Economic Evaluation of the Indigenous Australians' Health Programme Phase I

28 May 2018

Report prepared for the Department of Health by

Associate Professor Andrew Dalton

Research Fellow Anita Lal

Senior Research Fellow Mohammadreza Mohebbi

Professor Rob Carter

Deakin Health Economics

Centre for Population Health Research, Faculty of Health

Deakin University

Contents

Executive Summary

The Indigenous Australians' Health Programme (IAHP) spends $800M per year on the health of Aboriginal and Torres Strait Islander people; approximately 60% funds comprehensive primary health care services. On a per capita basis, the health expenditure upon Aboriginal and Torres Strait Islander people is just over twice that of their non-Indigenous counterparts[1], yet Aboriginal and Torres Strait Islander people still carry a higher burden of ill-health. The key justification for the greater per capita expenditure on the health care of Aboriginal and Torres Strait Islander people stems from well accepted goals of equity and social justice and led to the Council of Australian Governments (COAG) commitment to the 'Closing the Gap' campaign. Nevertheless, the Australian Government Department of Health (DoH) seeks an economic appraisal of the IAHP in order to gain further insight into the program's efficiency and potential for development.

To date, Closing the Gap's health related goal of life-expectancy is not on track[2]. But there remains a consensus that whatever health care is provided, it must be culturally appropriate if the health goals are to be achieved[2]. Central to the provision of culturally appropriate health care is the primary health care provided by Aboriginal Community Controlled Health Services (ACCHSs),[3] which are therefore central to the economic appraisal.

The project brief prepared by the Department specifies two phases. Deakin University was engaged to undertake Phase 1. This first phase analysed the costs of ACCHSs, reviewed the economic literature relating to the economic performance of ACCHSs, and examined the relationship between ACCHS care and hospitalisations, in particular whether ACCHSs provide a 'return on investment' by reducing the rate of hospitalisations in Aboriginal and Torres Strait Islander communities. This paper summarises the findings from Phase I.

Phase 2 will explore the return from investment from the IAHP more broadly.

The Cost per Episode of Care for Aboriginal Community Controlled Health Services (ACCHSs)

Phase I commenced with estimating the relative costs of primary health care provided by ACCHSs compared to mainstream primary health care. In interpreting the results though, it must be recalled that the two approaches to primary health care (PHC) are very different in the care they provide. In contrast to mainstream services, the culturally appropriate health care delivered by ACCHSs adopts a holistic approach that focuses on the presenting medical conditions as well as the underlying and interrelated issues. This approach is consistent with cultural norms for Aboriginal and Torres Strait Islander communities. In meeting these needs, a patient attending an ACCHS receives comprehensive integrated care in which they could see a range of staff and receive a range of services during one 'episode' (or visit). These staff include doctors, nurses, Aboriginal health workers, allied health professionals, social and emotional wellbeing staff and drivers. It is therefore to be expected that the cost profile of ACCHSs will be different to that of mainstream services.

Dr Katherine Ong[4] developed the Indigenous Health Service Delivery (IHSD) template as part of her doctorate. The IHSD captures the significant differences in the costs of health services delivery provided by ACCHS compared to mainstream GP practice. Mixed methods were used by Dr Ong to construct this template (i.e. literature review, stakeholder discussions and key informant interviews). In Phase 1 the template has been updated with the most recent cost and service usage data. The template enables costs to be estimated by remote and non-remote areas to generate a national average cost per episode of care (per patient, per day) at an ACCHS.

To estimate the cost of an episode of care as if it had been provided through mainstream services, we used MBS fees to calculate the cost of doctors, nurses and allied health contacts. A weighted average was calculated based upon the proportions of their use, obtained from the AIHW Online Services Report, 2016[5]. The costs include an allowance for practice incentive payments paid to GPs practicing remotely. The results are shown in Table E.1. Refer to Appendix 2 for details.

Table E.1: Average cost of an episode of care at an ACCHS compared to a mainstream clinic (MBS fees applied to ACCHSs services)

	Short consultation cost assumed	Long consultation cost assumed	Average cost of consultation
Mainstream non-remote†	$117	$134	**$129**
Mainstream remote†	$142	$163	**$157**
ACCHS Non-remote	$134	$194	**$164**
ACCHS Remote††	$280	$403	**$342**
Average ACCHS††	$167	$241	**$204**

Notes:

† The IAHP grant funding enables ACCHS to provide comprehensive care with a range of services, such as dentists, drivers, population health and social and community activities, which are excluded as MBS fees for mainstream service provision do not cover these costs.

†† Assumes ACCHSs do not claim for General Practice Rural Incentives Program.

Importantly, it has been noted that the cost profile of an episode of care at ACCHSs is different to that of mainstream services. In addition to providing more culturally appropriate (holistic) care, ACCHSs devote greater resources to outreach programs than do mainstream services. The cost of the outreach programs run by ACCHSs, including patient transport, contribute significantly to the difference between the estimate of the cost of mainstream services provision of primary health care and that of remote ACCHS. Furthermore, in the absence of ACCHSs, mainstream services may not even be available in remote areas.

When the reasons for the differences in resource use are noted, it logically follows that health outcomes from ACCHSs for the Aboriginal and Torres Strait Islander communities would be different (better) as well. Strong primary healthcare systems are more comprehensive, coordinated and community-focused and result in better health outcomes for people with chronic conditions[6]. Aboriginal and Torres Strait Islander people have greater trust in the primary care provided by ACCHSs, and thus it is not surprising that in a study examining health care use, they were found to have a higher probability of visiting health professionals than non-Indigenous Australians, most likely reflecting the availability of services through ACCHSs[7]. Approaches involving Aboriginal Health Practitioners have also been shown to improve adherence to treatment. For example, higher adherence to a tuberculosis treatment was achieved at an ACCHS in Brisbane[8]. Health professionals have also suggested increased involvement of Aboriginal health workers in medication management as an adherence support strategy[9]. Thus, it is not reasonable to consider comprehensive care at ACCHSs and mainstream primary healthcare as substitutes without negative health impacts.

Cost-Effectiveness

A literature review identified several economic papers using robust methods that provide useful insights into the cost-effectiveness of health care provided by ACCHS[4, 10-13]. Their results are uniformly positive. A majority of the studies found that higher attendance at ACCHSs resulted in a

reduced likelihood of an admission to hospital. In some cases, ACCHS care was found to provide both overall cost-savings from reduced hospitalisations as well as health gains [11-13]. The limitations of these papers though were that they addressed regional populations only, and/or addressed the relationship between ACCHS care and hospitalisations for a limited range of diseases.

The Cost-Savings from Prevented Hospitalisations following ACCHS care

The relationship between ACCHS episodes of care and hospitalisations was examined in Phase 1 using statistical regression techniques to correlate the rate of episodes of care at ACCHSs to the rate of potentially preventable hospitalisations (PPH). National data for episodes of care and PPH for Aboriginal and Torres Strait Islander people were obtained through the Department. The analysis showed a modest reduction in the rate of hospitalisations was associated with ACCHSs, but that there were significant limitations in the methodological approach used. Unfortunately, the time-frame available for the data extraction and analysis meant that more reliable methods could not be pursued in Phase 1.

Importantly, the construct of conventional economic evaluation as used in the articles reviewed reflects a biomedical model approach to quantifying health gains. The context for these papers should ideally be a social model of health reflecting the holistic approach to health most valued by Aboriginal and Torres Strait Islander people. Indeed, a challenge for the development of IAHP funding policy is to resolve the tension between the conventional approach of governments that analyses the performance of non-Indigenous programs through "…demands for program budgeting, performance indicators, financial efficiency and effectiveness, strategic planning, and targeting …….ultimately assessed in terms of financial and cost-cutting dimensions…" (Khoury, p.483[3]) and the needs and preferences of the Aboriginal and Torres Strait Islander communities that the ACCHSs are endeavouring to serve.

Conclusions

The literature review found evidence of a strong correlation between ACCHS episodes of care and prevented hospitalisations, suggesting that care from ACCHSs yield savings from reduced hospitalisations. The major limitations in the published literature, however, are that they address sub-populations only, and/or do so only for a limited range of diseases. The analysis of national data for this project also found a preventative effect upon hospitalisations from ACCHS care, although the effect was much weaker in size. The major limitation of the data analysed for this project though, was that the timeframe did not allow for analysis of the effects of time-lags between primary care and reduced hospitalisations. Thus, although national and across all health-conditions, the analysis would not have captured considerable benefits flowing from ACCHSs care over time. A weak effect under these circumstances, is therefore more significant for assuming a positive correlation.

There is a temptation to conclude from our results that the lower cost of mainstream services would mean that they could provide health care to Aboriginal and Torres Strait Islander communities more efficiently. The provision of this care through mainstream services may be cheaper, but is likely to be associated with worse health outcomes due to three main factors. Firstly, mainstream services provide a less comprehensive and less integrated approach, due to the reliance on Medicare fee-for-service funding. The comprehensive integrated care model is acknowledged as the most effective approach for people with chronic conditions and complex care needs[6]. Secondly, Aboriginal and Torres Strait Islander people would face financial difficulties in accessing mainstream services, due to the higher out-of-pocket costs[14] associated with accessing these services. Aboriginal and Torres

Strait Islander are over-represented in the most disadvantaged socio-economic groups, with 37% living in the most disadvantaged decile (bottom 10%), compared with 9% of the non-Indigenous population in 2011[15]. Finally, if reliance were to be placed on mainstream services in lieu of ACCHSs, reduced attendance and adherence to treatment is highly likely, due to services that may not meet their cultural needs and expectations. If this occurred, the gap in life expectancy between Aboriginal and Torres Strait Islander people and non-Indigenous Australians, would increase rather than reduce.

PHASE I Report

Background

Aboriginal Community Controlled Health Services

Aboriginal Community Controlled Health Services (ACCHSs) play a vital role in delivering primary healthcare services to Aboriginal and Torres Strait Islander communities, offering holistic healthcare in a culturally appropriate setting[3]. ACCHSs were established in the 1970's in response to mainstream health services failing to meet the needs of Aboriginal and Torres Strait Islander peoples[22]. In contrast to mainstream general practice clinics, local Aboriginal and Torres Strait Islander communities operate ACCHSs and their care model is based on the Aboriginal concept of health, whereby the focus is not only on patients' presenting for treatment of medical conditions, but also on the interrelated underlying issues that affect the patients' social emotional and cultural wellbeing[3]. Often primary health care (PHC) is provided alongside health education and health promotion. The benefits of ACCHSs should be considered not only in terms of the health benefits, but also the broader social benefits to the Aboriginal community that are not necessarily captured in monetary terms. Not only do ACCHSs improve the health of Aboriginal people directly, they undertake community development and address some of the social determinants of health that indirectly support health gains[22].

ACCHSs offer comprehensive integrated primary healthcare with an emphasis on team-based care that requires a range of health professionals and services. The IAHP PHC grant funding to ACCHSs allows the flexibility of a salary system for health professionals. This has advantages over mainstream reliance solely on fee-for-service remuneration by encouraging preventative efforts by General Practitioners (GPs) as well as encouraging health teams[23]. These teams both release physicians from performing easier tasks and allow them to refer patients to health care professionals who are more qualified to offer certain services[23]. This is in contrast to mainstream clinics whereby the Medicare fee-for-service payment system for GPs may inhibit teamwork in primary care or task delegation, particularly between other health-care professionals such as nurses. Under the fee-for-service system there is also an incentive to see more patients and recommend follow-up appointments, rather than provide long consultations to patients with multiple health conditions. The more flexible funding system for ACCHSs, which combines both Medicare and grant funding, also enables them to respond better to the growing need for providing better models of co-ordinated care, resulting in better treatment for patients.

Contribution of ACCHSs to improving health

Because ACCHS are culturally attuned to the medical, social and cultural needs of Aboriginal people, they treat Indigenous people more effectively[3]. Internationally, community control of health services has been shown to contribute to improved health and wellbeing of individuals and communities. In a Canadian study of First Nation community controlled health services, decreasing hospitalisations rates were reported each year following the signature of an agreement increasing local autonomy over resource allocation, when compared to shared responsibility or government control [24].

ACCHSs directly contribute to improving Aboriginal health by increasing Aboriginal peoples' access to quality primary health care. Government reports suggest that in 2014-15 ACCHSs delivered health services to approximately 49% of the Aboriginal and Torres Strait Islander population. These numbers vary by state, for example, in Victoria 70% of the Aboriginal population regularly accessed ACCHSs [25]. In 2015-16 there were 204 organisations providing primary health care to the Aboriginal and Torres Strait Islander community, with 33% located in very remote areas, 23% in outer regional areas, 21% in inner regional areas, 10% in remote areas and 10% in major cities [5]. One third of services are located in very remote areas, in locations without access to mainstream services [5]. The problem of attracting doctors to mainstream services in rural areas has long been recognised in Australia and is a relatively intractable issue. Thus the distributional bias of ACCHSs towards remote and very remote areas shows the important role they have in providing access to modern health services in these areas. Thirty-seven areas with poor accessibility to services have been identified by the AIHW [26] and an absence of ACCHSs would further increase this inequity of access.

