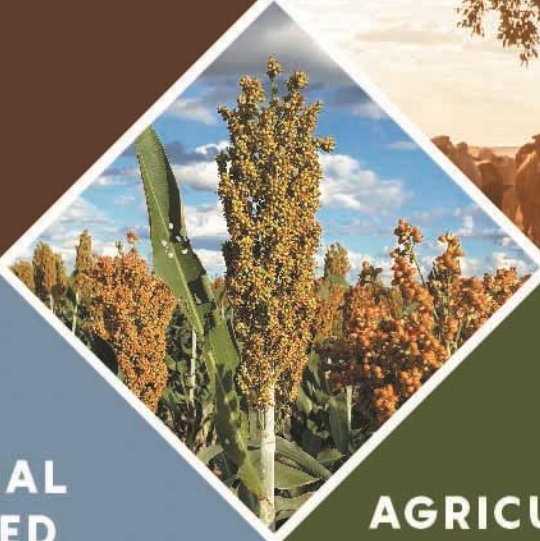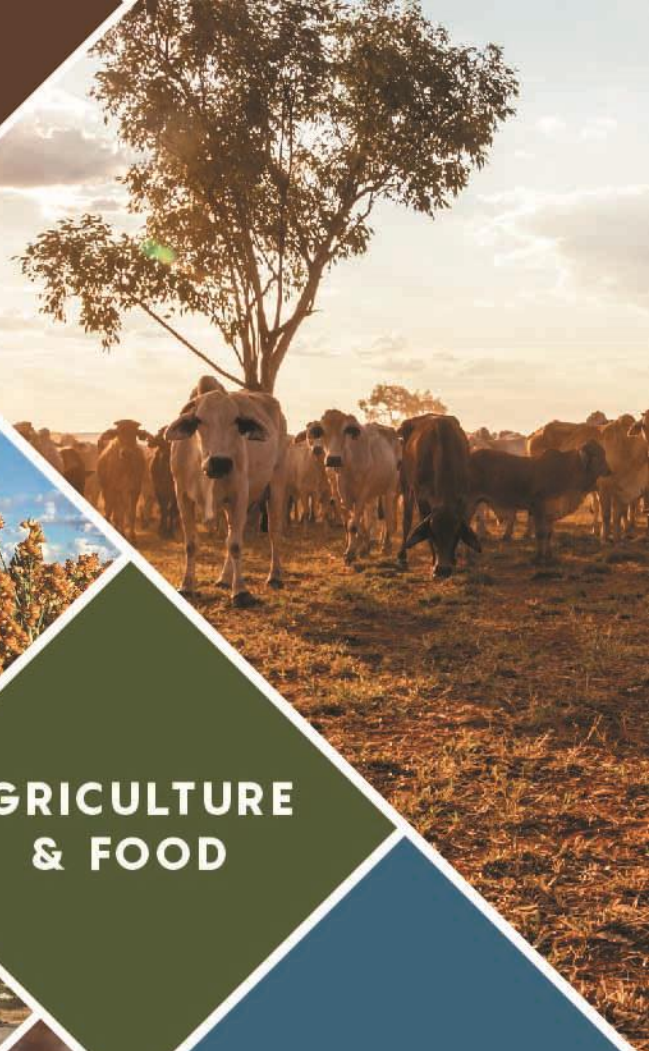NORTHERN HEALTH
SERVICE DELIVERY

TRADITIONAL
OWNER-LED
DEVELOPMENT

AGRICULTURE
& FOOD

Northern Australia Health Service Delivery Situational Analysis

Edelman A[1], Grundy J[2], Moodley N[3], Larkins S[4], Topp SM[5], Atkinson D[6], Patel B[7], Strivens E[8], and Whittaker M[9].

May 2020

CRCNA
DEVELOPING NORTHERN AUSTRALIA

Authorship

[1] James Cook University, [2] James Cook University, [3] James Cook University, [4] James Cook University, [5] James Cook University, [6] Rural Clinical School of Western Australia, [7] Top End Health Service, Northern Territory Government, [8] Cairns and Hinterland Hospital and Health Service, [9] James Cook University (Project leader)

Important contributors:

Sally Leigo, Cooperative Research Centre for Developing Northern Australia

Jasmine Bell, James Cook University

Acknowledgments

Disclaimer

Any opinions expressed in this document are those of the authors. They do not purport to reflect the opinions or views of the CRCNA or its partners, agents or employees. The CRCNA gives no warranty or assurance and makes no representation as to the accuracy or reliability of any information or advice contained in this document, or that it is suitable for any intended use. The CRCNA, its partners, agents and employees, disclaim any and all liability for any errors or omissions or in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this document.

Peer Review Statement

The CRCNA recognises the value of knowledge exchange and the importance of objective peer review. It is committed to encouraging and supporting its research teams in this regard. The authors confirm that this document has been peer reviewed and approved by the project's steering committee, its program leader and a range of independent northern Australian expert stakeholders from the public, private and non-government health service sectors and academia. These reviewers evaluated its:

- originality
- methodology
- rigour
- compliance with ethical guidelines
- conclusions against results
- conformity with the principles of the Australian Code for the Responsible Conduct of Research (NHMRC 2018)

and provided constructive feedback which was considered and addressed by the authors.

Table of Contents

List of Tables

List of Figures

Acronyms

ACCHS	Aboriginal Community Controlled Health Service
ACRRM	Australian College of Rural and Remote Medicine
AIHW	Australian Institute of Health and Welfare
AMSANT	Aboriginal Medical Services Association Northern Territory
ARC	Australian Research Council
ARF	Acute Rheumatic Fever
CARPA	Central Australian Rural Practitioners Association
CCMM	Chronic Conditions Management Model
COAG	Council of Australian Governments
CRCNA	Cooperative Research Centre for Developing Northern Australia
FIFO	Fly in fly out
GDP	Gross Domestic Product
HHS	Hospital and Health Service
JCU	James Cook University
KAHPF	Kimberley Aboriginal Health Planning Forum
MRFF	Medical Research Future Fund
NACCHO	National Aboriginal Community Controlled Health Organisation
NARN	Northern Australia Research Network
NATSIHWA	National Aboriginal and Torres Strait Islander Health Worker Association
NDIA	National Disability Insurance Agency
NGO	Non-government organisation
NHMRC	National Health and Medical Research Council
NT	Northern Territory
PHC	Primary Health Care
PHN	Primary Healthcare Network
PPH	Potentially Preventable Hospitalisations
QAIHC	Queensland Aboriginal and Islander Health Council
Qld	Queensland
RACGP	Royal Australian College of General Practitioners
RFDS	Royal Flying Doctor Service
RHD	Rheumatic Heart Disease
SWOT	Strengths, weaknesses, opportunities and threats
WA	Western Australia
WHO	World Health Organization

Project Participants

Contracted project participants comprised:

- James Cook University (project leader);

- Top End Health Service, Northern Territory Government;

- Rural Clinical School of Western Australia; and

- Cairns and Hinterland Hospital and Health Service, on behalf of the Tropical Australian Academic Health Centre.

While the participants above represented the formal project partners for contractual purposes, a much broader range of northern-based organisations, groups and individuals provided ongoing input and guidance (see the stakeholder consultation report on page 57).

Executive Summary

The *Northern Australia Health Service Delivery Situational Analysis* ("Situational Analysis") is an initiative of the Cooperative Research Centre for Developing Northern Australia (CRCNA). The CRCNA is investing in industry-led research collaborations to develop new technologies, products and services which address industry issues in northern Australia. The aim of the Situational Analysis is to identify strategic long-term development and growth opportunities for the health sector in northern Australia, towards a goal of improving the health and prosperity of northern Australian communities. The Situational Analysis is comprised of a series of outputs, namely: a literature review, export and demand analysis, SWOT analysis, research investment analysis, costing study and socialisation activities.

The health sector across northern Australia is complex, with multiple health care providers across government, community controlled, non-government and private providers, and with complex training, educational and regulatory frameworks. Strong innovation in response to health need is demonstrated across the north, and is evident in comprehensive service delivery (ranging from advanced tertiary hospital care to primary care) and health workforce education and training across the spectrum in the larger regional population centres. However, health workforce shortages and many service delivery challenges are still apparent in rural and remote areas. An experienced team of health systems researchers with deep knowledge of the sector and extensive contacts conducted this work and the complex stakeholder engagement that was necessary to document the issues.

Literature review

The Situational Analysis includes a synthesis of 324 papers predominantly from the last 10 years representing a diverse range of grey literature (including strategic plans, policy and annual reports) and peer-reviewed literature. Overall, the literature highlights the benefits of comprehensive primary healthcare and emphasises the need for community preferences, control and participation in health care decision-making. However, a mismatch was identified between stated commitments to act on social, cultural and environmental determinants of health at a strategic planning level, and translation of this strategic intent into operational capacity and funded action.

Other key challenges identified in the literature, which were also reflected in stakeholder consultations, included:

- Health workforce recruitment and retention in regional, rural and remote areas;

- Funding models rewarding occasions of service rather than quality of care or prevention;

- Gaps in culturally responsive care; and

- Often-limited inclusion of community preferences in the planning of health service models.

A key governance challenge related to fragmentation of health-related policy and planning in the north, leading in some cases to detrimental policy changes being made without adequate consultation or evidence – a finding supported in consultation workshops. Despite an apparent need for policy-focussed evaluative research, however, few quality systems- level evaluations of health-related policy were identified in the literature. Further, despite the many shared challenges and opportunities apparent across the north, opportunities for cross-jurisdictional and international collaboration in health service and workforce governance, planning and information-sharing received little attention.

Export and demand analysis

An analysis of Asia Pacific region demand and northern Australian health services-related export capability/export income generation considered opportunities for export in four categories:

- Knowledge transfer and exchange;

- Education and training;

- Services (including health systems advisory, research and medical tourism); and

- Health products (including new therapeutics, diagnostics, vaccines and technologies).

The analysis identified opportunities to grow and develop partnerships with neighbouring countries to Australia's north, focussed on health systems strengthening and workforce development, as well as areas where targeted investment and support could help to realise the potential for export income generation.

Stakeholder consultations indicated broad support for further developing regional partnerships, focussed on two-way sharing of health-related expertise and educational opportunities. However, concerns were raised both in reviewed literature and during consultation workshops (with public and private sector health system stakeholders; business development specialists were not part of the brief of this situational analysis) about the risk that export efforts, particularly health service exports, might divert already- stretched health service and workforce resources away from communities in northern Australia.

