	Depression	T2D	CVD	COPD	Asthma	Avg.
Health system costs	21%	71%	5%	11%	23%	25%
Productivity losses	21%	13%	5%	11%	9%	12%
Wellbeing losses	21%	23%	5%	7%	10%	14%

Source: research outlined in previous chapters. T2D = type 2 diabetes. Avg. represents the prevalence weighted average across the conditions (not adjusted for comorbidities).

8.3 Costs of illness and benefits of intervention for the representative consumer

To derive the cost of illness for the representative consumer, and the shares borne by consumers, the costs reported for each condition weighted by the prevalence of that condition in the NHS (ABS, 2016). Overall, chronic conditions for the representative consumer would be expected to incur around $3,146 in health system costs, $6,338 in productivity losses, and around $45,813 in wellbeing losses (Table 8.3).

Applying the prevalence weights to the costs borne by consumers, and then applying the average effectiveness values outlined above, **it was estimated that benefits of accredited exercise physiologist interventions would be approximately $6,562 per person in 2016**. Overall, $6,234 (95%) of the benefits derived from accredited exercise physiologist interventions are from improved wellbeing. Reduced consumer productivity losses and health system expenditure accounted for $259 (6%) and $69 (1%) of the benefits for the representative consumer, respectively.

Table 8.3: Average cost of selected conditions* and benefits of intervention to a representative consumer in Australia, per person, 2016

Cost type	Costs per person ($)	Costs borne by consumers ($)	Benefits of intervention ($)
Health system expenditure	3,146	278	69
Productivity losses	6,338	2,128	259
Wellbeing costs	45,813	45,813	6,234
Total	**55,297**	**48,218**	**6,562**

Source: Deloitte Access Economics calculations. * Selected conditions are T2D, CVD, depression, COPD, and asthma.
Note: components may not sum to totals due to rounding.

The health system expenditure borne by the representative consumer compares reasonably well with expectations – for example, the average out of pocket expenditure for Australians is approximately $1400 in 2016 (Australian Senate, 2016), higher than the $209 reported here. However, this can be explained by the relative high proportions of out of pocket expenditure which comes from dental services, other professionals and other medications (see chapter 2), which are generally not captured in the costs of these conditions.

For productivity losses, the costs borne by the consumer is a little over a week's wage, which was approximately $1,285 in 2016 for someone who is approximately 58 years old (ABS, 2016c). Finally, the wellbeing losses are approximately 16% of the total VLSY – see chapter 2.

8.4 Cost of accredited exercise physiologist interventions

To determine the cost of accredited exercise physiologist interventions, and the share borne by the representative consumer, the total costs reported in each of the other sections were weighted by the prevalence of the respective conditions (not adjusted for comorbidities). The average cost of accredited exercise physiologist interventions for the representative consumer was estimated to be $880.

Weighting across the conditions, the average amount paid for by consumers was 71%, meaning that **the representative consumer would be required to pay approximately $623 to receive the effectiveness of accredited exercise physiologist interventions outlined in this report**. So, the consumer would not expect to receive immediate financial benefits from accredited exercise physiologist interventions, although wellbeing costs greatly improve the benefits from the consumer's perspective.

8.5 Summary of benefits and costs

Overall, accredited exercise physiologist interventions have wide reaching benefits for all chronic conditions considered in this report. This includes benefits in terms of reduced consumer health system expenditure, improved consumer productivity, and improved

wellbeing. Improved wellbeing is by far the largest benefit consumers will experience – estimated to represent 95% ($6,234) of the total benefits for the consumer. Comparatively, the costs faced by the consumer are estimated to be relatively small, and as such, the net benefits ranging from around $243 through to $7,606 (Table 8.4).

This may differ depending on individual circumstances, such as current employment status for example, and only represents the average estimates.

Table 8.4: Benefits, costs and BCR of accredited exercise physiologist interventions for selected conditions

	Depres-sion	T2D	CVD	COPD	Asthma	Avg.
Consumer benefits ($)	6,025	3,197	8,293	6,889	1,075	6,562
Consumer costs ($)	559	377	687	260	832	623
Net benefit for consumer ($)	5,467	2,820	7,606	6,629	243	5,938
BCR from consumer perspective	10.8	8.5	12.1	26.5	1.3	10.5

Source: Deloitte Access Economics analysis. T2D = type 2 diabetes.

The overall benefits of accredited exercise physiologist interventions for the representative consumer was estimated to be $6,562 per person in 2016, comprised mostly of improved wellbeing ($6,234, or 93%), followed by reduced consumer productivity losses ($259, or 6%) and reduced consumer health system expenditure ($69, or 1%).

The costs of accredited exercise physiologist interventions were estimated to be $880, of which the consumer is expected to pay approximately $623 (71%).

The BCR from the perspective of the consumer is 10.5 – which represents a net benefit of $5,938 per person in 2016. **This means that for every $1 a consumer spends on engaging the services of an accredited exercise physiologist, they would receive benefits of $10.50 in improved wellbeing, greater consumer productivity, and reduced consumer health system expenditure.**

It is also worth noting that where consumers have access to other funding sources to pay for accredited exercise physiologist interventions, such as through private health insurance, pilot programs, or primary health network funding, the BCR from the perspective of the consumer may be higher than this (due to lower costs).

This indicates that accredited exercise physiologist interventions would be highly valuable for the representative consumer in Australia.

Conclusions

There is a broad move towards consumer directed care across the health, ageing and disability sectors in Australia. This has already occurred through My Aged Care and the National Disability Insurance Scheme, and private health insurance has been focusing on consumer directed care as well. Within the health sector, the flagship reform is the Health Care Homes model. Health Care Homes are a 'home base' that will coordinate the comprehensive care that patients with chronic and complex conditions need on an ongoing basis. This will support enrolled patients and their carers to be active partners in their healthcare, giving patients the knowledge, skills and support they need to make decisions about their health and keep healthy (Department of Health, 2016b).

The precise nature of the model, including the roles of accredited exercise physiologists and other allied health providers, will be determined by trials in ten Primary Health Networks across every state and territory (except the Australian Capital Territory). These trials are set to start from 1 July 2017 (Department of Health, 2016).

Given the ongoing and impending reforms towards consumer directed care across the health, ageing and disability sectors, this report provides important information for consumers to better choose which services they engage to enhance their health outcomes in a cost effective way.

Importantly, these reforms indicate that it is necessary to quantify the potential health benefits of including accredited exercise physiologists as an integral component of Health Care Homes and within other consumer directed care models for people with relevant chronic conditions.

> This report has quantified the value of accredited exercise physiologist interventions to consumers living with a chronic condition in Australia, finding large benefits from the perspective of the consumer for depression, type 2 diabetes, CVD, COPD and asthma. Given these large benefits, this report will help support better engagement of the accredited exercise physiologist workforce in Australia.

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