Evaluations of ACCHS programs show increases in service utilisation as a result of these programs[27] and improved health outcomes. For example, antenatal programs have led to improved antenatal attendances for Aboriginal women and their babies and improvements in perinatal health outcomes. ACCHSs have been effective in increasing Aboriginal peoples' access to other areas of primary health care, including cancer and chronic disease prevention and mental health services, and this has also been associated with improved care and health outcomes[28]. The ACCHS setting is integral to improving access and studies consistently describe ACCHSs as being familiar and welcoming with trusted staff and ways of delivering care[27].

Differences in rates of utilisation of ACCHSs have an impact on treatment adherence rates, which in turn impacts on health outcomes. When the treatment is delivered by an ACCHS, possibly due to targeted services, there are increased treatment adherence rates. For example, in 2013 rates of pneumococcal vaccination among Indigenous people aged 15 and over were 16% higher in very remote areas compared to major cities[29].

By advocating on behalf of Aboriginal and Torres Strait Islander communities, ACCHSs have contributed significantly to health policy. Specific examples include the success of Central Australian Aboriginal Congress in advocating for alcohol restrictions in Alice Springs Communities and greater regulation of licensed venues in the Northern Territory [30]. The regulations have resulted in reductions in alcohol-related assaults and decreases in presentations to primary care organisations and hospitals for alcohol-related conditions[27]. By addressing the social determinants of health through employment, ACCHSs contribute to improving Aboriginal health. The Aboriginal community controlled health sector itself is the largest employer of Aboriginal people in Australia [31] and contributes to broadening the skills of the Aboriginal and Torres Strait Islander workforce through providing training pathways in a range of management, administrative and health careers.

Previous work on the 'Dimensions of Benefit for Indigenous Health' as part of the ACE-Prevention project identified factors important to the Aboriginal and Torres Strait Islander community that are core benefits of ACCHSs, but are not captured by traditional health economics methods[32]. These included: i) individual health gain, comprising empowerment of the individual, emotional and spiritual wellbeing; ii) community health gain, comprising community control and community skills to solve problems; and iii) cultural security, characterised by affirming Aboriginal culture to enhance perceived access, utilisation and adherence.

The importance of equity in economic analysis for disadvantaged groups

It is clear that Aboriginal and Torres Strait Islander people are a special needs group deserving immediate priority on human rights, social justice and concern and equity grounds. Equity can be defined in many ways, including in terms of 'access' to health services, with the objective to achieve 'equitable access for unequal need'. Equity weights have been proposed to incorporate equity into economic evaluations of interventions for disadvantaged groups. Ong et al use the Aboriginal population as an illustrative case study [33]. The magnitude of the equity weight is constructed using the ratio of the costs of providing specific interventions via Indigenous primary health care services compared with the costs of the same interventions delivered via mainstream services. Applying this weight to the costs of subsequent interventions deflates the costs of provision via Indigenous health services. For example, if the cost of providing the intervention via an ACCHS is double that of a mainstream clinic, a cost-effectiveness analysis would take this into account by deflating the cost by half. This makes comparisons with mainstream more equitable when applied during economic evaluation [33].

Another approach proposed is to integrate efficiency and equity by weighting the health gains in a cost-effectiveness analysis of the disadvantaged group. These weights can quantitatively express the extent to which society is willing to trade overall health benefits to promote a more equitable distribution of health. A study by Lal et al[34] derived equity weights for socioeconomically disadvantaged groups using two methods. Firstly, preference-based weights were derived using a discrete choice experiment survey (n = 710). Respondents chose between two programs with varying gains in life expectancy going to a low or high income group. The results demonstrated that people are willing to make trade-offs between efficiency and equity and that health gains are valued differently, depending on which socioeconomic group receives the gain. Weights derived ranged from 1.3-1.8. The second method of deriving weights used burden of disease and mortality data by Socio-Economic Indexes for Areas (SEIFA) Index quintiles from the Australian Institute of Health and Welfare. Ratios were calculated based on comparisons of Quintile 1 (lowest) to the total Australian population, and Quintile 1 to Quintile 5 (highest). Weights derived ranged from 1.2-1.5.

The weights derived could be used to aid decision-makers and stakeholders to explore alternative value judgments around equity. If a program is not cost-effective yet improves equity, the weights could help decision-makers decide the level of concern for equity required for the program to be considered value-for-money. This could be particularly important for remote areas where service delivery can be expensive and the burden of disease is 3 times as high for Indigenous Australians compared to non-Indigenous Australians [17]. As an example of how this could be applied in practice, a program for Aboriginal people in remote areas with an incremental cost-effectiveness ratio of $150,000/QALY, could be reduced to $50,000/QALY if an equity weight of 3 was applied. Consideration could be given to using equity weights in Phase 2 of the project, providing a quantifiable measure that encourages equity concerns to be considered in a consistent, explicit and transparent way [33] .

Costing of Primary Health Care (PHC) delivered by ACCHSs versus GP Mainstream Clinics

The ACCHSs emphasis on a holistic approach means emphasis is not only on the physical, but also on the social, emotional and cultural wellbeing of the patient. Client contacts with teams is therefore integral to their approach, such that a patient could see a range of staff in one visit, including doctors, nurses, Aboriginal health workers (AHW), allied health professionals, social and emotional wellbeing staff and drivers. The aim of Phase I, Activity 2 was to quantify the differences in costs of primary health care delivered to the Aboriginal population via ACCHSs, compared to mainstream GP-based services. The differences in costs were identified and calculated for remote and non-remote areas, as well as nationally.

Previous studies have costed ACCHSs using different methodologies, resulting in different estimates of costs. In a top-down approach, cost components are valued by separating out the relevant costs from comprehensive sources (e.g. annual accounts), resulting in average unit costs[35]. The top-down approach was used by McRae et al using capital costs (with no explicit definition) and staffing costs for the year. Pottinger et al [36] also used a top-down approach, reporting an average expense per contact (rather than per episode) by area of remoteness, however costs of particular contacts are not provided.

In bottom-up approaches to costing, cost components are valued by identifying average resource use provided directly to a patient. This approach is often more accurate, as it captures more comprehensively the resources used in providing a particular service. The Indigenous Health Service Delivery (IHSD) template by Ong et al was used as the basis of costing health care delivered by ACCHSs, using a mix of top-down and bottom-up approaches[4]. The IHSD template was produced as part of the NHMRC-funded ACE-Prevention project, with the aim of costing the difference in health care delivered by ACCHSs compared to mainstream services. Resource allocation decisions that rely on mainstream evidence that is not representative of delivering services to the Aboriginal population, can result in inequitable funding decisions. The IHSD template allows for mainstream health interventions to be adapted to Aboriginal settings. Data collected for the template was initially based on a search of the literature. Further information and validation for the methods was sought from the ACE-Prevention Indigenous Steering Committee, which was chaired by Mick Gooda and consisted of academics and policy makers with expertise in Aboriginal health[4]. Key informant interviews were also conducted with ACCHS staff. Sixteen staff occupying various roles were interviewed to assess how well the IHSD template reflected real life work practices. The questionnaire was designed to validate the IHSD Template derived from the literature and obtain quantitative estimates of certain parameters that were not found elsewhere.

The IHSD template used a framework of components that described how health interventions delivered from ACCHSs differ from those delivered from mainstream GP services. Health service definitions were taken from the National Aboriginal Health Strategy for ACCHSs and the Royal Australian College of General Practitioners for GP services[4].

The IHSD template components are grouped into five broad categories:

1. Basic health intervention delivery characteristics:
    - Role substitution – a patient may be seen by an Aboriginal Health Worker or a nurse in as well as, or instead of, a doctor
    - Compliance management – e.g. medication dosing

- Staff training activities – e.g. cultural in addition to professional training for non-Indigenous staff
- Emphasis on home visits
- Seeing of other family members as part of routine consultations

2. Population health, social and community activities

    - Social work, counselling
    - Pharmacy, financial and housing assistance
    - Health promotion and community development
    - Provision of community space

3. Management and governance structures

    - Presence of a community management board
    - Additional management resources for larger staff numbers

4. Patient transport services

5. Provision of services to a large remote population

    - Out of hours emergency care
    - Housing and relocation costs
    - Outreach services

Template Updates

The original template used 2003 costs that were updated in this study to 2016, where possible. Where an update to a cost was not found, it was inflated using the Health Price index 2014-15 and linear trends in Microsoft Excel 2016 to interpolate to 2017 prices [37]. Specific updates using new sources included wages for AHWs [38], nurses[39] , allied health workers[40], manager/CEO[41], MBS items Level B and C, home visits [42]and service activity [5]. The results of this cost-update of the IHSD template are given in **Table 2**.

Mainstream Cost of Delivery of Primary Health Care

An alternative estimate of what the cost of an ACCHS episode of care would be was also developed by estimating what the cost would be if the mix of services (items) provided in an average episode of care at an ACCHS were valued using MBS fees for those items.

It is important to note that the AIHW defines client contacts in ACCHSs as the number of individual contacts made with each client by each health worker, including those providing transport [5]. Episodes of care on the other hand are defined as 'all contact[s] between an individual client and one or more health workers within a calendar day'.[5] In order to estimate the cost of an episode of care when the resource components are valued at MBS fees, the AIHW definition of an episode needed to be adjusted by omitting dentists and drivers from the costs, as these services do not attract an MBS fee. Also excluded from the costs are: i) population health, social and community activities; ii) management and governance structures; and iii) the provision of service to a large remote population that are included in the costs of an episode of care at an ACCHS.

From an economic perspective[1], the full cost of the resources for medical services may be best estimated by calculating the actual fee paid by clients – the Schedule Fee plus any above fee component charged by medical practitioners. As this paper reports the analysis of the cost of ACCHSs to government, a government financial perspective is more appropriate for the purposes of this project. The estimates provided are therefore based upon the actual MBS fees that apply to each of the resources. Included in the financial estimates is also an allowance for the cost of practice incentive payments (PIP) for remoteness made under the General Practice Rural Incentives Program (refer to Appendix 2 for details of methods).[43]

To estimate the average mix of services comprising an ACCHS episode of care, AIHW data was used to obtain the number of contacts by each of the relevant health professional categories; namely doctors, medical specialists, and all other staff (excluding dentists and drivers). The number of contacts within each of these categories was divided by total episodes for ACCHS data to estimate the average contacts per episode.[5] The average contacts per episode were found to be:

- 0.49 doctor contacts per episode;
- 0.02 medical specialist contacts per episode, and;
- 1.73 all other staff (excluding dentists and driver) contacts per episode.

The MBS fees that would apply to each of the three categories of health professional resources were derived from review of the MBS schedule. Consultations with a GP may be either standard consultations (MBS Item 23) or long consultations (MBS Item 36). Data for the average duration of attendances with a doctor at ACCHSs were identified from the literature.[44] Although the generalisability of the results was not clear as the results were taken from one centre in northern QLD, the proportion of standard and long consultations were very similar to those observed for mainstream services at 29% and 71% respectively (Australian Government Department of Health, 2018 #52). The MBS fees were applied to the ACCHS health professional categories as shown in Table 1.

Added to the MBS equivalent cost of the services provided by ACCHSs was an allowance for Practice Incentive Payments (PIP) made under the General Practice Rural Incentives Program. This scheme was developed to compensate GPs for the additional cost of practicing remotely. For this study, the adjustment to costs was made by applying the General Practice Rural Incentives Program loadings to the distribution of Australia's GPs by remoteness category (major cities, inner regional, outer regional, remote or very remote).[45] Eligibility for the loadings relates to the provision of a range of primary health care services and the payments vary in accordance with the degree of remoteness determined by Rural, Remote and Metropolitan Areas Classification (RRMA). The loadings paid range from 15% (RRMA3 for large rural centres) to 50% (RRMA7 for 'other remote areas').[43] Assuming all mainstream practices claim entitlements for these PIPs, the weighted average loading was applied to the IHSD updated template estimates (for further explanation of the methods used, refer to Appendix 2).

[1] This is based on the economic notion of 'opportunity cost', which is usually estimated from what transpires in the market place, adjusted where necessary (i.e. 'shadow-priced') for distortions.