Research investment

High quality research currently being undertaken in the north is addressing many of the key issues identified in this project, but more resourcing is needed for locally led research focussed on the key health systems challenges and priorities, including strengthening health workforce, improving accessibility of needed services and re-orienting financing models towards prevention and outcomes. Only two percent of national disbursements from Australia's largest government funding bodies for health and medical research are being administered by northern-based institutions, despite the north representing five percent of Australia's population, its strategic proximity to the Asia Pacific region and higher disease burden. Broadening the analysis to all grants under these schemes, in 2019 it is estimated that only 3.2 percent of the grants addressed specific northern Australia health systems issues.

An analysis of the types of studies funded by these bodies that were administered by northern institutions found that the smallest proportion of funding (11 percent) was for projects in the category of Health Services Research, which includes studies focussed on efficiency and effectiveness of the healthcare system; potentially highlighting underinvestment in policy-focussed evaluative research on health system functioning in the north.

The findings of this analysis and the consultations strongly suggest that more research capacity and activity is needed in the north to address the systems challenges that contribute to the higher disease burden, particularly targeting rural and remote populations. This investment must be northern led to ensure that the contexts and realities of the north are properly understood and to facilitate rapid implementation of findings into practice and policy. Findings from consultations across all three jurisdictions (presented later in this report) also indicated a degree of fatigue associated with externally driven research which was perceived as often undertaken from a deficit point of view. When northern researchers and organisations are engaged (if at all) as associate investigators, they are often not properly resourced to interrogate, manage or oversee the research, strengthening the case for research to be driven and led by northern institutions.

Costing study – Potentially Preventable Hospitalisations (PPH)

A costing study undertaken in the project identified that in the 2016-17 financial year there were 45,702 hospital separations documented as PPH across northern Australia. National PPH costs for 2016-17 were estimated at $3.7 billion. Across the north, these separations costed an estimated $241.8 million, representing 6.6 percent of national PPH expenditure. At greater than five percent, this is higher than the national average per person. Significant cost-savings are possible through investment in comprehensive primary health care to reduce these hospitalisations.

SWOT (strengths, weaknesses, opportunities, threats) analysis

The SWOT analysis drew from the desktop study and consultation findings, and highlights the strengths, weakness, opportunities and threats facing the health system in northern Australia:

- **Strengths** largely reflect the health service delivery and education and training expertise unique to northern Australia, developed in the region out of necessity based on geographic and population factors. Large regional centres display a broad range of service delivery options and strengths as hubs for postgraduate training. Strengths also include national attributes such as commitments to universal health coverage and reasonably well-developed infrastructure, including health service facilities and equipment particularly in larger regional centres. Policymakers across the north are also increasingly adopting e-health technologies to facilitate and enhance planning, information-sharing and patients' access to services regardless of service context.

- **Weaknesses** include siloed systems of governance, finance and planning that impact on services and ultimately health outcomes, which are reflected in fragmentation of efforts and funding both within and across jurisdictions. Health workforce shortages are also apparent, particularly in the Aboriginal, and Torres Strait Islander, health workforce, and high turnover of non-Indigenous health staff limits continuity and increases costs in remote areas. Whilst recognising the complexities of health service delivery in northern Australia, key service weaknesses include the failure of many health services in the north to provide integrated and optimal care across stages of the patient journey, including coordination of quality health services from hospital settings to community-based chronic and rehabilitative care, or to involve communities in co-design. Additional weaknesses include under-resourcing, particularly of critical prevention services, and an inadequate focus within the health sector on addressing the social, cultural and environmental determinants of health.

- **Opportunities** include improving the stability and cultural responsiveness of health workforce in the north and supporting locally led needs-based planning and research. Sustainable staffing in comprehensive primary health care would substantially improve quality of care at minimal or no overall cost. Attention is also warranted to review financing mechanisms, and financing distribution, to ensure greater resourcing of prevention.

- **Threats** include challenges in financing models. For example, some services and locations do not have block grant funding models, so occasions of service are rewarded rather than prevention or quality of care and outcomes, thus limiting flexibility. Threats also include those stemming from the higher disease burden, which represent risks to health service organisations and policymakers in terms of rising costs of health care and lost productivity, and ultimately to the development of northern Australia. More existential threats in terms of

vulnerability to emerging infectious diseases, natural disasters and climate change are also cogent.

Priority actions

Eight priority actions were identified in the project, which drew from the findings of the desktop-based analysis and stakeholder consultations across the jurisdictions:

1. **Support and enhance formal education and training of a fit-for-purpose culturally competent health workforce across all health disciplines and elements of rural health training pipelines;**

2. **Enhance professional support, career development and career pathways for rural health and Aboriginal and Torres Strait Islander workforce across all health disciplines;**

3. **Establish a cross-jurisdictional northern Australian health system network as an independent body;**

4. **Determine need and mechanisms to finance appropriate health service delivery models for rural and remote health service delivery;**

5. **Improve local amenities and infrastructure across sectors to reduce effects of adverse social determinants on health outcomes;**

6. **Undertake trials to develop and scale up place-based planning models;**

7. **Strengthen and grow northern-led research capacity and funding; and**

8. **Explore potential areas of export opportunity that deliver value for northern Australia.**

Implementing these actions will: improve the health and productivity of northern Australian populations; likely reduce health system costs associated with high potentially preventable hospitalisations, duplication of services and workforce turnover; empower local communities to develop solutions and have more control of their health and wellbeing; and strengthen northern Australia's strategic role and capacity within the broader Asia Pacific region.

Examples of the savings that may be obtained from this work, based on peer reviewed literature, suggest that:

- even small percentage reductions in PPH can translate to millions of dollars in cost savings (CEHSEU, 2009);

- investing in workforce strategies to halve the rate of remote health workforce turnover in

the Northern Territory could deliver direct annual cost savings of $32 million. This workforce turnover in turn adds $50 to the cost of each primary care consultation and contributes to unnecessary hospitalisations and poor health outcomes (Wakerman et al 2019);

- each $1 invested in remote Indigenous primary health care is likely deliver a return of $4-$12 in saved public hospital expenses (Zhao et al 2014).

Conservatively, the literature and the analysis undertaken in this project suggest that targeted investment of $10 million in comprehensive primary health care in northern Australian remote communities might be expected to deliver around $80 million of public hospital cost savings, quite apart from the cost savings from better health and productivity. Redirecting existing funding sources at federal and state levels into health services, through the mechanisms discussed in the eight priority actions, could help attain these savings and improve health outcomes.

Strengths and limitations

This Situational Analysis was undertaken in two parts: a desk top analysis; and a consultation process. It was not a research project and therefore relied upon publicly available data and literature/documents for its content; triangulated against the stakeholder, expert group and other feedback provided to the team.

The strengths of the approach taken in the project include incorporating the views and perspectives of 183 regional, rural and remote stakeholders, of whom the majority were clinicians with backgrounds in medicine, nursing, allied health, pharmacy and Aboriginal and Torres Strait Islander Health Workers and Health Practitioner roles. Many offered expertise from their roles in government, community controlled, non-government organisation (NGO) and private health care organisations. Care was taken to ensure that Aboriginal, and Torres Strait Islander, perspectives were included.

These experts contributed in a range of ways, including in a Technical Reference Group, three Jurisdictional Expert Advisory Groups, in 18 facilitated consultation workshops across the north (17 of which were face-to-face in different locations), and in a series of separate one-on-one meetings arranged during the project period. This process provided the project team with confidence that the synthesis and recommendations expressed in the report are broadly aligned with the health sector. A further strength was conducting the SWOT analysis using a framework that allowed contextualising for stakeholder expectations by different levels of remoteness, according to the Modified Monash Model; recognising the differences in service delivery needs and expectations between large regional centres and small discrete remote communities.

Publicly available data has several limitations and is often not well-matched geographically with

the locations of interest in northern Australia. Specific difficulties include: lack of disaggregation; incomplete or partial data; data reflecting only the public sector; and limitations on workforce data needs versus number of positions. It was beyond the scope of this work to set up a formal research project with appropriate ethical approvals to gain access to larger datasets, conduct formal community interviews or collect new data. Time is a key factor in undertaking this level of analysis.

Although several community leaders and council members were included in the stakeholder consultations, more formal community consultations were not included on the advice of the project's Reference and Advisory Group members, although it is acknowledged by all involved that including these views would bring important additional perspectives. This project instead draws from reports developed from previous community consultations as published in the grey literature, with multiple papers recommended to the project team through the course of the project. These findings were considered in the different sections of the report and in the synthesis of recommendations.

Likewise, the time allocated and budgetary limitations in the project precluded repeat workshops in remote communities if people were unable to attend the initial workshop. Despite the broad invitation to a range of health sector stakeholders (public, private, research, clinical, NGO and community owned services), the timing of this work in the fourth quarter of 2019 often overlapped with a range of end-of-year activities. To address this, the team followed up with phone calls and established a website incorporating workshop materials and an opportunity to provide comments online. The diversity of voices reflected in the project may have been affected by these limitations, particularly those of private providers.

The Situational Analysis was conducted within the second half of 2019, and as such represents stakeholder experiences of health service delivery and technologies up to that point and does not reflect any of the changes or progress made in 2020. Evaluations of these changes may help to inform the Priority Actions proposed in this report moving forward.

Finally, the scope of this work did not involve the development of models of service delivery, nor of competencies for various types of health professionals. The peer reviewed literature did document some of these details, including studies of location-specific interventions; these have been included in the review and contributed to informing the recommendations. Strengthening the health workforce and developing, implementing and evaluating new models of health care delivery are a clear priority in the recommendations from this work.

1. Introduction

Project background, aim and methods

Northern Australia is a vast region of three million square kilometres which incorporates the Northern Territory and the northern parts of Queensland and Western Australia above the Tropic of Capricorn (Commonwealth of Australia, 2018). Within the region, healthcare and social assistance is the largest employing industry, representing 13 percent of total employment (Commonwealth of Australia, 2018). Health care delivery, and education and training of the health workforce have developed rapidly in the north over the past two decades, particularly in the larger regional centres, where a strong suite of high quality hospital and community health services are now available.

Health care delivery within the northern Australian context is challenged by long distances between population centres, persistent health workforce shortages and high turnover rates across all health workforce categories. The region's tropical climate (including both wet and dry tropics), exposure to extreme weather events and proximity to Pacific Island nations and Asia shape a healthcare and health workforce development context that also involves managing tropical infectious disease risks and relationships with neighbouring countries. The effects of changing climate in terms of drought and extreme weather events are also felt acutely in the north (NESP, 2019).