Table 1: MBS items used to cost mainstream services

ACCHS Contact	MBS Description	MBS item	MBS Fee ($)
Doctor	Standard consultation with General Practitioner ≤20 mins (level B)	23	37.05
	Long consultation with General Practitioner (Level C), >20 minutes	36	71.70
Medical Specialist	Specialist, referred consultation - surgery or hospital	104	85.55
All Other Staff†	Follow-up allied health services for people of Aboriginal or Torres Strait Islander Descent	81300-81360	62.25
	Allied health Service for Chronic disease management provided (includes Aboriginal and Torres Strait Islander Health Practitioner, Aboriginal health worker, Diabetes Educator etc.)	10950-10951	62.25

Notes:
† MBS fees for allied health services are generally the same at $62.25 per service. The specific items listed in the table are illustrative only.

The results shown in **Table 3** represent the estimated cost an average ACCHS episode of care when services are valued at mainstream unit costs (MBS fees) and allow for the impact of PIP payments for remoteness.

Costing ACCHS vs Mainstream Care: Results

Costs of mainstream delivery of primary health care

Based on the MBS item costs for Aboriginal and Torres Strait islander people, the national average cost of delivery of primary health care in a mainstream clinic is $129 (using a weighted average of standard and long consultation fees). If only the fee for standard consultations (MBS Item 23) is applied, the estimate would be $117, but increases to $134 if the fee is for long consultations (MBS Item 36) is assumed to apply.

It is again important to note that these estimates do not include the cost of drivers and transport, which are a key feature of the service of ACCHSs, particularly for those in remote and very remote locations, as well as the other components of the services provided by ACCHSs that are not listed on the MBS (refer **Table 2**).

Costs of primary health care in ACCHSs (IHSD Template)

This section provides results of analyses described above for:

- The cost of an average episode of care at an ACCHS when using updated costs for the IHSD Template;[4] and

- The cost of an average episode of care at an ACCHS when services provided are valued at MBS fees, and including an allowance for the cost of PIP incentives for remoteness.

If costs are analysed using the IHSD template, the breakdown of the average cost categories for an episode of care are as detailed in Table 2. The largest cost is the basic health intervention delivery component, which varies from $79.60 to $153.80, depending on the length of the consultation. Patient transport is also a large proportion of the cost.

Table 2: Average cost per ACCHS episode (using updated IHSD Template costs)

Component	Cost
Basic health intervention delivery characteristic (depending on consult length)	$79.60—$153.80†
Population health, social and community activities	$21.60
Management and governance structures	$1.70
Patient transport services	$58.60
Provision of services to remote population	$5.90

Notes:
† Total costs associated with this range are: $167 - $242.

Total average costs of a primary care episode at an ACCHS are shown in Table 3 by remoteness and length of consultation. The estimated costs of short consultations in non-remote areas are similar to long consultations in mainstream clinics. The higher costs of episodes of care in ACCHSs can be explained by longer consultations, because of the more comprehensive nature of care provided in ACCHSs, but also by the absence of any co-payments charged by mainstream providers beyond the Schedule Fee (that is, the result assumes the Schedule Fee is used not the actual fee paid).

The MBS items approach also cannot reflect all the components of an episode of care in ACCHSs, and the more complex health needs of Aboriginal and Torres Strait Islander people. For example, transport to remote consultations are a large proportion of the cost and estimated to be $108 in remote areas. This provides improved access but contributes to the higher costs of ACCHSs in remote areas. Approximately 80% of mainstream GP services in Australia are in urban areas. Allowance for PIP claims under the General Practice Rural Incentives Program by mainstream services located in the 19.6% of GPs outside metropolitan areas, adds a further $24.56 to average cost of a mainstream episode of care.

Table 3: Average cost of an episode of care at an ACCHS compared to a mainstream clinic (MBS fees applied to ACCHSs services)

	Short consultation cost	Long consultation cost	Average cost of consultation
Mainstream non-remote††	$117	$134	**$129**
Mainstream remote††	$142	$163	**$157**
ACCHS Non-remote	$134	$194	**$164**
ACCHS Remote†	$280	$403	**$342**
Average ACCHS†	$167	$241	**$204**

Notes:

† Assumes ACCHSs do not claim for the General Practice Rural Incentives Program

†† The IAHP grant funding enables ACCHS to provide comprehensive care with a range of services, such as dental, drivers, population health, social and community activities, which are excluded as MBS fees for mainstream service provision do not cover these costs

Return on Investment of Potentially Preventable Hospitalisations

Introduction to Potentially Preventable Hospitalisations

Potentially Preventable Hospitalisations (PPHs) are those hospitalisations considered potentially able to be prevented through timely and accessible, quality primary and community-based care. Measures of these hospitalisations are used in Australia and internationally as a high-level health system performance indicator [46]. PPHs can be used as a measure of the performance of primary health and other out-of-hospital care, as the admission may have been avoided with the provision of optimal care in the community.

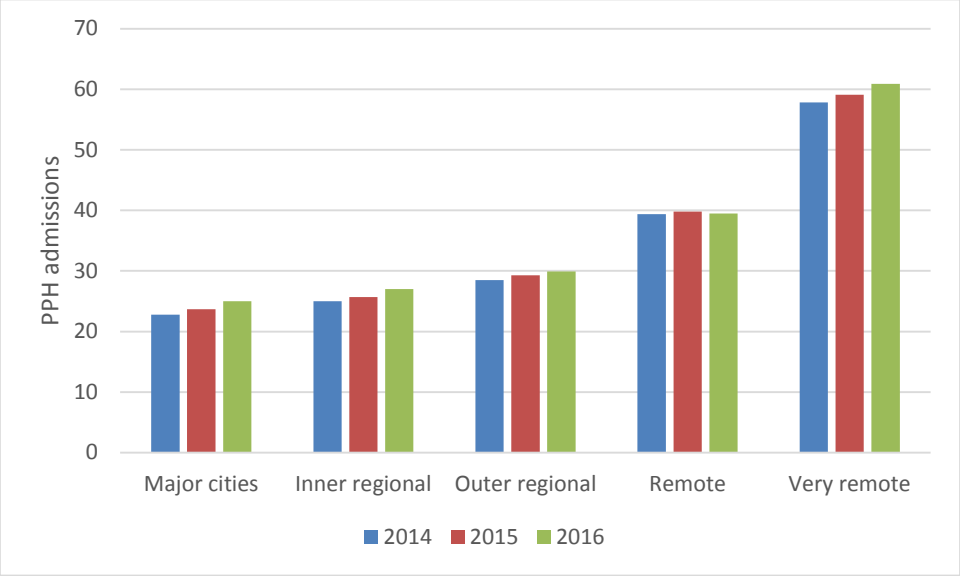
In Australia, PPH data is available for three broad categories [46]:

- Chronic conditions: These conditions may be preventable through lifestyle change, but can also be managed effectively through timely care (usually non-hospital), to prevent deterioration and hospitalisation. This category includes conditions such as congestive cardiac failure, diabetes complications, chronic obstructive pulmonary disease (COPD) and angina.
- Acute conditions: These conditions may not be preventable, but theoretically would not result in hospitalisation if timely and adequate care (usually non-hospital), was received. This category includes conditions such as urinary tract infections, cellulitis, dental conditions and ear nose and throat infections.
- Vaccine preventable conditions: These conditions may be preventable through vaccination. This category includes conditions such as influenza, measles, diphtheria and hepatitis B.

The rates of PPHs for Aboriginal and Torres Strait Islander people are reported to be substantially higher compared to non-Indigenous Australians[47]. In 2011 to 2013, PPH rates for chronic conditions were five times higher for Aboriginal and Torres Strait Islander people compared to rates for non-Indigenous Australians. Chronic conditions accounted for 56% of PPHs, acute conditions accounted for 41% and vaccine-preventable conditions accounted for 4% of admissions. Rates of PPHs were three times higher for Aboriginal and Torres Strait Islander people, with rates 7.3 times higher in remote areas, 3.5 times higher in very remote areas, 2.8 times higher in outer regional areas, 2.7 times higher in major cities and 2.1 times higher in inner regional areas. This may indicate gaps in the provision of primary health care in the community, especially in remote areas, as well as a higher prevalence of the underlying conditions[47].

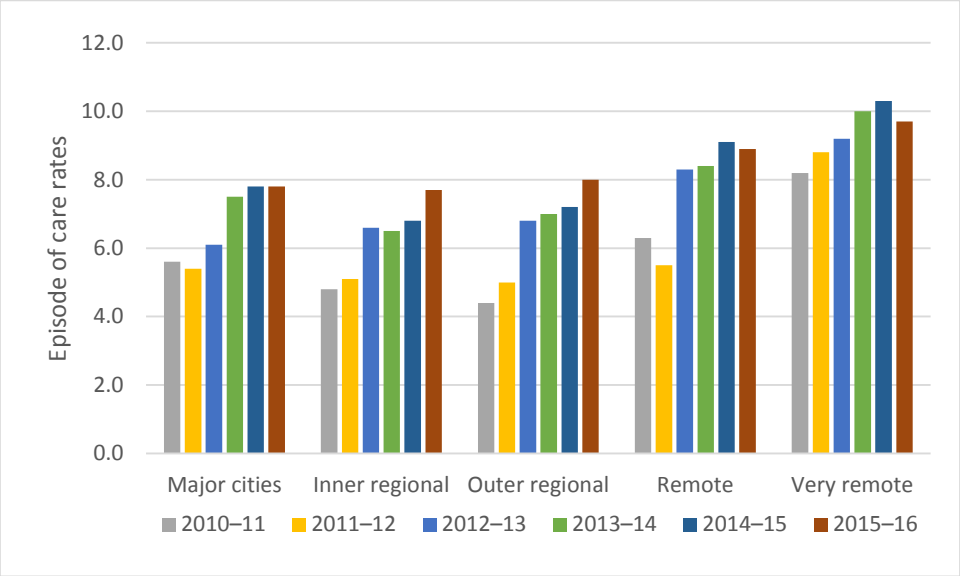
When comparing the rates of PPHs by areas of remoteness in 2013-14 to 2015-2016, they appear to have increased slightly each year, but remain steady in remote areas[48], [49] (Figure 1). Figure 2 shows that primary health care episodes have risen over the period 2010-11 to 2015-16 and this rate of primary health care episodes has coincided with an increase in PPHs overall for Aboriginal Australians[15]. The results though are subject to some confounding, as the data collection does not reliably record remote patients' place of residence correctly when they were admitted to hospitals in urban centres distant from their residence. Furthermore, subsequent to the data analysis, Deakin was informed that the Communicare system used by a proportion of ACCHSs (69/136) incorrectly recorded a higher number of episodes in 2015-16. As the data errors only related to the final year, however, the error is not likely to impact significantly upon the interpretation of results reported here for Phase 1 of this study.

Figure 1: Potentially preventable hospitalisations for Aboriginal and Torres Strait Islanders by area of remoteness 2011 to 2015



Source: *AIHW Tables 4.24[48], 4.23[49]*

Figure 2: Rate of primary health-care episodes of care in ACCHSs by remoteness area, 2010-2011 to 2015–16



Source: *AIHW[50]; Table S3.37*

The aim of this research is to estimate the cost savings from avoided hospital costs associated with ACCHSs, as measured by rates of episodes of care. This analysis will focus on evaluating the cost-savings of primary health care activities for Aboriginal Australians measured by the changes (reductions) in rates of PPHs.

Return on Investment ('ROI') Methods

The cost-offsets (savings) from avoided hospital costs would normally be estimated from a formal study designed specifically to determine the effect size (namely the number of avoided

hospitalisations) through technically robust methods. ACCHSs were established due to the failure of mainstream services to meet the needs of Aboriginal people in urban and rural areas. In the primary health program that has operated in various forms since the 1970's, it is more difficult to determine the effect of ACCHSs upon the rate of hospitalisations, as evidence for counterfactual outcomes does not exist.

Therefore, the effect was inferred from the observed correlation between ACCHS primary health care episodes of care rates and the rates of hospitalisation. The assumptions needed are similar to the implicit assumptions of Thomson et al., [51]who analysed the relationship between primary health care utilisation and hospital admissions in a cohort of Aboriginal Australians with diabetes. The implicit assumptions of this approach are that the contribution of the social determinants of health are all assumed to have no independent contribution to reduced hospitalisations.

PPH admissions and ACCHSs episodes of care in 2010-11 to 2015-16 were obtained by the Department from the Australian Institute of Health and Welfare.[2] Separate data sets for: i) all PPH admissions; and ii) PPH admissions excluding chronic disease categories not amenable to secondary prevention or substitution (i.e. Angina, Bronchiectasis, Nutritional Deficiencies, and Rheumatic heart disease), were used for this analysis. Population figures for Aboriginal and Torres Strait Islander people were sourced from the 2011 Census data[52] and ABS projections[53]. Where data were not available, projections were based on 2011 Census population numbers. A danger of analysing national data is 'ecological bias' (where the assumption is made that a population average has a simple interpretation when considering likelihoods for an individual and takes no account of the variation within the national sample). To provide more reliable and informative results, ACCHS episode of care data and PPH data were obtained by remoteness area (major cities, inner regional, outer regional, remote and very remote), further stratified by State/Territory and gender.

Estimates of the average cost of PPH per admission were based on two methods from the Department of Health report 'Paying for Value' [54], updated to 2017 dollars based on the AIHW price inflator and linear trend projections to 2017. The first method applied the percentage of PPH from total hospital costs (6.4%) in 2015-16 to total hospital expenditure in 2015-16. This was divided by the number of PPH hospitalisations to obtain a 'cost per PPH admission'. The second method used the National Efficient Price (NEP) and the National Weighted Activity Unit (NWAU) determined by the Independent Hospital Pricing Authority (Pricing Authority). The NEP is based on the average cost of an admitted acute episode of care provided in public hospitals during a financial year. Each episode of patient care is allocated a National Weighted Activity Unit (NWAU). The 'average' hospital service is worth one NWAU.The NEP was $3,595 inflated to 2017 prices. Costs per day were calculated based on the average length of stay of a PPH admission of 4 days[55] .

Regression analysis was used to correlate the rates of ACCHS episodes of care to the rates of PPH. Poisson regression modelling[3] is used to model the aggregated rates of hospitalisation. Numbers of hospitalisations (total, chronic) per gender, States and Territories, and area of remoteness, offset by relevant Indigenous population numbers have been used as the outcome. The models have been adjusted for gender, States and Territories, and area of remoteness to estimate the association

[2] AIHW have advised that data prior to 2009-10 should not be used due to differences in data recording that occurred.

[3] Poisson regression modelling is a type of generalised linear modelling. The Poisson distribution is applicable to this analysis as: i) the event is something that can be counted in whole numbers; and ii) occurrences are independent, so that one occurrence neither diminishes nor increases the chance of another.

between the number of episodes of care (exposure) and hospitalisation rates. Risk ratio (RR) and 95% confidence intervals are reported. A two-sided type I error of 0.05 was used in all analyses.

Average cost savings from PPH associated with ACCHSs episodes of care were calculated as per the formula:

$$S_{PPH} = (Episode\ of\ care_{\$A}) - (Pr_{PPH} \times PPH_{\$A}) - (Productivity)$$

Where:

S_{PPH} = Savings from PPH avoided

$Episode\ of\ care_{\$A}$ = Total average costs of episodes of care

Pr_{PPH} = the probability of a PPH

$PPH_{\$A}$ = the average cost of a PPH

$Productivity$ = *productivity cost avoided*

Total costs of episodes of care were obtained by multiplying the total number of episodes of care by the cost of an average episode.

Productivity was valued for short term absenteeism costs using the Human capital approach (HCA)[56]. The human capital approach measures lost productivity as the amount of time working life is reduced due to illness. The value of work time lost is the market rate. The average weekly income of $542 Aboriginal and Torres Strait Islander people was obtained from the AIHW [57] and converted to a daily rate. Labour force participation rates and unemployment rates were obtained from the ABS[58]. The productivity costs were based on the average length of stay of a PPH admission of 4 days[4].

'ROI' Results

Lost productivity costs saved were valued at $48.90 per day.

From the statistical analysis, the risk ratios and the probability of potentially avoidable hospitalisations for each area of remoteness are detailed in Table 4. The probabilities are all less than 1%, apart from outer regional areas with a probability of 1.27%. The Inner Regional and Remote areas by contrast suggest that PPHs in these areas actually increase with ACCHS episodes of care. The finding for these two areas is hard to interpret, given the effect is very small, indeed close to neutral, and that stronger positive effects apply to all other regions.

[4] Some COI studies estimating productivity effects, also include an additional time period out-of-hospital for recovery – sometimes this goes as high as 3 days recovery time for each day in hospital. Adopting this methodology would increase the potential savings estimate for PPHs.

Table 4: Risk ratios and probability of avoided PPHs by area of remoteness

	Regression			Probability of PPH avoided		
	risk ratio	95% CI			95% CI	
Overall	0.9973	0.9972	0.9974	0.27%	0.28%	0.26%
Major city	0.9984	0.9981	0.9988	0.16%	0.19%	0.12%
Inner regional	0.9997	0.9993	1.0001	0.03%	0.07%	-0.01%
Outer regional	0.9873	0.9870	0.9876	1.27%	1.30%	1.24%
Remote	1.0002	0.9999	1.0004	-0.02%	0.01%	-0.04%
Very remote	0.9991	0.9989	0.9993	0.09%	0.11%	0.07%

Notes: CI = confidence interval.

The results of the cost savings in PPH admissions avoided associated with episodes of care are detailed in Table 5. The two methods of valuing hospital costs give wide variations in the hospital costs saved. When all PPH admissions are included and hospital costs are valued as a percentage of total expenditure at $6,614 per admission, cost savings are the highest. Savings are lowest when hospital costs are valued based on the National Efficient Price (NEP).

Table 5: Total costs of episodes of care and cost savings from PPH admissions

	All potentially preventable hospitalisations		Potentially preventable hospitalisations with exclusions for non-amenable conditions	
	Hospital costs as percentage of total expenditure	Hospital costs valued as NEP	Hospital costs as percentage of total expenditure	Hospital costs valued as NEP
Episodes of Care	$938,419,919	$938,419,919	$938,419,919	$938,419,919
Hospital cost savings	-$84,478,404	-$48,949,486	-$79,822,585	-$46,251,756
Productivity savings	-$2,344,438	-$2,344,438	-$2,215,230	-$2,215,230
Balance	$851,597,077	$887,125,995	$856,382,103	$889,952,932

Notes: NEP: national efficient price.

As usually occurs with the analysis of large and complex issues, limitations apply to the analysis.

- Time limitations for the report meant that it was not possible to obtain retrospective data for individual patients as was done in other reports[12, 13, 59]. These data would have enabled direct correlation between the rates of attendance at ACCHS and the subsequent rates of hospitalisation. The use of population data as performed for this study meant that it was not possible to exclude those Aboriginal and Torres Strait Islander patients who attended mainstream services and became hospitalised. The effect of ACCHS in preventing hospitalisations was therefore confounded to the extent the data are 'contaminated' by mainstream attendances[60], which may be up to 50%. Consideration is being given to

conducting a case-study with one or more ACCHSs that would assist in addressing this limitation.

- Cross sectional population data by year, as this analysis was constrained to, cannot capture lagged effects beyond 12 months, whereas the benefits, particularly from preventive care, can endure for years and even decades. An advantage of the individual patient level data approach is that it can overcome the problem of time lags between the episode of care and subsequent hospitalisation/s.

- Related to the previous limitation is that the set of hospitalisations that form the set of all potentially preventable hospitalisations does not have a time dimension. That is, many of these hospitalisations may not be avoidable within the same year as that in which the episode of care occurred, and therefore will be missed in the data used for this analysis.

- It is well known that the important social determinants of health include education, housing and income - factors that many health professionals and administrators do not regard as being directly related to health, but which are central to improving Aboriginal and Torres Strait Islander health outcomes and therefore to the work of ACCHS. It was not possible to include these important determinants of health in the explanatory variables of our regressions, but the effect of these in terms of the fiscal multiplier that applies could be explored in Phase 2 of the study.

Aboriginal and Torres Strait Islander Health Disadvantage.

There are significant health inequities between Aboriginal and Torres Strait Islander people and non-Indigenous Australians. Overall, the burden of disease for Aboriginal and Torres Strait Islander people is 2.3 times as high as non-Indigenous Australians[16]. In remote areas the burden is 3 times as high[17]. The likelihood of Aboriginal and Torres Strait Islander people dying early is 2.7 times as high as non-Indigenous Australians. Chronic diseases caused 70% of the gap in disease burden between Aboriginal and Torres Strait Islander peoples and non-Indigenous Australians, with the largest causes of the gap being cardiovascular diseases (19%), mental and substance use disorders (14%), injuries including suicide & self-inflicted injuries (14%) respiratory diseases, such as asthma and other breathing problems (10%), cancer (9%), with diabetes and other endocrine diseases (7%). In terms of risks to health, tobacco was the largest cause of the health gap (23%), followed by excessive weight (14%) and high blood sugar (9%).

The social determinants of health, namely daily living circumstances, including income, education, employment and social support, are a strong influence on a person's chance of leading a healthy life[18, 19]. Aboriginal and Torres Strait Islander peoples' health has been affected by colonisation and the subsequent lack of employment and educational opportunities, by impoverished living conditions,[3] as well as other factors such as racism, discrimination, cultural dislocation, and remoteness[20]. These determinants are shaped by political, social and economic forces. Analysis by the AIHW revealed that 34.4% of the gap in health outcomes between Aboriginal and Torres Strait Islander people and non-Indigenous Australians is due to social determinants, but the issue is complex. A recent study of Northern Territory found that socioeconomic status alone accounted for 30%-50% of the gap in life-expectancy[21]. It has been asserted that "The main explanation for this abysmal health profile [inequality] is that it reflects Indigenous socioeconomic disadvantage and exclusion from the resources and opportunities available to other members of Australian society"[3]. In short, improving the broader social, economic and cultural determinants of health outcomes for Aboriginal and Torres Strait Islander peoples is essential as their health problems are not solved by health care alone. However, effective primary healthcare is vital for screening, early diagnosis and

prevention of chronic diseases, which are in turn crucial to reducing the burden of disease and illness requiring treatment.

Conclusions

The literature review found a number of studies that did not use robust methods such that the interpretation of results from an economic perspective were limited[61-63]. Those studies that were well designed provided evidence of a strong correlation between ACCHS episodes of care and prevented hospitalisations, suggesting that care from ACCHSs produce savings from reduced hospitalisations[4, 10, 12, 13]. The major limitations in these more rigorous publications, were that they addressed sub-populations only, and only for a limited range of diseases. The analysis of national data for this project also found a preventative effect upon hospitalisations from ACCHS care, although the effect was much weaker in size. The major limitation of the data analysed for this project was that the time-frame did not allow for analysis of the effects of time-lags between primary care and reduced hospitalisations. Thus, although national and across all health-conditions, the analysis would not have captured considerable benefits flowing from ACCHS care over time.

From our study of the estimated cost of an ACCHS episode of care, if delivered through mainstream services, there is a temptation to conclude that the lower cost of mainstream services means mainstream delivery of primary health care (PHC) to Aboriginal and Torres Strait Islander communities would be more efficient. It must be noted though that the two approaches to PHC are very different in the care they provide. More comprehensive, coordinated and community focused primary healthcare has been shown to result in better health outcomes for people with chronic conditions[6] - a major contributor to the burden of disease. In contrast to mainstream services, the culturally appropriate health care delivered by ACCHSs adopts a holistic approach that focuses on the presenting medical conditions, but also on the underlying and interrelated issues. This approach is consistent with cultural norms for Aboriginal and Torres Strait Islander communities. In meeting these needs, a patient could see a range of staff in the course of one 'episode' (or visit) to an ACCHS. These staff include doctors, nurses, Aboriginal health workers, dentists, allied health professionals, social and emotional wellbeing staff and drivers, that would not all be covered under a Medicare fee-for-service system. It is therefore to be expected that the cost profile of ACCHSs will be different to that of mainstream services.

The provision of care through mainstream services may be cheaper on a per episode basis, but the evidence strongly suggests that it is likely to be associated with worse health outcomes, due to the strong preferences of Aboriginal and Torres Strait Islander communities to attend ACCHSs, the lack of access to mainstream services in remote areas, and the higher rates of co-payment in mainstream services[14]. Finally, if reliance were to be placed upon mainstream services in lieu of ACCHSs, reduced attendance and adherence to treatment is highly likely, such that the gap in life-expectancy between Aboriginal and Torres Strait Islander people and non-Indigenous Australians would increase rather than decrease. Thus it is not reasonable to consider these two approaches as substitutes.

The key justification for the greater per capita expenditure on the health care of Aboriginal and Torres Strait Islander people stems from well accepted principles of social justice, leading to the Council of Australian Governments (COAG) commitment to 'Closing the Gap'.