Despite commonalities between the three northern jurisdictions in experiences of health care delivery and workforce planning, these functions are often siloed. The ad hoc relationships and ways of working between service providers and other health system stakeholders across the north sometimes hamper opportunities to jointly and systematically identify cross-jurisdictional health systems issues and areas of development potential.

In the 2015 White Paper on Developing Northern Australia, the Australian Government recognised the importance of a northern Australian approach to health sector development by including "healthcare" as one of the five industry pillars underpinning development in the north (Commonwealth of Australia, 2015). The industry pillars represent areas of endeavour seen as fundamental to both the wellbeing of people living in the north and broader economic prosperity (Commonwealth of Australia, 2015).

The Northern Australia Health Service Delivery Situational Analysis ("Situational Analysis") is an initiative of the Cooperative Research Centre for Developing Northern Australia (CRCNA), which was established by the Australian Government in 2017. With a budget of $75 million over ten years, the CRCNA brings together industry, research organisations and the three northern jurisdictions to identify and conduct research on developmental opportunities in key industry

areas including food, agriculture and health (CRCNA, 2019).

The Situational Analysis involves the production of a health-sector-focussed report that identifies the key challenges and opportunities facing the northern Australian health service delivery sector and health workforce and puts forward strategic development priorities for future investment. The aim of the project is to improve the health and prosperity of northern Australian communities by identifying strategic long-term development and growth opportunities for the health sector.

The production of this report involved a desktop review, synthesis and health sector stakeholder consultation over six months from August 2019. This was the scope of the accepted tendered design. The project consisted of two stages:

Stage 1: Production of a draft report, incorporating: a literature review; an analysis of health sector export and demand opportunities; an analysis of strengths, weaknesses, opportunities and threats; an analysis of government-partnered research projects; and a costing study.

Stage 2: Circulation of the draft report and engagement with health sector stakeholders across northern Australia to identify the key challenges and opportunities facing the northern Australian health system, refine the draft report and inform the development of a policy action plan.

The stakeholder engagement plan, developed in consultation with the CRCNA, involved systematically selecting a range of health system stakeholders across northern Australia from public and private health service delivery (including government and community controlled services), health agencies, regional educational institutions, local peak bodies, non-government organisations and local council organisations. This included many regional, rural and remote clinicians with backgrounds in medicine, nursing, allied health, pharmacy, and Aboriginal and Torres Strait Islander Health Workers and Health Practitioner roles. Participants also offered expertise from working in diverse government, community controlled and private health care organisations and settings. Care was taken to ensure that Aboriginal and Torres Strait Islander perspectives were included. The experts involved in the project contributed in a range of ways, including in a Technical Reference Group, three Jurisdictional Expert Advisory Groups in 18 facilitated consultation workshops across the north (17 of which were face-to-face in different locations), and in a series of separate one-on-one meetings arranged during the project period. Many of these local care providers and local organisation representatives have an additional role as local health system users. Further detail on stakeholder engagement activities are documented in the stakeholder consultation report on page 57.

In developing the tender, on the advice of the broader team, the project team decided against

2

broader "town-hall" style public consultations, due to a risk of falsely raising expectations. Additionally, there was concern regarding "over-consultation" of these communities, as the three jurisdictional bodies in the north had already held a series of consultations with these communities over the last one-to-two years in developing their jurisdictional health plans.

Across both stages, analysis, consultation and reporting were informed by the World Health Organization (WHO) health system "building blocks".[1] The WHO building blocks are health system components that contribute to the functioning of health systems in different ways – some are cross-cutting (Leadership and Governance; Health Information Systems), while others represent key inputs (Financing; Health Workforce) or outputs (Essential Medicines and Technologies; Service Delivery).

Both stages were informed and reviewed by the jurisdictional advisory groups (including a broad range of public, private, community-controlled and academic health sector partners) and the report was thoroughly stakeholder-tested (more detail on page 57). These reviewers: evaluated the report's originality, methodology, rigour, compliance with ethical guidelines, conclusions against results, and conformity with the principles of the *Australian Code for the Responsible Conduct of Research*; and provided constructive feedback which was considered and addressed by the authors.

This Situational Analysis is intended to provide a foundation for health sector collaboration, advocacy, funding and policy development to improve health systems in northern Australia.

Health system context

Population characteristics

The majority of the 1.3 million people in northern Australia live in the coastal towns and cities of Mackay, Townsville, Cairns and Darwin (Commonwealth of Australia, 2015). Around 40 percent of the population live in highly distributed rural, remote or very remote communities and townships with fewer than 8000 people (ABS, 2019).

Around 170,000 Aboriginal, and Torres Strait Islander, Australians live across the north, representing approximately 15 percent of the northern Australian population and 30 percent of all Aboriginal Australians and Torres Strait Islanders (Commonwealth of Australia, 2015). There are over 200 distinct Aboriginal, and Torres Strait Islander, communities across the

---

[1] The WHO describes health systems in terms of six core components or "building blocks": Service Delivery; Health Workforce; Health Information Systems; Access to Essential Medicines and Technologies; Financing; and Leadership and Governance. A seventh category – Community Engagement – is sometimes added to highlight community perspectives and priorities.

north, with land rights and native title existing in multiple northern locations (Commonwealth of Australia, 2019). Connection to country is an important element of Aboriginal and Torres Strait Islander health and wellbeing, with land rights systems influencing the way that land is used by communities as well as the work of health service providers (Qld DoH, 2015).

Between 2004 and 2014, the population of northern Australia grew by two percent, which was higher than the national rate for that period (1.7 percent) (Commonwealth of Australia, 2015). On current growth trajectories, populations across the north will be increasingly urban and coastal, with the regional cities of Cairns and Townsville predicted to have the largest populations of around 400,000 people by 2050 and Darwin not far behind (Cummings Economics, 2015). However, unique among Australian capital cities, Darwin faced a small population decline in 2017-2018, and populations are declining in large very remote areas of northern Western Australia and western Queensland (ABS, 2019; WQPHN, 2017).

Disease burden and risk profile

Epidemiological and health service data from Primary Health Care Networks (PHNs) indicate a higher disease burden and risk profile in northern Australia compared to the rest of Australia. The PHNs in northern Australia report rates of Potentially Preventable Hospitalisations of between 3000 and 6000 per 100,000 people – well above the Australian average of around 2500 (AIHW, 2018a).

The northern PHNs also report lower life expectancies at birth than the Australian average of 82.5 years in 2014-16, with both the Western Queensland and Northern Territory PHNs reporting the lowest life expectancies in the country of 78.1 and 77.1 years respectively (reported life expectancy in the Northern Queensland PHN region is 81.2; and 81.0 in Country Western Australia, which includes vast regions outside of the north) (AIHW, 2018b).

The northern PHNs also report higher rates of potentially avoidable deaths[2] as well as hospitalisation from intentional self- harm, with the Northern Territory PHN reporting the highest rates in the country (AIHW, 2018b; AIHW, 2018c). **Figure 1** shows the higher rates of potentially avoidable deaths for all four northern PHNs compared with the national rate. The Northern Territory and Western Queensland PHNs report the highest rates at 218 and 188 per 100,000 respectively.

Across the north, Aboriginal peoples and Torres Strait Islanders have worse health outcomes, with the health disparity increasing with age and remoteness (AHMAC, 2017). In the Northern Territory, rapid life expectancy gains among Aboriginal people are reported in the period from

---

[2] Potentially avoidable deaths are the number of deaths each year of people under the age of 75 from conditions that are potentially preventable through accessing health care services.

1967-1984, but these gains plateaued from the mid-1980s as non-communicable diseases became more prevalent (Georges et al, 2017). The Northern Territory has the highest Aboriginal child mortality rate in Australia (305 per 100,000), and the largest child mortality rate gap between Aboriginal and non-Aboriginal children (207 per 100,000) (Australian Government, 2018).

The northern Australian PHNs report rates of age-standardised daily smoking above the Australian average of 14.7 percent, with the Northern Queensland PHN reporting the highest rate of 20.2 percent in 2014-15 (the daily smoking rate in Northern Territory in the same period was 19.9 percent; and in Country Western Australia 18.9 percent)[3] (AIHW, 2018c).

The northern PHNs also report obesity rates (age-standardised) above the Australian rate, with the Northern Queensland PHN reporting the highest rate in the country of 37.7 percent of the population in 2014-15 compared to a national average of 27.5 percent (obesity rates in Country Western Australia and Northern Territory were 30.2, 29.8 respectively) (AIHW, 2018c). Encouragingly, two of the four northern Australian PHNs (Western Queensland and Northern Queensland) report higher rates of child immunisation than the national rate. The same two PHNs also report higher breast screening rates than the national rate, with the Northern Queensland PHN reporting the highest coverage in the country (AIHW 2018d).

A well-trained and equitably distributed health workforce, involving health professionals and workers across multiple health disciplines including doctors, nurses, allied health professionals and Aboriginal and Torres Strait Islander Health Workers and Health Practitioners, is required to address the higher disease burden in the north. However, ongoing workforce shortages are widespread. Data on workforce numbers and trends in northern Australia are not routinely reported, but national figures show decreasing availability of medical practitioners (as a proportion of population) by increasing remoteness (AIHW, 2016). Industries such as mining, which require fly-in-fly-out or drive-in-drive-out work, employ many northern Australians and thus also contribute to shaping health and health workforce needs and health system capacity in the north.

---

[3] Data on smoking and obesity rates were not reported for the Western Queensland PHN.

Figure 1: Number of potentially avoidable deaths per 100,000 people (age-standardised) in the four northern Primary Health Network regions, 2014-2016 (source: AIHW, 2018b)

Northern Australia Health Service Delivery Situational Analysis, 2020
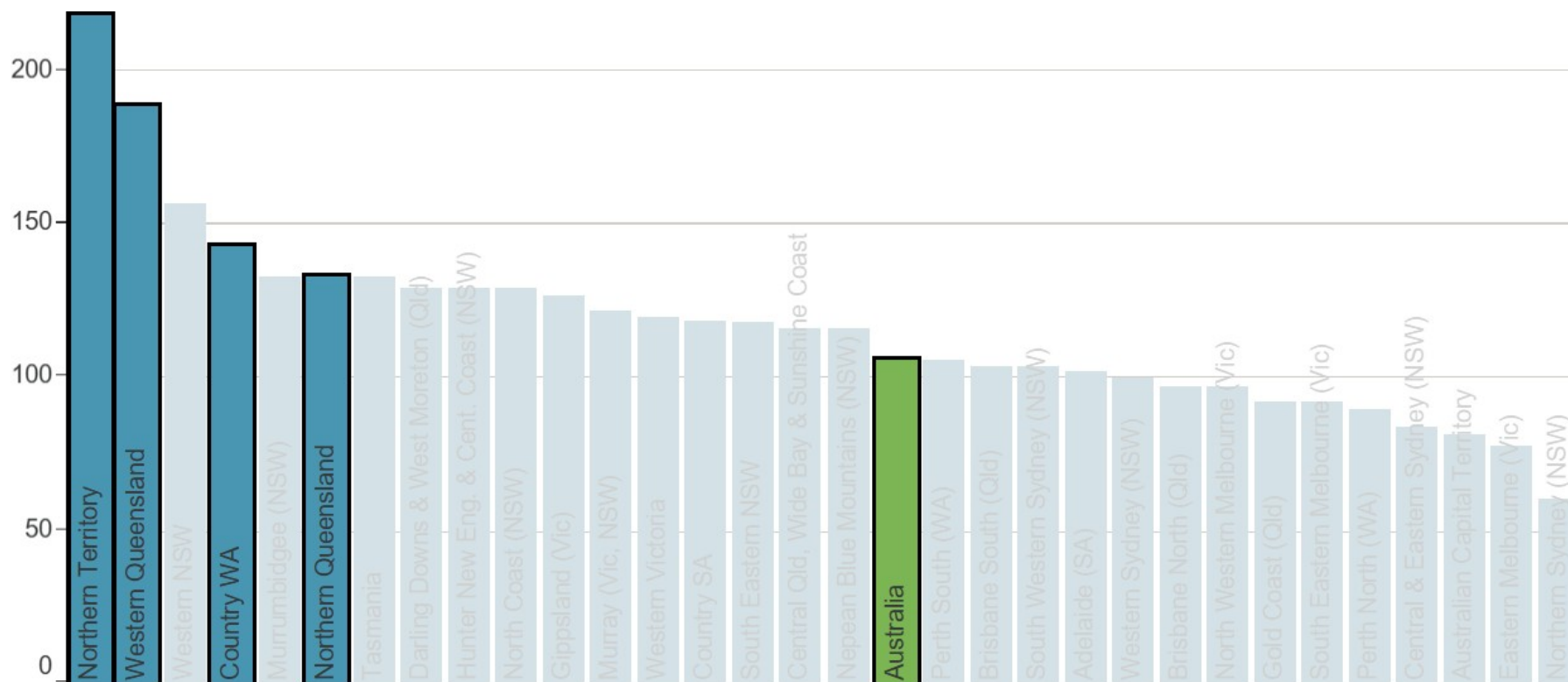
2. Literature review

Aim and methods

This literature review synthesises the evidence on the current issues characterising the northern Australian health service delivery sector and identifies key gaps. A scoping review design was adopted (Pham et al, 2014), involving systematic methods to comprehensively identify and map the literature relating to health service delivery and workforce in northern Australia.

Both peer-reviewed and grey literature were sourced for the review, with searches for both types undertaken in parallel by two members of the project team during August 2019. A combination of electronic database and website searching was used to find papers, supplemented by snowballing and expert and peer recommendations. Additional sources were added following the consultation phase of the project (October-December 2019) to incorporate papers suggested by participants and peers.

Following searching and selection, key information was extracted from included papers into a template and findings were analysed and reported against the World Health Organization (WHO) health system "building blocks" (WHO, 2010).[4] The initial review findings informed the consultation phase of the project, with final review findings then used in subsequent analyses such as the SWOT analysis.

Description of dataset

A total of 324 papers were included in the review following screening and eligibility assessment (**Figure 2**), of which 197 were peer-reviewed journal articles and 127 were policy papers ("grey literature"). **Figures 3, 4, 5 and 6** show classification of documents by jurisdiction and by document/evidence type for both the peer-reviewed and grey literature.

---

[4] The WHO building blocks are: Service Delivery; Health Workforce; Health Information Systems; Access to Essential Medicines and Technologies; Financing; Leadership and Governance; and the often-added Community Engagement.

Northern Australia Health Service Delivery Situational Analysis, 2020

Figure 2: PRISMA flow diagram showing results of literature searches
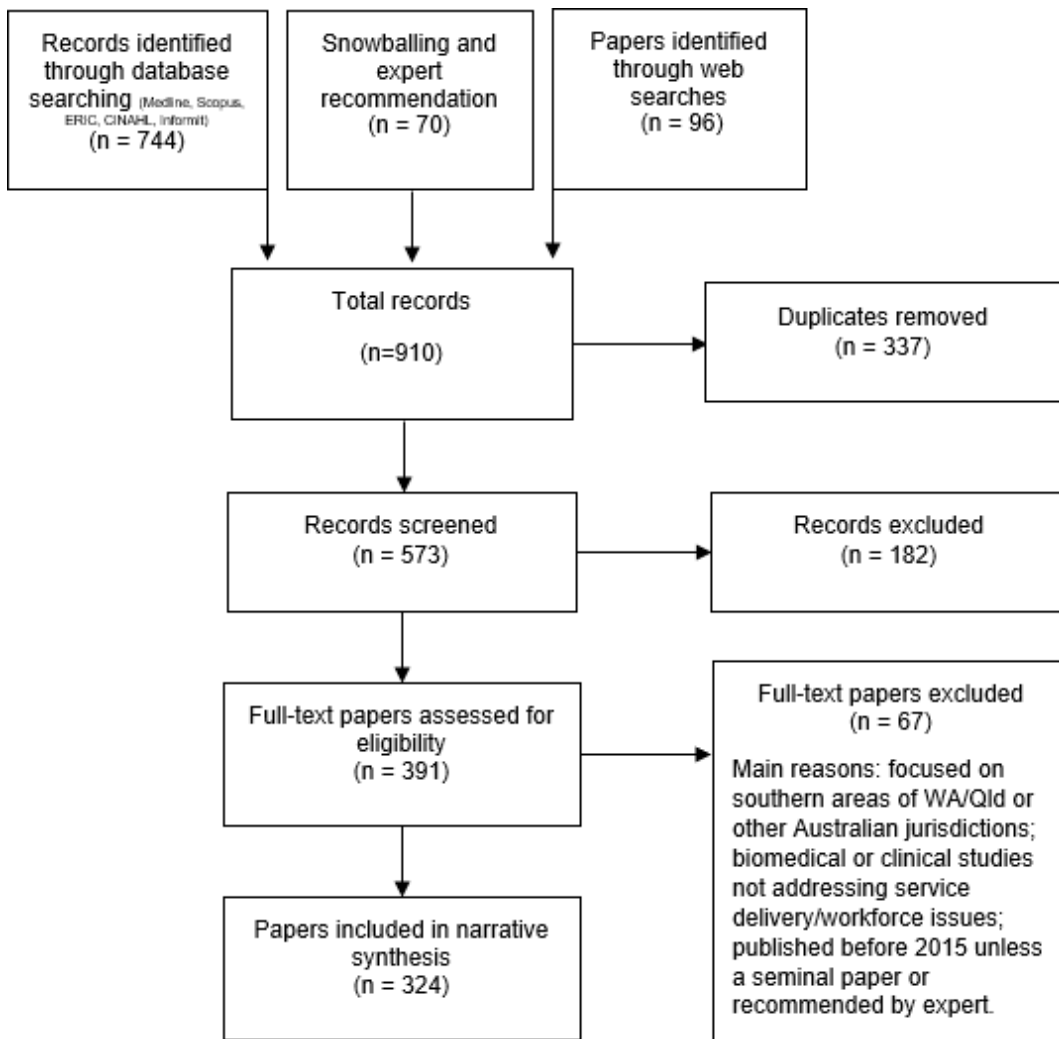
Figure 3: Peer-reviewed literature by jurisdiction (n=197)

Cross jurisdictional, 20

WA papers, 33

Qld papers, 76

NT papers, 68
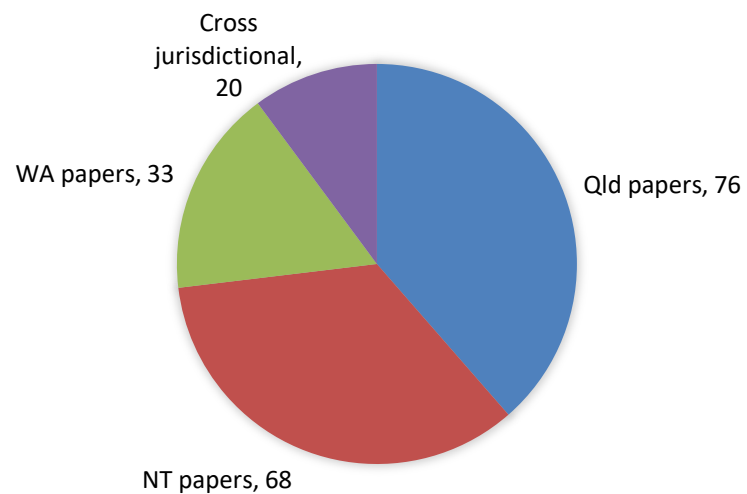
Figure 5: Grey literature by jurisdiction (n=127)

Cross jurisdictional, 38

Qld papers, 29

WA papers, 21

NT papers, 39
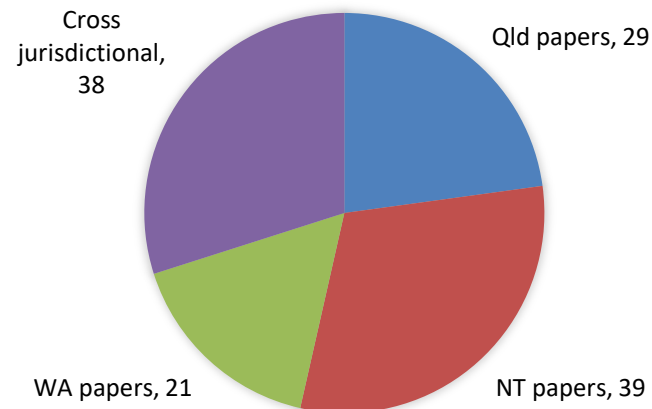
Figure 4: Peer-reviewed literature by evidence type (n=197)