References

1. Steering Committee Productivity Commission. 2014 Indigenous Expenditure Report. Canberra; 2014.
2. Commonwealth of Australia. Closing the Gap Prime Minister's Report 2018.
3. Khoury P. Beyond the Biomedical Paradigm: The Formation and Development of Indigenous Community-Controlled Health Organizations in Australia. Int J Health Serv. 2015;45(3):471-94.
4. Ong KS, Carter R, Kelaher M, Anderson I. Differences in primary health care delivery to Australia's Indigenous population: a template for use in economic evaluations. BMC Health Serv Res. 2012;12:307.
5. Australian Institute of Health and Welfare. Aboriginal and Torres Strait Islander health organisations: Online Services Report—key results 2015–16. Aboriginal and Torres Strait Islander health services report no. 8. Cat. no. IHW 180. Canberra: AIHW; 2017.
6. Swerissen H, Duckett S, Wright J. Chronic failure in primary medical care. Grattan Institute; 2016.
7. Whelan S, Wright DJ. Health services use and lifestyle choices of Indigenous and non-Indigenous Australians. Soc Sci Med. 2013;84:1-12.
8. Jeremy R, Tonkin A, White H, Riddell T, Brieger D, Walsh W, et al. Improving cardiovascular care for indigenous populations. Heart, lung & circulation. 2010;19(5-6):344-50.
9. de Dassel JL, Ralph AP, Cass A. A systematic review of adherence in Indigenous Australians: an opportunity to improve chronic condition management. BMC Health Services Research. 2017;17:845.
10. Beaver C, Zhao Y. Investment analysis of the Aboriginal and Torres Strait Islander Primary Health Care Program in the Northern Territory. OATSIH, Commonwealth of Australia,; 2004.
11. Vos T, Carter R, Barendregt J, Mihalopoulos C, Veerman L, Magnus A, et al. Assessing Cost-Effectiveness in Prevention (ACE–Prevention): Final Report. Melbourne: University of Queensland, Brisbane and Deakin University, Melbourne; 2010.
12. Thomas SL. The cost-effectiveness of primary care for Indigenous Australians with diabetes living in remote Northern Territory communities. Med J Aust. 2014;201(8):450.
13. Zhao Y, Thomas SL, Guthridge SL, Wakerman J. Better health outcomes at lower costs: the benefits of primary care utilisation for chronic disease management in remote Indigenous communities in Australia's Northern Territory. BMC Health Serv Res. 2014;14:463.
14. Cuesta-Briand B, Saggers S, McManus A. 'It still leaves me sixty dollars out of pocket': experiences of diabetes medical care among low-income earners in Perth. Aust J Prim Health. 2014;20(2):143-50.
15. Australian Institute of Health and Welfare. Aboriginal and Torres Strait Islander Health Performance Framework 2017, Online data tables. Canberra: AIHW; 2017.
16. Australian Institute of Health and Welfare. Australian Burden of Disease Study: Impact and causes of illness and death in Aboriginal and Torres Strait Islander people 2011. Australian Burden of Disease Study series no. 6. Canberra: AIHW; 2016.
17. Australian Institute of Health and Welfare. Supplementary data tables.. Australian Burden of Disease Study: Impact and causes of illness and death in Aboriginal and Torres Strait Islander people 2011. Australian Burden of Disease Study series no. 6. Canberra: AIHW; 2016.
18. Marmot M, Ryff CD, Bumpass LL, Shipley M, Marks JS. Social inequalities in health: next questions and converging evidence. Soc Sci Med. 1997;44(6):901-10.
19. Wilkinson R, Marmot M. The social determinants of health: the solid facts. Copenhagen, Denmark: World Health Organisation; 2003.
20. Dwyer J, Silburn K, Wilson G. National Strategies for Improving Indigenous Health and Health Care: Consultant Report No. 1. Canberra: La Trobe University; 2003.
21. Zhao Y, Wright J, Begg S, Guthridge S. Decomposing Indigenous life expectancy gap by risk factors: a life table analysis. Popul Health Metr. 2013;11(1):1.

22. Campbell MA, Hunt J, Scrimgeour DJ, Davey M, Jones V. Contribution of Aboriginal Community-Controlled Health Services to improving Aboriginal health: an evidence review. Aust Health Rev. 2017;7(10).
23. Collier R. Shift toward capitation in Ontario. Canadian Medical Association Journal. 2009;181(10):668.
24. Lavoie JG, Forget El Fau - Prakash T, Prakash T Fau - Dahl M, Dahl M Fau - Martens P, Martens P Fau - O'Neil JD, O'Neil JD. Have investments in on-reserve health services and initiatives promoting community control improved First Nations' health in Manitoba? (1873-5347 (Electronic)).
25. Adams K, Halacas C, Cincotta M, Pesich C. Mental health and Victorian Aboriginal people: what can data mining tell us? Aust J Prim Health. 2014;20(4):350-5. doi: 10.1071/PY14036.
26. Australian Institute of Health and Welfare. Australia's health 2016. Canberra: AIHW; 2016.
27. Aboriginal Health & Medical Research Council. Aboriginal communities improving Aboriginal health: An evidence review on the contribution of Aboriginal Community Controlled Health Services to improving Aboriginal health. Sydney: AH&MRC.; 2015.
28. Lavoie JG, Forget EL, Prakash T, Dahl M, Martens P, O'Neil JD. Have investments in on-reserve health services and initiatives promoting community control improved First Nations' health in Manitoba? Social Science & Medicine. 2010;71(4):717-24.
29. Australian Institute of Health and Welfare. The health and welfare of Australia's Aboriginal and Torres Strait Islander peoples. Canberra: AIHW; 2015.
30. Hogan E, Boffa J, Rosewarne C, Bell S, Chee DA. What price do we pay to prevent alcohol-related harms in Aboriginal communities? The Alice Springs trial of liquor licensing restrictions. Drug Alcohol Rev. 2006;25(3):207-12. doi: 10.1080/09595230600644665.
31. Alford K. Investing in Aboriginal community controlled health makes economic sense. Canberra: NACCHO; 2014.
32. Otim ME, Kelaher M, Anderson IP, Doran CM. Priority setting in Indigenous health: assessing priority setting process and criteria that should guide the health system to improve Indigenous Australian health. International Journal for Equity in Health. 2014;13(45).
33. Ong KS, Kelaher M, Anderson I, Carter R. A cost-based equity weight for use in the economic evaluation of primary health care interventions: case study of the Australian Indigenous population. Int J Equity Health. 2009;8:34.
34. Lal A. Equity weights for socioeconomic position: two methods -– using surveys of stated preferences and using epidemiological data Melbourne: Deakin University; 2017.
35. Tan SS, Rutten FFH, van Ineveld BM, Redekop WK, Hakkaart-van Roijen L. Comparing methodologies for the cost estimation of hospital services. The European Journal of Health Economics. 2009;10(1):39-45.
36. Pottinger. Development of a Cost Index. Sydney: Department of Health; 2015.
37. Australian Institute of Health and Welfare. Health expenditure Australia 2014–15. Canberra, Australia AIHW; 2016.
38. Fair Work Commission. Aboriginal Community Controlled Health Services Award 2010 Canberra: Fair Work Ombudsman; 2017 [cited 9 August 2017]. Available from: http://awardviewer.fwo.gov.au/award/show/MA000115#P269_27744
39. Fair Work Commission. Nurses Award 2010 Canberra: FWC; 2015 [cited 4 December, 2017].
40. Industrial Relations Commission of New South Wales. NSW Health Service Health Professional (State) award 2017. NSW: IRCNSW; 2017.
41. Australian Industrial Relations Commission. AP843641 - Health, Community Services and Ambulance - Management and Administrative Staff (Public Sector - Victoria) Award 2005. Canberra: AIRC; 2008 [cited Dec 5, 2017]. Available from: http://www.airc.gov.au/Awardmod/fullbench/industries/awardmodlist.cfm?award=ambos
42. Australian Government Department of Health. Medicare Benefits Schedule Book Category 1. Canberra Commonwealth of Australia; 2016.

43. Department of Human Services. Practice Incentives Program Guidelines; Rural Loading Incentive,. https://wwwhumanservicesgovau/organisations/health-professionals/services/medicare/practice-incentives-program?utm_id=92018.
44. Larkins SL, Geia LK, Panaretto KS. Consultations in general practice and at an Aboriginal community controlled health service: do they differ? Rural Remote Health. 2006;6(3):560.
45. Department of Health. Report on the Audit of Health Workforce in Rural and Regional Australia,. http://wwwhealthgovau/internet/publications/publishingnsf/Content/work-res-ruraud-toc~work-res-ruraud-2~work-res-ruraud-2-3~work-res-ruraud-2-3-med~work-res-ruraud-2-3-med-gen2008.
46. Falster M, Jorm L. A guide to the potentially preventable hospitalisations indicator in Australia. Sydney: Centre for Big Data Research in Health, University of New South Wales in consultation with Australian Commission on Safety and Quality in Health Care and Australian Institute of Health and Welfare; 2017.
47. Australian Institute of Health and Welfare. Aboriginal and Torres Strait Islander Health Performance Framework 2014. Canberra: AIHW; 2015.
48. Australian Institute of Health and Welfare. Admitted patient care 2015–16: Australian hospital statistics Canberra: AIHW; 2017.
49. Australian Institute of Health and Welfare. Admitted patient care 2014–15: Australian hospital statistics Canberra: AIHW; 2016.
50. Australian Institute of Health and Welfare. Aboriginal and Torres Strait Islander health organisations: Online Services Report—key results 2015–16. Canberra: AIHW; 2017.
51. Thomas S, Zhao, Yuejen, Guthridge, Steven, Wakeman, John. The cost effectiveness of primary care for Indigenous Australians with diabetes living in remote Northern Territory communities. Medical Journal of Australia. 2014:200(11):658-62.
52. Australian Bureau of Statistics. Estimates of Aboriginal and Torres Strait Islander Australians. Table 1 Estimated resident Aboriginal and Torres Strait Islander population, States and territories, Remoteness Areas–5-year age groups (to 75 and over)–30 June 2011. Canberra: ABS; 2013.
53. Australian Bureau of Statistics. 3238.0 Estimates and Projections, Aboriginal and Torres Strait Islander Australians, 2001 to 2026. Canberra: ABS; 2011.
54. Department of Health. Paying for Value. Canberra: Australian Government; 2016.
55. Australian Institute of Health and Welfare. Rate of potentially preventable hospitalisation per 100,000 people, age-standardised, Australia. Canberra: AIHW; 2017.
56. Liljas B. How to calculate indirect costs in economic evaluations. Pharmacoeconomics. 1998;13(1 Pt 1):1-7.
57. Australian Institute of Health and Welfare. Aboriginal and Torres Strait Islander Health Performance Framework Canberra: AIHW; 2017 [cited 6 November, 2017]. Available from: https://www.aihw.gov.au/reports/indigenous-health-welfare/health-performance-framework/contents/tier-2/income-measure-2-08
58. Australian Bureau of Statistics. 2011 Census of Population and Housing: Characteristics of Aboriginal and Torres Strait Islander Australians Canberra: AIHW; 2013.
59. Zhao Y, Malyon R. Cost drivers of remote clinics: remoteness and population size. Aust Health Rev. 2010;34(1):101-5.
60. Australian Institute of Health and Welfare. Healthy Futures - Aboriginal Community Controlled Health Services: Report Card. Canberra AIHW; 2016.
61. Alford K. Investing in Aboriginal Community Controlled Health Makes Economic Sense. In: Organisation NACCH, editor. NACCHO Aboriginal Community Controlled Health Organisation Press Club: National Aboriginal Community Controlled Health Organisation; 2014.
62. Alford KA. Indigenous health expenditure deficits obscured in Closing the Gap reports. Med J Aust. 2015;203(10):403-3 e1.
63. Econtech Pty Ltd. Costings Models for Aboriginal and Torres Strait Islander Health Services,. In: Department of Health and Ageing, editor. Canberra2004.

Appendix 1: Literature Review

This overview of the Primary Health Care literature relating to Aboriginal and Torres Strait Islander peoples reviewed for the evaluation of the IAHP is divided into four sections. The first section provides some background information that is relevant to the interpretations of this report. The remaining three sections comprise those papers that have addressed either: i) costs; ii) outcomes; or iii) both costs and outcomes to provide a full economic evaluation reporting the cost-effectiveness of health care provided through ACCHSs.

A1. Background

Before reviewing the literature relevant to the economic performance of Primary Health Care (PHC) for the Aboriginal and Torres Strait Islander population, it is first important to consider the framework or terms of reference. The conventional or Western concept of "health" gains derive from the biomedical model; a Western system of medical diagnosis that addresses solely physiological factors, excluding the possible effects of cultural health or social factors. It fosters the theory that cultural health and social factors bear no influence on biological diseases. The biomedical view of health gains concept is still applied today [1-7] even though the social model of health adopted by Aboriginal and Torres Strait Islander people is quite different and relates to a much more holistic view of health as described in the main body of this report. The NACCHO has described the concept as:

"…… *not just the physical well-being of an individual but refers to the social, emotional, and cultural well-being of the whole Community in which each individual is able to achieve their full potential as a human being thereby bringing about the total well-being of their Community. It is a whole of life view and includes the cyclical concept of life-death-life.*"[8]

This difference in the concept of benefit has been noted upon by a number of the papers in this review [9-14], but is well explained in the paper by Khoury [12], describing the history and rationale for ACCHSs. A number of anecdotes are used to describe background of alienation and exclusion that led to the formation of ACCHSs over 40 years ago, but a key point is that the poor health status of Indigenous people emerges from the social and material conditions of their existence and not from their "race," biology, or culture.