Literature review, 5

Expert opinion (e.g. commentary, letter to the editor), 19

Empirical research (multiple study designs), 173
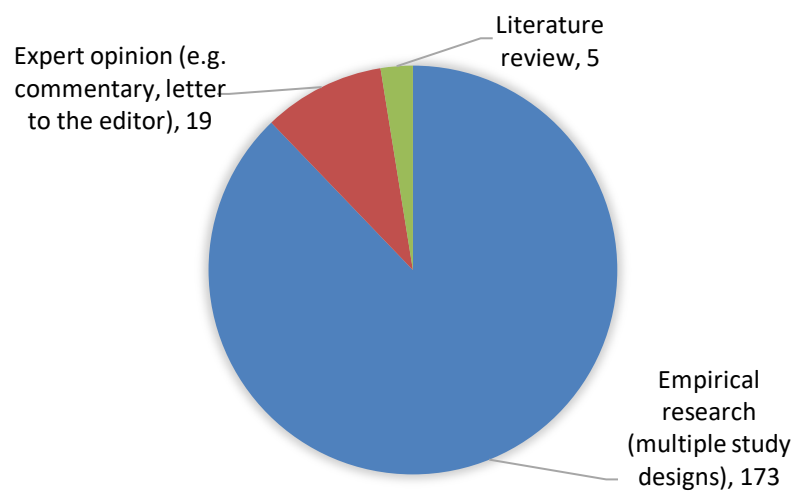
Figure 6: Grey literature by document type (%)

Budget 2%

Health profile 6%

Data/survey 16%

Policy paper 6%

Report 23%

Strategy/plan 36%
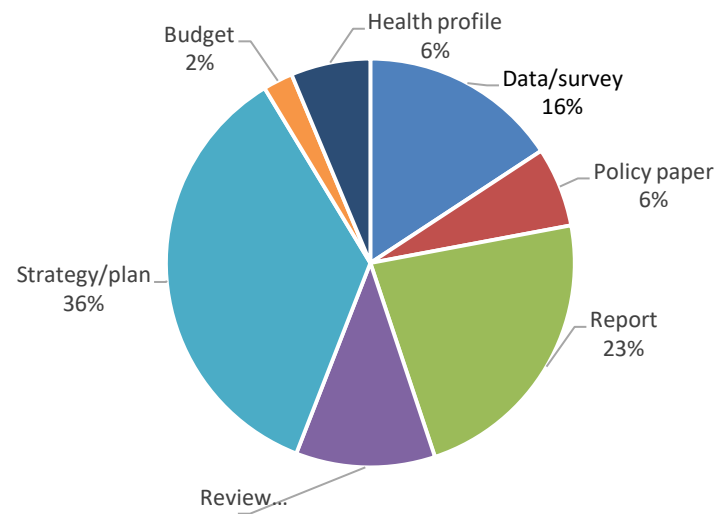
Review...

Key findings and gaps

This section summarises the peer-reviewed and grey literature addressing health service delivery and workforce characteristics, trends, challenges and opportunities across northern Australia. The grey (or "policy") literature synthesis reflects the strategic foci and efforts of the key health service delivery and workforce planning bodies in northern Australia.

Service Delivery

Summary:

Literature in the **Service Delivery** building block highlighted the growing pressures on health care systems in the north to manage the high non-communicable disease burden and respond to demographic changes resulting in increasing health service use.

This building block also encompasses the largest body of peer-reviewed literature in the review, with many papers focussed on improving health care access for specific population groups. Reflecting the vast geographical distances between population centres and specialist services in the north, a specific focus was on making health services more accessible closer to home for rural and remote patients, minimising the need for travel.

For Aboriginal peoples and Torres Strait Islanders, connection to country was highlighted as an additional and critical factor driving a need for models of care to facilitate remaining on country while accessing needed services.

The literature in this building block highlighted the benefits of comprehensive primary healthcare (PHC) and emphasised the need for community preferences, control and participation in health care decision-making. The policy literature also indicated a mismatch between stated commitments to act on social determinants of health at a strategic planning level, and translation of strategic intent into operational capacity and funded action.

Opportunities for further work/investigation:

- Supporting/developing comprehensive models of PHC in both rural and regional settings, with an emphasis on the need for modelling of comprehensive PHC in regional contexts.

- Scale-up of service models that offer services close to home and minimise patient

travel, such as telehealth and home-based monitoring options.

- Addressing fragmentation and duplication of services.

- Exploring methods to improve navigability of services through employment of care coordinators, outreach workers, and provision of supplementary services.

- Community-led development and evaluation of care models, including care (and funding) that follows the patient.

- Strengthening the translation of strategic intent to act on social and cultural determinants of health into operational capacity and funded action.

- Development and scale up of culturally responsive health service models and capabilities of workforce.

Detailed findings:

There are 746 public hospitals in Australia, of which 91 are in northern Australia (12.2 percent) (Commonwealth of Australia, 2015). Of the 613 private hospitals in Australia, 21 (3.4 percent) are in the north (Commonwealth of Australia, 2015). Most of these facilities are located in the more populous areas, and many are small local hospitals offering primary care services often without a resident doctor.

In addition to government facilities, health services in northern Australia are delivered by Aboriginal Community Controlled Health Services (ACCHSs), private health care providers and pharmacies, non-government providers such as the Royal Flying Doctor Service, laboratory services, outreach services to rural and remote sites including mobile visiting screening services and specialists, and patient transport and emergency services. Use of telehealth is increasing to support on-the-ground services in many rural and remote locations.

Mental health services are also delivered through non-government organisations such as Headspace and True Relationships – often commissioned by Primary Health Networks (PHNs). Industry-based health services are also offered in areas such as mining and defence. Corporations such as in the mining sector also offer corporate-sponsored or commissioned health services to whole communities (not just employees), although these services were not addressed in the literature.

A range of different models of health service delivery are apparent in northern Australia. In general, the literature highlights a recognition that acute, reactive, hospital-based systems are necessary but inadequate to meet population needs. Models of "comprehensive" and "integrated" primary health care (PHC) that incorporate a focus

on prevention are receiving growing attention and build on the successes of ACCHS models. Several studies highlighted the benefits of comprehensive PHC in reducing inequitable rates of preventable diseases in communities at risk (Wakerman et al, 2008; Nattabi, 2018), which involves the important integration of public health and primary care services.

A report by the Greater Northern Australian Regional Training Network (GNARTN) documented a need across the north to "re-focus on wellness, prevention and primary health care" (GNARTN, 2014). A review of health services in WA similarly found that the culture and capabilities of the health workforce, and patterns of resource allocation, need to change to better address issues of prevention (Sustainable Health Review, 2019). Multiple strategies and plans emphasised the need to improve the social determinants of health in order to improve health outcomes. Overall, however, the policy literature reveals a gap between stated commitments to act on social and cultural determinants of health at a strategic planning level and translation of strategic intent into operational capacity and funded action.

Multiple studies addressed patients' use of health services and clinical practice issues, highlighting many barriers and enablers to health care access. The literature also reported disease or risk factor burden/prevalence and implications for service delivery. For example, a study on school attendance rates in the NT found that attendance among Aboriginal children was lower if they suffered any level of hearing impairment, strengthening the need for early detection and management of hearing loss on entry into primary school (Su et al, 2019). In addition, increasing incidence of cardiometabolic conditions such as diabetes, obesity and cardiovascular disease among Aboriginal and Torres Strait Islander children and young people was reported, with a need identified for more screening, prevalence data and targeted interventions for this cohort (Titmuss et al, 2019).

In a study undertaken by the Western Australia Primary Health Association (WAPHA) in 2017, the Kimberley region was found to have the highest number of Potentially Preventable Hospitalisations in the state, followed by the Pilbara region. The whole of the Kimberley region was identified as a "hotspot" for acute, chronic and vaccine-preventable conditions, particularly the Halls Creek and the Derby–West Kimberley sub-regions, with rates of admissions in these regions more than four times the state average for chronic conditions, and more than ten and eight times the state average respectively for vaccine-preventable conditions (WAPHA, 2017). The report found that a major predictor of the higher rates was socio-economic disadvantage, with all areas of the Kimberley, except Broome, being in the top 10 percent of most socio-

economically disadvantaged areas in the state.

Notable health services initiatives or interventions profiled in the literature include:

- The NT Diabetes in Pregnancy Partnership (Kirkham et al, 2017), which was found to have facilitated health care providers' self-reported confidence and ability to negotiate the care of women, along with improved models of care;

- The LiTTLe Program (Learning to Talk, Talking to Learn), implemented in a remote Aboriginal community in the NT, which helped prepare children with otitis media for school through familiarising children with early literacy activities and resources as well as school routines (Jones et al 2018);

- The Baby One Program in Aboriginal communities in remote Cape York, Qld (Campbell et al, 2018), which was designed as a family-centred, Indigenous Health worker-led, home-visiting model of care focused on promoting family health to give children the best start to life;

- A state-wide Hepatitis C (HCV) model of care for rural and remote regions of WA (Cheng et al, 2015), which increased identification and treatment of patients living with HCV;

- A community-based risky drinking intervention (Beat da Binge) in Far North Qld (Jainullabudeen, 2015), which led to reductions in the proportion of survey respondents who reported binge drinking, along with increases in awareness and involvement in alcohol-free social activities;

- The Katherine Individual Support Program (KISP), which provided case-management and support to vulnerable people who frequently attended the Katherine Hospital emergency department through a collaboration between the hospital and key organisations in the health and housing sectors, resulting in improved health status for KISP clients and cost savings to the health system (Quilty et al, 2019);

- A flexible, community based, culturally appropriate respite service in Alice Springs (Carey et al, 2016), which enabled improved care coordination of chronic and complex patients as well as improved medication compliance and symptom management; and

- A culturally safe support program for people living with acute rheumatic fever (ARF) called "Champions 4 Change" – a national program led by the Darwin-based organisation Rheumatic Heart Disease Australia, involving locally-based

13

volunteers ("champions") who raise awareness about ARF, help patients navigate the health system, and promote prevention in the community (RDH Australia, 2019).

Key enablers of successful programs included cross-sectoral collaboration, use of innovative workforce models, community leadership and patient/family involvement in program design, effective communication between all stakeholders, a focus on more than one health-care issue or need, and culturally appropriate continuity of care close to home. The importance of "person-centred" care and outcome measures were highlighted in a study evaluating a person-centred community rehabilitation service which improved outcomes for patients with a neurological condition (Barker et al, 2016).

Multiple opportunities for health system improvement were identified, and all jurisdictions were investing in strengthening clinical governance processes. Jurisdictional variations in ongoing support and investment in continuing quality improvement, particularly in Aboriginal and Torres Strait Islander health, were evident (Bailie et al, 2017). One study found that a key challenge for health professionals in the NT in providing post-partum diabetes care to Aboriginal and Torres Strait Islander women was disjointed systems and confusion about whose role it is, highlighting a need for better communication pathways and integration of different health system components (Kirkham et al, 2019). A need for better communication and care coordination was also found in a study reporting health practitioners' experiences in screening and management of diabetes in pregnancy in far north Qld (McLean et al, 2019). One study explored the quality of service provision to remote-dwelling infants following health system changes in the top end of NT (Josif et al, 2017), finding an urgent need for better management practices and maternal and infant health system reform to improve the quality of care provided to remote-dwelling Aboriginal infants and their health outcomes.

The importance of inter-cultural communication was highlighted in multiple studies (e.g. Rumbold et al 2015; Ralph et al, 2017; Smith et al, 2017; Mihrshahi et al, 2017; Canuto, 2018; Turner, 2019). For example, a study exploring the views of key stakeholders (healthcare providers, administrative team members and Aboriginal community members) on cultural appropriateness of primary care services for Aboriginal people in north west Qld (Smith et al, 2017) found that in contrast to the views of primary care providers, a significant number of Aboriginal people did not perceive that they were receiving culturally appropriate services. The study highlighted deficiencies in the providers' cultural capability training and/or in the ability of service models to deliver on this intent.

14

Health Workforce

Summary:

The Health Workforce literature highlighted the significant and ongoing health workforce recruitment and retention challenges experienced across northern Australia, which affect rural and remote locations more acutely.

High workforce training needs across multiple professions were documented. Multiple studies highlighted the benefits of rurally based health professional recruitment and education models to train and retain local health workforce, particularly in medical (and increasingly other health professional) "generalist" roles. The importance of health professionals in rural areas being able to work to their full scope of practice in team-based models using tele-health was also highlighted, along with high health system costs related to turnover.

Cultural competence, safety and responsiveness were emphasised in multiple studies as workforce attributes that are critical for health services to be able to improve Aboriginal, and Torres Strait Islander, health care and access. An urgent need was also identified to grow, strengthen and support the Aboriginal, and Torres Strait Islander, health workforce.

Opportunities for further work/investigation:

- Meeting the training needs of health professionals including cultural capabilities across all health professions, involving expansion and support of training models for rural/remote retention and workforce stability. There is a particular need to move on from "undergraduate" training models to life- long learning models that cater for the whole pipeline, including practice support, professional development, and upskilling.

- Investment in Aboriginal, and Torres Strait Islander, health workforce development strategies, including in innovative community roles and in leadership positions.

- Scale-up, development and evaluation of rural and regional retention workforce strategies to address shortages of workforce cadres in rural and remote areas.

- Development, trialling and implementation of new models of rural health workforce design, based on the skills and experiences required to meet the needs of northern Australian communities.

- Development of workforce capability in public policy, public health and primary prevention, including identification of capacity gaps in these areas.

<u>Detailed findings:</u>

The policy literature documented challenges across northern Australia in recruitment and retention of health workforce. Many jurisdictions report undersupply of health workforce, particularly medical generalists and specialists and allied health workforce in rural and remote areas, with nursing shortages projected.

Studies describing patterns, characteristics and trends of health workforce similarly reported very high turnover of nurses and allied health professionals in government-funded remote NT clinics and high reliance on agency nurses (Russel et al, 2017; Zhao et al, 2017a; Wakerman et al, 2019). One study reported that only 20 percent of nurses and allied health professionals remained working at the same remote clinic 12 months after commencing and that half left within four months (Russel et al, 2017). Another study reported low levels of doctor retention in WA, finding that the majority of new doctors left rural practice within five years of their posting (Bailey et al, 2016).

Under-representation of Aboriginal, and Torres Strait Islander, people in the health workforce was also reported; for example, in WA Country Health Service catchment, 10 percent of the population identify as Aboriginal or Torres Strait Islander, but only 4.4 percent of health sector employees identify as such (WACHS, 2018). Accessibility and cultural safety of mainstream health services are enhanced by the employment of Aboriginal and Torres Strait Islander staff members. These chronic shortages highlight the urgency of investing in implementing, adequately resourcing and evaluating staffing and training models that stabilise the rural and remote primary care workforce and support local career pathways.

A synthesis of studies on health workforce retention applied to the NT context described potential savings to the NT health system of around $32 million per annum if staff turnover in remote clinics were halved (Wakerman et al, 2019). This study found considerable evidence about what works in improving health workforce retention but described a persistent "implementation gap" in translating empirical research evidence into policy action, requiring political commitment, and coordination and collaboration between different organisations and sectors.

The Australian Government's Stronger Rural Health Strategy, announced as part of the 2018-19 Federal Budget, aims to improve incentives for doctors to train and practice in rural and remote Australia, as well as to strengthen the role of nurses and allied health professionals within team-based models of care (Department of Health, 2019), and may therefore contribute to addressing some of these challenges. Northern Australian health professional schools already provide leadership in training a fit-for-purpose health

workforce.

Although few studies utilised a strengths-based approach, several studies examined the role and/or training pathways of Aboriginal and Torres Strait Islander Health Workers and Health Practitioners (McDermott et al, 2015; Segal et al, 2016; and Hill et al, 2018; Kelly et al, 2018), finding the roles to be effective but potentially hampered by significant unmet training and support needs. There is wide-spread acceptance of the important role played by Aboriginal and Torres Strait Islander Health Workers and Health Practitioners in the health system, but the study by Segal et al (2016) found that the capacity for these roles to improve health was constrained by multi-faceted disadvantage experienced in some communities which is likely to require policy attention to social and cultural determinants of health other than access to health services, such as to address socio-economic disadvantage. Similarly, while availability of Aboriginal and Torres Strait Islander Health Workers and Health Practitioners was described in another paper as instrumental to culturally safe health service delivery, this cadre of health workforce is under- recognised, under-supported and underutilised (Briscoe, 2019).

Training need was also identified among:

- Rural doctors in the context of managing emergencies in rural northern Qld (Pandit et al, 2018);

- Northern Qld dentists to ensure safety of patients in relation to radiation-protection (Ihle et al, 2019);

- Primary health care staff working in rural and remote areas in Cape York relating to health promotion work (McFarlane et al, 2018);

- Rural and regional allied health professionals in relation to research experience and support (Pain et al, 2015); and

- Multidisciplinary hospital staff in the NT in relation to providing both clinically and culturally safe care for Aboriginal and Torres Strait Islander patients (Kelly et al, 2018).

Another study proposed a re-think of health workforce training towards clinically- and skills- based models that involve "step off" points offering useable qualifications along a para-professional career pathway (Nancarrow et al, 2014). However, meeting training needs in rural and remote locations is often challenged by higher costs and lack of training capacity.

Promising training models included an inter-professional allied health graduate program trialled in the NT Top End Health Service (Sooful et al, 2018), as well as models of undergraduate medical and rural generalist training to develop a fit-for-purpose rural medical workforce (McGrail et al, 2018; Orda et al, 2017; Ray et al, 2015; Rikard- Bell and T. Woolley, 2018; Playford et al, 2017; Playford et al, 2015; Woolley et al, 2019; Woolley et al, 2018). These studies highlighted the importance of exposure among undergraduate students to all elements of the rural training pathway, including well-supported rural clinical placements, to building the rural and remote workforce.

Notable new initiatives include trials of workforce models that include generalist therapists (Hall et al, 2019) and allied health assistant roles (Kuipers et al, 2015) in rural and remote areas, alongside continuing efforts to explore the roles and utilisation of mid-level practitioners such as nurse practitioners and physician assistants. Key enablers of these roles included appropriate delegation and supervision models.

In a study examining how allied health professionals construe the role of the remote workforce, participants all saw remote work as requiring "generalist" expertise and a reliance on relationships (Campbell et al, 2016). A report on the impact of allied health professionals in rural and remote areas (SARRAH, 2015) highlighted that a significant number of negative health outcomes can be avoided when patients are treated by allied health professionals, with sizable potential cost savings.

Two studies about the dental health workforce (Stuart et al, 2017; Patel et al, 2015) highlighted benefits of locally based dental volunteers in rural areas and challenges experienced by dentists in developing relationships with other primary health care providers.

Some studies considered the mental and occupational health and wellbeing of rural and remote workforce (e.g. Lenthall et al, 2018; Hegney et al, 2015; Onnis, 2015). These studies highlighted the need for adequate resourcing and support of rurally-based health professionals.

Planning and Health Information Systems

Summary:

The Planning and Health Information Systems literature profiles some important approaches and methods that incorporate local needs and community participation or co-design in planning processes as well as the role of information and communication technology.

Multiple economic studies in the review demonstrate the benefits of economic evaluations in providing accurate assessments of the true costs of specific service models, which can assist in health service planning.

Opportunities for further work/investigation:

- Investigation of opportunities for data sharing and data linkages across the northern region, including systems of data capture and sharing across jurisdictions and possibilities for inter-linkages between data sources and integrated electronic medical record systems.

- Expansion/strengthening of place-based and participatory co-design approaches for health service delivery and workforce development and building community perceptions of health and illness into local area and strategic planning.

Detailed findings:

Very little information was identified in the literature on health information systems per se, which may reflect that the introduction of electronic health records is fairly new and patchy, with limited evaluation of these systems available to date. The main focus of the literature in this building block was on the establishment and role of planning organisations and structures, as well as on the use of health information for planning.

The establishment of the PHNs signify a trend towards more decentralised planning systems which aim to enable planning based on local needs and characteristics. Commissioning of services may mean that health plans can be adapted to the needs of local places; for example, the WA Primary Health Care Alliance states that commissioning aims to improve alignment between the stated priorities of organisations and the needs of communities which they serve (WAPHA, 2019b).

Community-focussed planning approaches are showcased across the north in the form of Aboriginal, and Torres Strait Islander, peak bodies, such as the Kimberley Aboriginal Health Planning Forum (KAHPF, 2018). KAHPF strives towards being the collective voice for the regional planning, coordination and advocacy of key actions required to

deliver high quality comprehensive, culturally responsive primary health care services to Aboriginal people in the Kimberley (KAHPF, 2018).

Health system organisations across the jurisdictions regularly publish strategic planning documentation and annual reports. The PHN needs assessments also provide valuable information for strategic planning and reporting in the north. The establishment of new planning fora were also profiled, such as the Social Determinants Summit convened in May 2018 by the Miwatj Health Aboriginal Corporation in east Arnhem Land, which aimed to share examples of programs that address the social determinants of health and shift thinking from mainstream approaches to the "Yolgnu Way" (Schmidt, 2019). The Aboriginal Remote Housing Forum held in Darwin in March 2015 was also a cross-sectoral planning initiative that brought together community leaders and Aboriginal organisations from across the NT to discuss housing management and planning challenges and opportunities (Bisset, 2015).