Davy [7] makes a similar argument and claims that Indigenous health care services may provide the best opportunity to address access, because they are in a better position to address the types of social and cultural determinants of health faced by Indigenous communities. In contrast, mainstream services are generally set up to cater for the dominant, often non-Indigenous cultures, and may not have the resources required to respond to the needs of others. Mainstream services also tend to operate within a set of socially constructed values and norms that can at times be at odds with Indigenous communities' beliefs and values – the delivery of mainstream services being predominantly influenced by the biomedical model rather than a more holistic sense of health adopted by many Indigenous peoples

Anikeeva [15] analysed the results of Australian government funding for Aboriginal and Torres Strait Islander health project officers and outreach workers employed within Divisions of General Practice. The aim of the initiative as to support primary health care providers in managing the unique health needs of their local Indigenous population and to improve collaboration between mainstream and

Indigenous health services. The Divisions identified a range of problems that Indigenous Australians encountered when accessing mainstream primary care, including:

- financial barriers;
- transport issues; and
- the lack of cultural sensitivity.

A2 Costs

Australia has obligations to Aboriginal and Torres Strait Islander people under the International Covenant on Economic, Social and Cultural Rights and the right to health. Couzos [16] reported that overall spending per person on health services was only 18 % higher for Aboriginal and Torres Strait Islander peoples than non-Indigenous Australians, but of relevance to this study is that nearly half of this expenditure was for use of hospital services, which Couzos [16] argued was a reflection of Aboriginal peoples' poor access to primary health care causing otherwise preventable admissions. They concluded that equity in health between Aboriginal and Torres Strait Islander people and non-Indigenous Australians is achievable, but not until the shortfall in health services expenditure for Aboriginal and Torres Strait Islander people is addressed.

A number of papers have analysed the costs of PHC for Aboriginal and Torres Strait Islander people. Some of these may incorrectly be interpreted as full economic analyses, as their conclusions include funding recommendations [2, 6, 10, 17].

Silburn [18] reported concerns about the overburden of compliance reporting experienced by members of the Victorian Aboriginal Community Controlled Health Organisation. A further consequence of reporting against different funding streams is that client data are not captured and are not reported in a way that enables service providers or governments to gain a useful understanding of the overall needs of clients and families.

McRae [19] endeavoured to develop a simplified regional service planning model to assist the Department with the allocation of growth funding for Indigenous primary care services. The basis of the allocation model though is that funds would be allocated to meet "need", which would be multiplied by a cost index that reflects the cost per unit of some measure of activity. However, allocation according to "need" is recognised by modern health care funding policy as antiquated with the preferred analytical framework being funding according to health outcomes derived from that funding (i.e. cost-effectiveness). Funding according to need usually has little correlation to funding according to health outcomes. Of interest though are the cost estimates per contact (as distinct from per episode). These were reported as:

- Major cities: services with 50,000 contacts per year cost around **$180 per contact;**
- Inner regional areas: services with 50,000 contacts per year cost around **$200 per contact;**
- Outer regional: services with 50,000 contacts per year cost around **$150 per contact;**
- Remote: services with 50,000 contacts per year cost around **$200 per contact;** and
- Very remote: services with 50,000 contacts per year cost around **$200 per contact.**

McRae concluded that a top down modelling approach is in principle the optimal way to derive the required index, although the reasons for this were not evident from the material available.

The study by Zhao [20] analysed expenditure related to primary health care delivery (personnel and operational) for three fiscal years, 2004–05 to 2006–07, from a range of different funding sources, provided to 56 remote health centres. When evaluated in per capita terms, the trends differed. The

average per capita expenditure tended to increase with increasing remoteness. This result is similar to that reported by McRae [19], who also found a slight increase in costs for remoteness. The relationship between average per capita expenditure and population was, however, more complex, with expenditure initially very high for the lowest scale of population, declining as population increased, then rising again for the largest communities. Zhao et al concluded that the small upward slope of the backward J-curve may suggest that scale inefficiencies occur in clinics servicing larger populations.

Econtech [2] were engaged by the Department to contribute to the development of funding policy. They analysed cost data from ACCHSs and mainstream services and noted that Aboriginal and Torres Strait Islander people have lower utilisation rates of mainstream health services compared to the general population, despite having poorer health status. The purpose of their report was given as answering two questions:

1. What would have to be spent on primary health services for Indigenous Australians (not distinguishing between general and Indigenous-specific health services) to provide per capita expenditure relative to non-Indigenous Australians that reflected relative morbidities? This is a relative needs or population benchmark approach. It is essentially based on equity/ distributive epidemiology reasoning.

2. What would have to be spent on Indigenous-specific primary health services for Indigenous Australians to provide them with universal access to Indigenous-specific programs? Again this is an equity rationale that focuses on supply side or resource requirements approach. Equity objectives usually focus on minimising disparities in health status, utilisation of services, or access to services. Note that choosing one of these equity objectives (access) may mean trade-offs in achieving the others (utilisation, health status).

Econtech estimated from an analysis of AIHW data for overall public health spending that $2,518 per capita was spent on meeting the health needs of non-Indigenous Australians in 1998–99, whereas meeting the health needs of Aboriginal and Torres Strait Islander people was estimated to cost $5,575 (or some 2.21 times as much as non-Indigenous Australians). It was then assumed that all components of this expenditure would have the same 2.21 ratio, including relative expenditure on PHC.

The Econtech conclusions though are subjective. There is no empirical evidence to support the assumption that PHC has the same 2.21 ratio as the average of overall expenditure, and more importantly, the assumption that doubling the expenditure will double the health outcomes has little foundation in economics. At the risk of oversimplifying supply-side economics, the relationship between fixed costs/variable costs and short-term/long term analysis often focuses on diminishing returns to scale, not constant returns to scale.

There is mixed evidence about the relative use of mainstream services by Aboriginal and Torres Strait Islander people, despite their greater burden of death, disease and disability. Angell [6] analysed Medicare expenditure to explore relative use and its predictors in a cohort of Aboriginal and Torres Strait Islander people and non-Indigenous Australians. Average MBS expenditure was lower per capita for Aboriginal and Torres Strait Islander people relative to other participants. Aboriginal and Torres Strait Islander individuals living in remote areas had lower MBS expenditure ($932 per year $P < 0.001$) than other individuals. MBS expenditure was found to increase for: i) those aged over 65 years ($128, $p = 0.013$); ii) being female ($472, $p = 0.003$); iii) lower baseline reported quality of life ($102 per 0.1 decrement of utility $p = 0.004$); and iv) a history of diabetes ($324, $p = 0.001$), gout

($631, p = 0.022), chronic obstructive pulmonary disease ($469, p = 0.019) and established CVD, whether receiving guideline-recommended treatment prior to the trial ($452, p = 0.005) or not ($483, p = 0.04). When controlling for all other characteristics, morbidly obese patients had lower MBS expenditure than other individuals (-$887, p = 0.002). However, once demographic and risk-related factors were controlled for there was no significant difference in the MBS expenditure of Aboriginal and Torres Strait Islander people and non-Indigenous participants. For Aboriginal and Torres Strait Islander individuals living in non-remote locations, other factors were more important in determining their care than their indigeneity. This suggests that this cohort of high-risk individuals were receiving care equivalent to their non-Indigenous counterparts with similar risk levels.

The findings suggest that for the majority of participants, once individuals are engaged with a primary care provider, factors other than whether they are Indigenous determine the level of Medicare expenditure for each person. Generalisation of the results though are limited by the study being restricted to only people at high risk of cardiovascular disease. Furthermore, the distribution of the study participants differed from the general Aboriginal and Torres Strait Islander population, with 67% of participants being from urban areas, 12% from regional areas and 21% from remote areas.

Cuesta-Briand [21] explored the impact of Aboriginal and Torres Strait Islander status and socioeconomic disadvantage on the experience of diabetes care in the primary health setting. The overall aim of the study was to explore the impact of socioeconomic disadvantage on the management of diabetes. Their analysis suggested that Aboriginal and Torres Strait Islander people and socioeconomically disadvantaged people tailor their health care seeking behaviour to the limitations imposed by their income and disadvantaged circumstances. ACCHS clients reported seeing their GP regularly, monthly or as often as once a week for the management of their diabetes. Their accounts suggested that they had ready access to clinical services, however cost was commonly reported as a barrier to accessing health care services other than the GP, and participants highlighted the difficulty in facing upfront payments, and the resulting out-of-pocket expenses derived from Medicare's limited reimbursement. Finally, transport costs were also reported as a barrier to accessing health care services; these included public transport fares, petrol costs and parking fees. The results though were derived from focus group interviews and not quantified.

A3 Outcomes

The most comprehensive approach to estimating health outcomes identified for this review was found in the AIHW report of 2009[22]. In this study the results of the 2004–05 National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) were used by the AIHW, the NACCHO and the ABS who worked collaboratively to develop measures of social and emotional wellbeing for the Aboriginal and Torres Strait Islander people.

The concept of social and emotional wellbeing used in the report was based on the Australian Aboriginal view of health. This view recognises that achieving optimal conditions for health and wellbeing requires a holistic and whole-of-life view of health that encompasses the social, emotional and cultural wellbeing of the whole community. It includes mental health, but also considers the impact of other factors on emotional wellbeing, such as life stressors, removal from family, discrimination and cultural identification. The interim module has eight domains—psychological distress, impact of psychological distress, positive wellbeing, anger, life stressors, discrimination, cultural identification and removal from natural family. Key findings from the 2004–05 NATSIHS were:

- Over one-quarter (27%) of Aboriginal and Torres Strait Islander adults reported high or very high levels of psychological distress.
- Aboriginal and Torres Strait Islander Australians were twice as likely to report high or very high levels of psychological distress as non-Indigenous Australians.
- Almost 1 in 10 Indigenous Australians had visited a doctor or health professional in the 4 weeks prior to interview due to feelings of psychological distress.
- In relation to life stressors, 4 in 10 Indigenous adults indicated that they or their family or friends had experienced the death of a family member or close friend in the previous year, 28% reported serious illness or disability and 20% reported alcohol related problems.

It was also reported that:

- Over half of Aboriginal and Torres Strait Islander adults reported feeling calm and peaceful (51%) and/or full of life (55%) all or most of the time.
- Nearly three-quarters (71%) reported being happy in the last 4 weeks. Other data sources also indicated that Aboriginal and Torres Strait Islanders have poorer social and emotional wellbeing than non-Indigenous Australians.
- The rate of community mental health service contacts for Indigenous people was more than twice that for non-Indigenous people.
- Aboriginal and Torres Strait Islander people were twice as likely to be hospitalised for intentional self-harm as non-Indigenous people.

The report provides a 'dashboard' of results that reflect the high burden of illness experienced by the Aboriginal and Torres Strait Islander people. In economic evaluation, however, outcomes are usually expressed in a single index. Incremental cost-effectiveness ratios (ICERs) are either expressed as cost per physical outcome (cost-effectiveness analysis using clinical outcomes), cost per quality adjusted life year (cost-utility analysis), or as a net return in dollars (cost-benefit analysis). The use of a common metric (such as dollars or QALYs/DALYs) allows comparison across disparate interventions and the application of a decision rule (e.g. cost per QALY < $50,000 interpreted as being a cost-effective intervention).

Forms of economic analysis that try to capture broader dimensions of benefit either: i) add description of these effects to the ICER result (e.g. cost-consequences analysis); ii) construct a purpose-specific benefit measure (e.g. PBMA; Options Appraisal); iii) weight the ICER for chosen additional factors (e.g. equity, severity); or iv) use cost-benefit analysis to put a dollar value on a broad range of outcomes.

Further complicating the benefit measurement side, is the plethora of quality of life measures that cover both clinical and economic instruments, often developed for different purposes. Mapping between them is often possible, but requires thoughtful and rigorous methods. SF-36 scores[22], for example, have been mapped to economic instruments, such as the AQoL. Mapping between the NATSIHS results and QALY/DALY would be very complex. Development of an Indigenous concept of health instrument that drew on this data might be a better way to go. Work on such an instrument was started in the context of the ACE-Prevention study[14], but not completed.

The only other papers identified that concerned outcomes alone, tended to be papers that examined the effects of specific interventions, such as risk factor reduction (smoking cessation,

alcohol reduction etc.), where outcomes were measured as surrogate outcomes or more commonly expressed in qualitative terms[3, 23, 24].