Several research studies showcased innovative approaches to planning. For example:

- An action research project that involved development and demonstration of a model of health workforce planning in Cairns and two rural communities (Mareeba and Yarrabah; Panzera et al, 2016) demonstrated that needs-based regional health workforce planning can be achieved successfully through participatory processes with stakeholders. The study highlighted the benefits of participatory planning, involving systems-thinking and creativity unbound by current funding or governance streams or disciplinary silos;

- A geospatial approach to data analysis was found to assist primary health-care clinics and outreach providers to better understand who accesses their clinics, and to improve service delivery and regional planning (Panaretto et al, 2017);

- An evaluation of the Chronic Conditions Management Model (CCMM) in the NT (Burgess et al, 2015) found that the model led to substantial improvements in preventive care for cardiovascular disease in the primary health care context;

- An electronic data management system ("Communicare"), implemented in the delivery of health services to the Fitzroy Valley in WA, was found to be a feasible way to establish population health indices, particularly for chronic diseases for the remote health service with minimal expenditure (Davis, 2015); and

- Results from multiple economic analyses (e.g. Jacups et al 2018; Gorham et al 2019; Burns et al 2017) demonstrate the benefits of economic evaluations in providing accurate assessments of the true costs of specific service models which

20

can assist in health service planning including budget allocation.

Some studies reported challenges relating to health service planning include the ageing population in the NT (Lowe et al, 2019), significant limitations in oral health data for Aboriginal and Torres Strait Islander children (De Silva, 2016), and, broadly across the policy literature, limitations on data sharing and systems interoperability.

Essential Medicines and Technologies

Summary:

Multiple studies in the Essential Medicines and Technologies building block examined tele-health models of service delivery, overwhelmingly highlighting their value as models that meet patients' preferences in terms of minimising travel, while at the same time providing equivalent care at reduced cost. An added benefit of telehealth models was demonstrated in rural workforce development through tele-supervision.

However, the literature also described some limitations to the use of telehealth for some conditions and in some contexts, suggesting that telehealth should be utilised as a component of (rather than replace) community-led comprehensive health service models.

Studies about essential medicines and related medical products focussed on access issues, including multiple barriers to accessing treatment in different settings across the north.

Opportunities for further work/investigation:

- Scale up of, and limits to, digital and telehealth services for both service delivery and health workforce development across vast geographies. This may involve mapping of availability of telehealth capability across the north and support for implementation trials of telehealth initiatives in a wide range of locations and populations.

- Investigating barriers and implementing solutions to medicines access (including stability in climatic extremes) in remote communities, as well as cross-jurisdictional differences in medicines handling, prescribing and distribution.

- Exploration and evaluation of point-of-care testing to improve quality of care and reduce preventable hospitalisation, and potential scale-up of proven technologies.

Detailed findings:

The literature in this building block addressed both access to medicines and the role of

21

technological innovations in improving health care particularly among rural and remote patients. A multitude of studies conducted in different service contexts evaluated telehealth models for treatment, service access or workforce development; these studies all found telehealth to be a feasible, safe, acceptable and cost-effective delivery method from the perspective of both service providers and patients. There is substantial emphasis across the northern jurisdictions on the benefits of digital and telehealth models of care which is translating into increased use of innovative communication technologies in healthcare across the north.

However, some key limitations to the overall effectiveness of digital and telehealth have been addressed in the literature, including the need for adequate rural health care resources (including local health workforce), infrastructure (including technical support), training and governance arrangements, as well as the nature of its use in specific contexts. For example, one study about the logistical challenges of conducting an outreach, secondary prevention program for adults discharged from Alice Springs Hospital following an acute presentation of cardiovascular disease (Tuttle et al, 2016) found that technological solutions do not address the key issue of the individual's hesitation to use health care services. The study found that isolation in itself is not the only reason that Aboriginal people in Central Australia do not engage with health care; and that more policy attention is needed on how Aboriginal populations engage with and value services.

Studies relating to access to medicines and treatments include a study assessing the feasibility, compliance and toxicity of concomitant chemo-radiotherapy in head and neck cancers in the NT (Gupta et al, 2017); and studies on the efficacy and cost-effectiveness of point-of-care testing for diagnosis and treatment management (Guy et al, 2018; Spaeth et al, 2016; Spaeth et al, 2018). Like the tele-health studies, these studies highlighted the benefits of this technology in bringing treatment closer to home for patients.

A review of the use of the Royal Flying Doctor Service (RFDS) Medical Chest Program within Qld (Cherry et al, 2018) found that the medical chests remain a vital tool for medical care of remote populations and the need for telehealth medical advice remains unchanged, although fewer items are being dispensed. A notable initiative impacting on medicines access in northern Australia is the "QUMAX" project which is a collaboration between the Pharmacy Guild of Australia and the National Aboriginal Community Controlled Health Organisation (NACCHO) that aims to improve access to medicines and pharmaceutical advice (NACCHO, 2016). This project has since been followed by the "IPAC" trial of pharmacists in ACCHS, profiled elsewhere in this report.

22

Some studies reported key barriers to treatment, including:

- Low levels of knowledge and understanding of insulin treatment among a group of adults with poorly controlled diabetes in the Torres Strait islands (Taylor et al, 2016);

- Difficulties accessing reimbursement for Hepatitis B treatment in the Torres Strait Islands, which is only available from specialist services (Anderson et al, 2016);

- Deficits in existing registration and recall systems, the pain of injections, and varying perceptions of locus of responsibility in secondary prophylaxis delivery for rheumatic fever and rheumatic heart disease in far north Qld (Chamberlain et al 2016); and

- Limited external validity of clinical trials which needs to be addressed to better translate improvements in congestive heart failure therapeutics into clinical practice in the NT (Iyngkaran, 2015).

Financing

Summary:

Literature in the Financing building block highlighted the significant cost pressures facing the northern Australian health system relating to vast distances, chronic disease burden, ageing population, new technologies and ageing infrastructure.

The literature, overall, highlighted that strengthening comprehensive PHC is one of the most effective strategies for both improving health outcomes and containing health care costs.

Some studies offered critiques of current funding schema that reward volume over value (activity throughput rather than high quality care, which disadvantages smaller population centres with higher health needs) and highlighted a need for financing models to reflect not only disease burden and cost but also the notion of a "minimum equitable viable service". This is particularly relevant in small rural and remote communities where Medicare funding is inadequate to sustain services.

Opportunities for further work/investigation:

- Evaluation of the limitations to current financing systems and identification of options to improve them, including investigation of alternative resource allocation formulas and payment systems for comprehensive PHC that compensate for value rather than volume; taking into account the important role of social and cultural

determinants in overall high burden of disease, and the costs of service provision in the north.

- Economic analyses showcasing economic returns from improving health in the north, especially the value of investments in PHC and primary prevention.

- Exploring opportunities for cross-sectoral community-level funding – allowing more integrated responses to needs in environmental health and other social and cultural determinants.

<u>Detailed findings:</u>

There are significant cost pressures facing the northern Australian health system related to chronic disease burden, ageing population, new technologies and ageing infrastructure. Per capita spending on health is higher in parts of northern Australia: in 2017-2018, the average per capita spending on health in the NT was $10,857 per person compared with $7,485 per person nationally (AIHW, 2019). Rising preventable hospital admissions across the north are a leading driver of rising costs.

Key infrastructure challenges include ageing facilities, lack of national infrastructure planning in health and housing, the need for upgrading information and communication technology infrastructure and services, and the requirement for infrastructure investments to support prevention services in such areas as accommodation, health centre space and transport. The Close the Gap report from Qld identifies lack of a national plan to address both health and housing infrastructure (Holland et al, 2017).

A study on the economic benefits of eliminating Aboriginal health inequality in the NT (Zhao et al, 2016) found the excess cost[5] of the Aboriginal health gap to be around $16.7 billion for the five-year study period, equivalent to 19 percent of the NT gross state product. The excess costs associated with the health gap included 22 percent caused by higher health expenditure for servicing the gap, 35 percent attributable to lost productivity caused by illness, and 43 percent associated with lost life-years. The findings highlight the long-term potential economic benefits of the Australian governments' Close the Gap initiative for the NT. Although similar studies were not identified for northern Qld and WA, the higher disease burden among Aboriginal and Torres Strait Islander peoples living in the northern regions indicates potential for comparable economic and social returns from closing the gap.

---

[5] "Excess cost" in this study was defined as the cost differential for Aboriginal health care and was estimated by calculating the difference between: actual expenditure on Aboriginal health care; and the estimated expenditure if the per capita costs were the same as for non-Aboriginal residents in the NT.

The literature also highlights that strengthening comprehensive PHC is one of the most effective strategies for improving health outcomes and containing health care costs. The literature demonstrated clear differences between the Medicare Benefit Schedule (MBS) fee-for-service "walk in walk out" models of primary care, and the strategic intent of resource allocation for population-based comprehensive PHC as commissioned through PHNs and implemented in ACCHS models. Indeed, the focus of the MBS "almost entirely on medical professional services" (Commonwealth of Australia, 2009) has likely disadvantaged transitions to comprehensive models of PHC.

Recent implementation of a new MBS item number for dialysis treatment in a very remote location by a nurse or Aboriginal Health Practitioner was described in two papers as having the potential to expand staffed services in remote and very remote communities (Gorham et al, 2018; Brown, 2018). However, due to the way funding of services are structured, there is potential for wide disparities in the incomes earned by doctors working in the private sector in urban areas, compared with the lower incomes of rural or public sector doctors.

A study on equitable resourcing of PHC services in very remote communities in NT (Wakerman et al 2017), involving 11 PHC sites, found a direct linear relationship between the total cost of resident PHC services and population, while cost per capita decreased with increasing population. These findings suggest that there is a minimum funding base for a PHC service in remote communities in the NT, supplemented by a capitation rate (an amount of money provided per patient per unit of time based on local costs, health needs and average utilisation of services). The authors argue that as activity-based approaches foster a biomedical, episodic and piecemeal approach to patient care, focused solely on outputs rather than quality and outcomes, they are not appropriate as the sole funding criterion for rural and remote contexts. The research findings contribute to an evidence base for funding remote PHC services that includes the safety and equity requirements for a minimum viable service.