A4 Economic analysis/Cost-Effectiveness

Alford [10, 17]claimed to be the first health economics studies of ACCHSs and related resource and funding issues in Australia. However, the reports are actually a study of relative expenditure and relative burden of disease. The information derived is not evaluated in a systematic way that analyses the interaction between costs and outcomes to determine value-for-money and thus does not provide reliable estimates of cost-effectiveness. Alford [17] stated the dual focus was:

- The assessment and evaluation of the economic (as well as health) value derived from the ACCHS sector, and any additional cross-sector benefits, including in employment, economic independence and education; and
- The assessment and evaluation of government policy and expenditure on ACCHSs, and on Aboriginal and Torres Strait Islander health more generally.

The author[17] observed that Aboriginal and Torres Strait Islander Australians do not access health services to the level expected given their health status. It was claimed that this was for two main reasons: i) an inadequate supply of comprehensive Aboriginal primary health care services; and ii) an inequitable share of mainstream programs.

Alford[17] argued that since 51% to 61% of Australia's Aboriginal population visit Aboriginal primary health care and ACCHSs annually, the potential for a well-resourced Aboriginal primary health care sector to directly address determinants of the health gap is substantial. Alford[17] added that mainstream primary health care services were not working well for Aboriginal people, with unmet health and wellbeing needs and poor access to mainstream primary care/preventive health services resulting in a higher burden of disease, avoidable mortality and poorer quality of life than for non-Aboriginal Australians. High levels of avoidable admissions and avoidable deaths primarily also reflect inadequacies in the provision of primary health care.

The author's logic was that since:

> *"Aboriginal and Torres Strait Islander people comprise 3% of the population and, on the most conservative basis, have a relative need of at least twice that of the rest of the population because of much higher levels of illness, so ought to be receiving approximately 6% of funding for mainstream programs, a level rarely, if ever achieved" (p.7, Alford 2014).*

As with the Econtech paper, this is essentially an equity/distributive epidemiology rationale, rather than a health economics rationale. The relationship between resources made available and health improvements (i.e. 'efficiency') is an empirical issue that can vary substantively from context to context. There is no evidence to support a simplistic assumption in this setting of constant returns to scale; indeed if anything, there is evidence to suggest the assumption is invalid.

Points in the report that are relevant to note include those relating to continuing barriers to access, which include:

- 12% of Aboriginal Australians on average defer GP visits for more than a year because of costs, more than twice the rate of the total population.
- Gaps in access to early detection and early treatment services. Examples include lower proportions of older Aboriginal Australians having annual health assessments and Aboriginal women participating in breast screening, compared with their non-Aboriginal counterparts.

- Disproportionately high "potentially avoidable GP-type presentations" to hospital casualty/outpatients, particularly in major cities and inner regional areas - 1 in 6-7 compared with less than 1 in 10 for other Australians.
- Five times higher rates of potentially preventable hospitalisations across all jurisdictions and seven times higher hospitalisation rates for potentially preventable chronic conditions.
- Potentially preventable hospital admissions (excluding those for dialysis) account for 26% of all hospital admissions. *"Avoidable hospitalisations are an important indicator of effective and timely access to primary care, and provide a summary measure of health gains from primary care interventions". It should be noted though that this estimate is significantly greater than reported in an internal Department report ("Paying for Value", 2017).*

An Australian government priority "health enabler" in the current National Aboriginal and Torres Strait Islander Health Plan 2013-2023 is: *"….a culturally respectful and non-discriminatory health system"* (revised implementation plans will be available in 2018 and 2013).

Australian research indicates that by industry sector, education multipliers tend to be the highest, followed by health (2.1) and community services[25]. Health economics research suggests that a 1.62 multiplier effect on employment and 1.6 on income from an initial investment is a reasonable, low end of the range of health multipliers. That is, for every additional job created or dollar invested, an additional 0.62 jobs and 0.6 more income would be generated (secondary effects). The final, longer term impact (induced demand) would be greater again as the cumulative effects of additional employment and income generate additional new investment[26] [25].

No other studies were identified that looked at the cost-effectiveness of PHC for Aboriginal and Torres Strait Islander people and of ACCHS in particular. There were a number of papers that looked at the cost-effectiveness of specific interventions, or a narrow range of targeted diseases. The ACE-Prevention Study [11] was a major study that estimated the cost-effectiveness of 19 interventions for the Aboriginal and Torres Strait Islander population. The interventions were assumed to operate from mainstream health services, with model parameters adjusted for target population, participation and adherence rates; or they were assumed to operate from ACCHS, with model parameters adjusted using the Indigenous Health Service Delivery template (Ong [13]). A number of the selected interventions related to pharmacotherapies available, including a hepatitis B vaccine, and results can be found in Table 0.3, p.7 of Vos, Carter et.al. [11]. Relevant to ACCHS, was their evaluation of blood pressure monitoring (and pharmacotherapy) and pre-diabetes advice, which were both found to be cost-effective at less than $50,000/DALY.

Thomas [4] also studied diabetes related treatment. The Department is well aware of this study, which used linked data for PHC attendances and hospitalisations to conclude that, on average, the savings from hospitalisations averted from PHC attendances was greater than the cost of the primary health episode of care. The patient data were derived from the NT Department of Health and was for patients with confirmed diabetes >5 years of age. The results are not easily generalizable, however, to PHC to the Aboriginal and Torres Strait Islander population as a whole.

Using a similar database to that of Thomas, Zhao [5] compared health outcomes and costs at different levels of primary care utilisation to determine if primary care represents an efficient use of resources for Aboriginal and Torres Strait Islander patients for a broader range of common chronic diseases; namely hypertension, diabetes, ischaemic heart disease, chronic obstructive pulmonary disease and renal disease. This study related to NT patients aged 15 years and over who lived in remote communities and used a remote clinic or public hospital from 2002 to 2011. Compared to a low

utilisation group, medium and high levels of primary care utilisation were associated with decreases in total and avoidable hospitalisations, deaths and years of life lost. Higher levels of primary care utilisation for renal disease reduced avoidable hospitalisations by 82-85%. The result reported was that investing $1 in primary care in remote Aboriginal and Torres Strait Islander communities could save $3.95-$11.75 in hospital costs, in addition to health benefits for individual patients.

Importantly, Zhao state that they **did not have access to data from ACCHS** that also provide primary care in some remote NT communities. Therefore, the results only relate to PHC delivered through mainstream services.

Chronic disease is a major and increasing problem for Aboriginal and Torres Strait Islander people. It is the main reason for the significant gap between Aboriginal and Torres Strait Islander life expectancy and the remainder of the Australian population. In 2003, a series of papers were commissioned to provide information, analysis and advice to Government as part of a Review of the Australian Government's Aboriginal and Torres Strait Islander Primary Health Care Program. One of these papers was a more serious economic evaluation by Beaver [1]. Beaver focused upon the prevention and management of chronic disease, with a particular focus on preventing the development of high cost complications related to diseases such as hypertension and Type 2 diabetes. Beaver argued that managing the growing 'epidemic' of chronic disease required realignment of the service delivery model from an acute care model to a chronic care model, with a stronger focus on comprehensive primary care. Consequently, a subset of chronic diseases was selected as the basis of this investment analysis. Beaver used a partial equilibrium model, with the focus on a set of preventable diseases. The conditions addressed were hypertension, diabetes, renal disease, ischaemic heart disease, chronic obstructive pulmonary disease, respiratory and related ear infections, diarrhoea, malnutrition and skin infections.

A series of 'what if' analyses were undertaken to explore the implications of alternate investment and disinvestment assumptions. The modelling addressed investments in comprehensive primary health care, which include services funded from mainstream and Indigenous-specific funding mechanisms as part of the Aboriginal and Torres Strait Islander primary health care program. The value of existing Australian Government investment in primary health care (through the OATSIH grants program) was estimated by modelling the withdrawal of that funding and estimating the impact on the Indigenous population. While potential savings to the Australian Government were identified through lower OATSIH funding, it was also estimated that such a funding withdrawal would lead to a delay in diagnosis and treatment, more severe chronic conditions and increased hospitalisations; indicating that current investments were having an important impact in terms of providing greater levels of diagnosis and treatment of disease, preventing progression to more severe chronic disease and reducing hospitalisation levels. If this funding was not provided, it was estimated that total health costs on other parts of the system would be higher, exceeding $136 million over five years after funding was no longer provided, $470 million in 10 years. Also, without these investments, late diagnosis and treatment could be expected to lead to worse health outcomes, with a loss of healthy life years due to premature death and increased disability equivalent to 2.6, 6.1 and 12.6 years per person over 5, 10 and 20 years respectively.

The economic modelling approach adopted by Beaver is called the Health Benefit Group (HBG), Health Resource Group (HRG) approach, and was first used in the UK. The HBG categories used by Beaver were:

- 'Not at risk'
- 'At risk'

- ‘New case’
- ‘Existing cases’
- ‘Requiring hospital care’

The HRG categories were:

- ‘Health promotion’
- ‘Prevention’
- ‘Clinical primary health care (new cases)’
- ‘Clinical primary health care (existing cases)’
- ‘Hospital care’

Modelling was based on average expenditure by HRGs and population response to investments. The HBG/HRG approach does not usually model individual programs.

The model included only that impact of HRG activity that could be attributed to the health system (no allowance was made for environmental legislation, etc.). While little evidence was available, under this assumption, a greater proportion of the total impact of primary health care and hospital care was attributed to the health system as compared to health promotion and prevention activity, where other sectors are more likely to be involved. The amount of the total impact attributable to the health care system for the various HRGs were:

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

The DALYs were estimated from Australian and NT burden of disease studies.

Changing the way in which funds are allocated in an environment of no new investment showed that shifting $1 million from Clinical Primary Health Care (new cases) and Clinical Primary Health Care (existing cases) to Health Promotion and Prevention would result in a gain of 14, 000 DALYs in 5 years as a consequence of better prevention. However, this also would lead to a loss of 18,600 DALYs in 5 years as a consequence of shifting resources away from primary health care (diagnosis/treatment and continuing care for chronic diseases). Therefore, the benefit would be offset by the loss. Shifting funding would result in a decrease in benefit in the source HRG and a marginal increase in benefit in the target HRG.

Beaver [1] provides a full list of savings/cost ratios (refer Table 12; p.24[1]). These results show that for the purpose of saving health care resources, first and second priorities are different for individual diseases:

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

The longer term shows a different pattern for individual diseases.

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

The strength of the Beaver paper is that it addresses a much broader range of diseases than either Thomas [4] or Zhao [5], but the breadth of the analysis also creates a weakness in that there are a number of assumptions required to generate the results. Furthermore, the modelling is based on the NT population, disease profile, cost structures and service development. Therefore, they may not be representative of Australia and may not be generalizable to other States.

In a paper by Angell 2017[9], the authors also noted that health economic evaluations have been criticised as potentially unsuited to Aboriginal and Torres Strait Island populations, as they are based on a biomedical notion of health that is inconsistent with the way that these populations may view their health. They argue though that health economic techniques used to measure health outcomes, such as health-related quality of life measures, have been used and validated in Indigenous populations around the world. These approaches allow for patient preferences for health to be incorporated into the design and evaluation of services and present a clear mechanism through which the values and preferences of Aboriginal and Torres Strait Islander populations can be used to identify the services most effective in improving the health of these communities. A number of other techniques are commonly used in the health economic field to directly incorporate population preferences for different aspects of health and health care, such as discrete choice experiments or contingent valuation studies. These techniques, if used in Aboriginal and Torres Strait Islander communities, could potentially serve as a means to value interventions aimed at improving the health of these populations from the point of view of the communities themselves and highlight components of services that are most important to the health of these groups. They also note though that such methods remain virtually untested in these population groups in the published literature.

Making similar observations to those of other authors, Angell notes that Australia spends more per capita on the health care of Indigenous Australians than on non-Indigenous Australians (at a ratio of $1.47 to every $1 spent on a non-Indigenous Australian).[14] However, the makeup of this spend differs markedly between the two groups, with Aboriginal and Torres Strait Islander Australians utilising significantly less primary health care and pharmaceutical services. The authors refer to Thomas[4] in noting that improving access to primary health care can reduce hospital expenditure through improved health outcomes. They conclude that health economic evaluations built on Aboriginal and Torres Strait Islander values and preferences would provide a means to prioritise interventions and policies to ensure that the resources that are available to improve Aboriginal and Torres Strait Islander people's health are used in the most effective ways possible.

This recommendation of Angell[9] is consistent with the approaches being considered for Phase II of this study.

The ACE prevention study (Vos, Carter, et.al.[11]) economic evaluations of interventions for Aboriginal and Torres Strait Islander populations addressed cardiovascular disease, diabetes and kidney disease, due to the much higher rates of these three diseases and commonality of risk factors in the Aboriginal and Torres Strait Islander population.

The study highlighted the interaction of higher cost of episodes of care at ACCHSs compared to mainstream delivery of PHC, but also the higher attendance and compliance at ACCHSs (and hence better health outcomes). An example is their finding in relation to a polypill (to reduce both blood pressure and cholesterol) is a cost-saving intervention if delivered by mainstream services to all Aboriginal and Torres Strait Islander people over the age of 35. However, delivery of the polypill by ACCHSs is no longer cost-saving due to the higher costs of health service visits, but was predicted to lead to greater health gain because of an improved Indigenous access to health services (increased utilisation of services and adherence to treatment). The lifetime health impact of any of these interventions delivered to the Indigenous population by ACCHSs is 50% greater than if these same interventions were delivered by mainstream health services, due to improved Indigenous access. The authors note that this is important to consider in addition to cost-effectiveness ratios if an objective is to close the Indigenous health gap.

Appendix 1 References

1. Beaver C, Zhao Y. Investment analysis of the Aboriginal and Torres Strait Islander Primary Health Care Program in the Northern Territory. OATSIH Commonwealth of Australia; 2004.
2. Econtech Pty Ltd. Costings Models for Aboriginal and Torres Strait Islander Health Services. Canberra: Department of Health and Ageing; 2004.
3. Ralph AP, Fittock M, Schultz R, Thompson D, Dowden M, Clemens T, et al. Improvement in rheumatic fever and rheumatic heart disease management and prevention using a health centre-based continuous quality improvement approach. BMC Health Serv Res. 2013;13:525.
4. Thomas SL. The cost-effectiveness of primary care for Indigenous Australians with diabetes living in remote Northern Territory communities. Med J Aust. 2014;201(8):450.
5. Zhao Y, Thomas SL, Guthridge SL, Wakerman J. Better health outcomes at lower costs: the benefits of primary care utilisation for chronic disease management in remote Indigenous communities in Australia's Northern Territory. BMC Health Serv Res. 2014;14:463.
6. Angell B, Laba TL, Lung T, Brown A, Eades S, Usherwood T, et al. Healthcare expenditure on Indigenous and non-Indigenous Australians at high risk of cardiovascular disease. Int J Equity Health. 2017;16(1):108.
7. Davy C, Harfield S, McArthur A, Munn Z, Brown A. Access to primary health care services for Indigenous peoples: A framework synthesis. Int J Equity Health. 2016;15(1):163.
8. The National Aboriginal Community Controlled Health Organisation (NACCHO). About us. 2014.
9. Angell B, Eades S, Jan S. To Close the Gap we need to identify the best (and worst) buys in Indigenous health. Aust N Z J Public Health. 2017;41(3):224-6.
10. Alford KA. Indigenous health expenditure deficits obscured in Closing the Gap reports. Med J Aust. 2015;203(10):403-3 e1.
11. Vos T, Carter R, Barendregt J, Mihalopoulos C, Veerman L, Magnus A, et al. Assessing Cost-Effectiveness in Prevention (ACE–Prevention): Final Report. Melbourne: University of Queensland, Brisbane and Deakin University, Melbourne; 2010.
12. Khoury P. Beyond the Biomedical Paradigm: The Formation and Development of Indigenous Community-Controlled Health Organizations in Australia. Int J Health Serv. 2015;45(3):471-94.
13. Ong KS, Carter R, Kelaher M, Anderson I. Differences in primary health care delivery to Australia's Indigenous population: a template for use in economic evaluations. BMC Health Serv Res. 2012;12:307.
14. Otim ME, Kelaher M, Anderson IP, Doran CM. Priority setting in Indigenous health: assessing priority setting process and criteria that should guide the health system to improve Indigenous Australian health. International Journal for Equity in Health. 2014;13(45).
15. Anikeeva O, Katterl R, Bywood P. The Closing the Gap Initiative - successes and ongoing challenges for divisions of general practice. Aust Fam Physician. 2012;41(7):523-7.
16. Couzos S, Thiele DD. The International Covenant on Economic, Social and Cultural Rights and the right to health: is Australia meeting its obligations to Aboriginal peoples? Med J Aust. 2007;186(10):522-4.
17. Alford K. Investing in Aboriginal community controlled health makes economic sense. Canberra: NACCHO; 2014.
18. Silburn K, Thorpe A, Carey L, Frank-Gray Y, Fletcher G, McPhail K, et al. Is Funder Reporting Undermining Service Delivery? Compliance reporting requirements of Aboriginal Community Controlled Health Organisations in Victoria. Melbourne, Australia: The Lowitja Institute; 2016.
19. McRae I. A Draft Report for the Indigenous and Rural Health Division of the Department of Health. Fianian Pty Ltd; 2014.
20. Zhao Y, Malyon R. Cost drivers of remote clinics: remoteness and population size. Aust Health Rev. 2010;34(1):101-5.

21. Cuesta-Briand B, Saggers S, McManus A. 'It still leaves me sixty dollars out of pocket': experiences of diabetes medical care among low-income earners in Perth. Aust J Prim Health. 2014;20(2):143-50.
22. Australian Institute of Health and Welfare. Measuring the social and emotional wellbeing of Aboriginal and Torres Strait Islander peoples. Cat. no. IHW 24, . Canberra: AIHW; 2009.
23. Cosh S, Hawkins K, Skaczkowski G, Copley D, Bowden J. Tobacco use among urban Aboriginal Australian young people: a qualitative study of reasons for smoking, barriers to cessation and motivators for smoking cessation. Aust J Prim Health. 2015;21(3):334-41.
24. Muhunthan J, Angell B, Hackett ML, Wilson A, Latimer J, Eades AM, et al. Global systematic review of Indigenous community-led legal interventions to control alcohol. BMJ Open. 2017;7(3):e013932.
25. Stoeckl N, et. al. Regional Economic Multipliers in Australia's Tropical Savannas. Report for the Tropical Savannas Cooperative Research Centre, James Cook University, Queensland; 2007.
26. Doeksen GA, Schott V. Economic importance of the health-care sector in a rural economy. Rural Remote Health. 2003;3(1).

Appendix 2: Detailed Costs and Technical Notes

Data used in the calculation of the results shown in **Table 3** are shown below:

Supplementary Table 1: Detailed costing of mainstream non-remote services

Short GP Consult (MBS Item 23; $37.05)[5]				
	All areas contacts[6]	**Contacts per service[7]**	**Proportions**	**Costs**
Doctor	1,534,834	7,524	0.49	$18.28
Medical Specialist	61,064	299	0.02	$1.68
All other contacts except driver & dental	4,825,930	23,657	1.55	$96.56
Total				**$116.52**
Long GP Consult (MBS Item 36; $71.70)[1]				
	All areas contacts	**Contacts per service**	**Proportions**	**Costs**
Doctor	1,534,834	7,524	0.49	$35.37
Medical Specialist	61,064	299	0.02	$1.68
All other contacts except driver & dental	4,825,930	23657	1.55	$96.56
Total				**$133.62**
Equivalent ACCHs mainstream weighted average short/long consult				
	All areas contacts	**Contacts per service**	**Proportions**	**Costs**
Doctor	1,534,834	7,524	0.49	$30.42*
Medical Specialist	61,064	299	0.02	$1.68
All other contacts except driver & dental	4,825,930	23,657	1.55	$96.56
Total				**$128.66**

Notes: *Based on weighted average from proportion of long consults = 0.71 and proportion of short consults = 0.29. Source: Larkins et al, 2006[7].

The IAHP grant funding enables ACCHS to provide comprehensive care with a range of services, such as dental, drivers, population health, social and community activities, which are excluded as MBS fees for mainstream service provision do not cover these costs

[5] Medicare Benefits Schedule, 2018.
[6] AIHW Online services report, 2017.
[7] Larkins SL, et al, 2006. Consultations in general practice and at an Aboriginal community controlled health service: do they differ? Rural Remote Health. 6:560

Supplementary Table 2: Detailed costing of ACCHS episode of care

	Non-remote	Remote	Composite of Remote and Non-remote
Basic intervention components			
Short consult	$60.87	$123.25	$74.18
Long consult	$121.75	$246.50	$148.36
Compliance management	$1.68	$3.08	$1.98
Home visits	$3.43	$3.43	$3.43
Population health activities			
Other consultative services	$20.80	24.59	$21.61
Administrative and governance structures			
Community management board	$0.17	$0.20	$0.20
Additional management	$1.46	$1.59	$1.49
Other service components (transport service)	$45.20	$107.79	$58.56
Remoteness adjustment			
Outreach services	-	$3.75	$1.36
Emergency services	-	$3.42	$1.24
Staff relocation and housing	-	$9.04	$3.27
Total costs			
Total costs short consultation	$133.62	$280.15	$167.30
Total costs long consultation	$194.49	$403.40	$241.49
Average cost of consultation	$164.05	$341.77	$204.40

Notes: Updated 2017 costs from the Indigenous Health Service Delivery Template[8]. Assumes ACCHSs do not claim for the General Practice Rural Incentives Program.

[8] Ong KS, Carter R, Kelaher M, Anderson I. Differences in primary health care delivery to Australia's Indigenous population: a template for use in economic evaluations. BMC Health Serv Res. 2012;12:307.

Calculation of average rural and remote practice incentives payment for mainstream services in Table 3

The Department of Health compensates GPs for working remotely. The calculation of payments is based on activity levels within eligible locations and the length of time a medical practitioner has been on the program. The loading provided for 'eligible services', mainly comprising professional fees, is shown below by area of remoteness:

Supplementary Table 3: Practice Incentives Program Rural Loading for each Rural, Remote and Metropolitan Areas (RRMA) category, 2013

RRMA classification and category	Examples of locations	Rural Loading
Capital city	Brisbane, Canberra	0%
Other metropolitan centre (pop > 100,000)	Townsville, Newcastle, Geelong	0%
Large rural centre (pop 25,000-99,999)	Cairns, Mackay, Launceston	15%
Small rural centre (pop 10,000–24,999)	Gympie, Maryborough (QLD), Port Pirie	20%
Other rural area (pop < 10,000)	Ingham, Atherton, Byron Bay	40%
Remote centre (pop> 5000)	Mt Isa, Roma, Alice Springs	25%
Other remote area (pop < 5000)	Normanton, Weipa, Yulara	50%

Source: Australian Government Department of Human Services, 2013. Practice Incentives Program Rural Loading, November 2013. https://www.humanservices.gov.au/organisations/health-professionals/services/medicare/practice-incentives-program?utm_id=9

From the above table, it was assumed for this analysis that:

- Non-Remote equated to areas with a population of >100,000 and received 0% loading
- Remote equated to areas with a population of <100,000 and received loadings between 15% - 50% weighted by the geographic distribution of GPs (See Supplementary Table 3).

Supplementary Table 4: Geographic distribution of GPs, 2006-2007

	Major cities	Inner Regional	Outer Regional	Remote	Very Remote	Total
NSW	6110	1612	412	50	3	8187
VIC	4696	1184	297	6		6183
QLD	3120	1007	750	178	143	5198
WA	1776	257	273	139	55	2500
SA	1504	226	242	58	23	2053
TAS		498	158	10	8	674
ACT	412					412
NT			142	103	109	354
National	17618	4784	2274	544	341	25561
Weightings	67.3%	18.7%	8.3%	1.7%	0.9%	

Source: Department of Health, 2008. General practitioners: Total number by state/territory and Remoteness Area, 2006-07. http://www.health.gov.au/internet/publications/publishing.nsf/Content/work-res-ruraud-toc~work-res-ruraud-2~work-res-ruraud-2-3~work-res-ruraud-2-3-med~work-res-ruraud-2-3-med-gen

From these data, it can be calculated that 29.7% of all GPs in Australia were potentially eligible for practice incentives for remoteness. Weighted loadings were applied to the cost of ACCHSs episodes at MBS fees to capture the cost of GP claims on the MBS for remoteness for these 29.7% of GPs.

Mainstream service total costs from Supplementary Table 1 are added to practice loading costs to obtain the mainstream remote service costs.

Supplementary Table 5: Practice incentive loadings applied to mainstream remote services

	Short consult	Long consult	Average
Practice loading cost*	$25.30	$29.00	$27.90
Mainstream service cost from Supplementary Table 1	$116.52	$133.62	$128.66
Mainstream remote service cost	$141.80	$162.60	$156.61

Notes: *Weighted average from Practice Incentives Program loadings.

Source: Australian Government Department of Human Services, 2013. Practice Incentives Program Rural Loading, November 2013. https://www.humanservices.gov.au/organisations/health-professionals/services/medicare/practice-incentives-program?utm_id=9