Indeed, the development of integrated, team-based care such as the health care home or medical home, which focuses more on coordinated, holistic and population-based approaches, suggests a need for payment reforms that focus on value rather than volume (Burgess, 2016). In its blueprint for the next 10 years in the health sector in Australia, the Australian Healthcare and Hospitals Association (AHHA) proposes the development of a mixed funding formula for the health sector, whereby 25 percent of resource allocation is outcomes-based, and is initially trialled for the top four chronic diseases, risk factors or determinants (AHHA, 2017).

The policy literature also highlights the fragmentation of health service delivery and funding, which was one of the stated reasons for the establishment of the PHNs. The PHN model of funding, through commissioning of services in such areas as mental health, drug and alcohol services, integrated team care and health care homes has been described in the WA context as being a more "flexible" or "innovative" way of allocating resources (WAPHA, 2019).

A study undertaken in the Kimberley region (McMullen et al, 2017), identified 12 environmental risk factor classifications relevant to the Kimberley context and applied these in an empirical study of health service attendance. The study found that around 20 percent of attendances at primary care facilities were directly attributable to the environment, indicating that investments in environmental factors such as sanitation and hygiene, home condition, land use, air pollution and chemical exposure could substantially reduce healthcare demand. However, a baseline study of referrals to environmental health services in the Kimberley found limited understanding of environmental determinants among primary health care staff, with health most often thought of through a medical lens (WA Country Health, 2017).

Leadership and Governance

Summary:

Papers in the Leadership and Governance building block emphasised the strengths of the Aboriginal Community Controlled Health Service (ACCHS) model of community governance. However, very few of the included papers offered an analysis of the benefits or disadvantages of different governance structures or approaches outside of the ACCHS sector.

Some studies profiled initiatives, such as Academic Health Centres, that aim to create governance infrastructure to bring together different health system components within distinct geographic areas. These emerging initiatives are reported as approaches to facilitating networked health service and workforce planning to improve population health.

A key governance challenge related to fragmentation of health-related policy and planning, leading in some cases to detrimental policy changes being made without adequate consultation or evidence. Despite an apparent need for policy-focussed evaluative research, however, few quality systems-level evaluations of health-related policy were identified in the literature.

Further, despite the shared challenges and opportunities apparent across the north,

opportunities for cross- jurisdictional and international collaboration in health service and workforce governance, planning and information-sharing received little attention.

Opportunities for further work/investigation:

- Development of cross-jurisdictional networks focussing on issues such as comprehensive PHC, workforce development, Aboriginal and Torres Strait Islander employment strategies and health sector review to effect alignment between cross-agency policy and clinical care pathways and facilitate northern-Australia-wide uptake of emerging policy evidence.

- Evaluation and implementation of community-engaged models of health system governance, building on community health forum models and the strengths of the ACCHS comprehensive PHC model.

- Evaluation of health-related policy at a systems level to provide evidence to policymakers on the best use of resources for improving health outcomes and reducing health system costs.

Detailed findings:

The policy literature documented a trend towards decentralising services management through primary healthcare networks, ACCHSs and locally governed health services districts or networks such as Qld's Hospital and Health Services. As well as becoming more decentralised, leadership (e.g. board composition) is becoming more population-based in order to better address local population needs and reduce health system fragmentation. However, very few of the included papers offered an analysis of the benefits or disadvantages of different governance structures or approaches outside of the ACCHS sector.

The role of community members as agents of health governance is not highly visible, except within the ACCHS model which is a notable example of community governance. "Community control" in this context reflects both the organisational model of ACCHSs that has existed across Australia for many decades, as well as the principle that Aboriginal communities have the right to participate in decision-making that affects their health and wellbeing (Northern Territory Aboriginal Health Forum, 2009). The benefits of this model of governance is widely-recognised, with a Qld Productivity Commission inquiry into government investment in remote and discrete Aboriginal, and Torres Strait Islander, communities reporting that the key to achieving a sustained improvement in Aboriginal, and Torres Strait Islander, health outcomes is to enable communities to develop solutions for themselves (QPC, 2017).

Numerous studies in this review highlighted the comparative strengths of the ACCHS model in responding to population health inequities and in providing a comprehensive model of PHC (Freeman et al, 2016; Carrol et al, 2015; Campbell et al, 2018; Ah Chee, 2019; Nattabi et al, 2018; Marley et al, 2012). One review (Campbell et al, 2018) found that ACCHSs contribute to improving the health and wellbeing of Aboriginal, and Torres Strait Islander, peoples through several pathways, including community-controlled governance, providing employment and training, strengthening the broader health system and providing accessible, comprehensive PHC. The review authors argue that it is important that the full range of pathways through which ACCHSs contribute to improving health are considered when making resource allocation decisions, but that the contribution of ACCHSs is sometimes under-appreciated. One paper compared the ACCHS model with services that include Aboriginal community members but only in an advisory role, which are less able to reflect community priorities (Ah Chee, 2019).

ACCHSs also have an important policy advocacy function and capacity which may be enabled by their independence from government. For example, the Aboriginal Medical Services Alliance Northern Territory (AMSANT) has engaged in policy advocacy in such areas as the NT Child and Adolescent Health Plan, Alcohol Policies and Legislation Review, and the NT Tobacco Action Plan (AMSANT, 2018). AMSANT has also contributed to policy discussion in relation to broader cross-sectoral issues that impact on health such as homelessness and incarceration rates (AMSANT, 2018). Also in the NT, the Aboriginal Health Forum has overseen significant progress in the development and reform of best-practice Aboriginal PHC for two decades through a partnership between AMSANT and Commonwealth and NT governments (AMSANT, 2016).

Notable new governance-related initiatives include the development of a framework to improve preventive health care in Aboriginal and Torres Strait Islander PHC settings (Bailie et al, 2017) which highlights the need for strong Aboriginal participation in PHC services (Turner et al, 2019). Studies by Carrol et al (2015) and Reeve et al (2015) report on the impact and key enablers of change in re-orienting a remote acute care model to comprehensive PHC delivery in Fitzroy Crossing, WA. The studies profile the development of a partnership between the local hospital, the leading ACCHS and the local community health centre, which was found to reduce duplication and improve service delivery. The partnership drove a change in philosophy from a reactive acute care system to a more proactive, comprehensive PHC approach.

The Lower Gulf Strategy, a partnership between the North West Hospital and Health Service, Gidgee Healing and the Western Queensland PHN aimed at providing

comprehensive PHC in the communities of Mornington Island, Doomadgee and Normanton, is also reported as an initiative that has led to decreasing emergency department presentations in these communities (Mann, 2019). An Academic Health Centre partnership recently established in northern Qld between five Hospital and Health Services, James Cook University and the Northern Qld PHN was also profiled (Edelman et al, 2018) as a strategy to improve research-informed service delivery across the northern Qld region.

A key governance challenge related to fragmentation of health-related policy and planning, leading in some cases to detrimental policy changes being made without adequate consultation or evidence. For example, Aboriginal housing policy in the NT (and across Australia more broadly) was described as fragmented and unstable, with a need identified for more robust information systems to enable evaluation of housing initiatives (Ross et al, 2006). Another study found that the withdrawal of general practitioner services over a 13-year period in Tennant Creek resulted in an immediate and sustained doubling in quarterly aeromedical service use, with subsequent replacement of general practitioner services having little effect (Haren et al, 2015).

In general, there were few quality evaluations of service models or policy at a macro level, indicating an important gap in the literature. Where evaluations had been undertaken, they offered constructive advice to policymakers. For example, two studies (Clough et al 2016; Clough et al, 2017) examined the health and social effects of Qld's Alcohol Management Plan policy in rural and remote Qld finding that the policy has had favourable effects, with ongoing risks warranting retention of the alcohol restrictions more or less in their current form for the foreseeable future in Qld's Aboriginal, and Torres Strait Islander, communities.

The policy literature also demonstrated limited networking of health strategy across northern Australia, meaning that jurisdictions mostly manage common problems in isolation. Although there are historical and political reasons for the jurisdictional separation, there is also a strong case for the establishment of cross-jurisdictional models of health services and workforce governance, with potential benefits including improving efficiency and effectiveness, building new capabilities, reducing duplication, and identifying shared opportunities for new initiatives (GNARTN, 2014). Determining an approach to cross-jurisdictional partnership in health can draw on the lessons available from past initiatives. For example, an evaluation of the Connecting Healthcare in Communities (CHIC) initiative in Qld, which aimed to establish formal partnerships in the primary health care sector to improve health care and outcomes, emphasised that partnership approaches to system-level change should have: a clear and documented

purpose, be inclusive, articulate roles and expectations of members, establish key positions and develop transparent and inclusive decision-making processes (Australian Institute for Primary Care and Ageing, 2011).

The use of Remote Primary Health Care Manuals in clinical settings in both the NT and northern WA and the processes used for their locally based review also provide a useful example of cross-jurisdictional collaboration focussed on health needs of northern populations (Central Australian Rural Practitioners Association, 2017).

Community Engagement

Summary:

The addition in this report of Community Engagement to the six WHO building blocks resulted from identification of many papers that highlight the importance of community participation or co-design in planning and decision-making.

Many of the papers mapped to this additional category address cultural preferences and approaches to health and wellbeing among Aboriginal peoples and Torres Strait Islanders, which in many instances are not being reflected in dominant, biomedical models of health care.

Community engagement issues are also addressed throughout the other categories; in Leadership and Governance, for example, degree of community engagement is identifiable on a continuum from passive feedback platforms to active community control of governance structures.

Opportunities for further work/investigation:

- Building understanding of community experiences of health, wellbeing and illness into policy and practice.

- Testing the applicability of various participatory planning strategies and approaches in different contexts.

- Implementation of wellbeing models in PHC planning, practice and evaluation.

- Evaluating best practice processes and impacts of community engagement strategies.

- Evaluation of workforce implications of community-led health care models, including the role of Aboriginal and Torres Strait Islander Health Workers and Health Practitioners.

<u>Detailed findings:</u>

The Community Engagement category was added to the review to capture and describe community-focussed issues in the literature. Most strategic plans and policies express the intent to engage with individuals and communities through management mechanisms, governance models, service delivery or "consumer" feedback processes. Overall, the degree of community engagement as described in the literature can be identified on a continuum from passive feedback platforms to active community control of governance structures (see Leadership & Governance).

A fundamental need was identified in the literature for health services to be delivered in a way that values and respects cultural rights, views and values of Aboriginal, and Torres Strait Islander, peoples across the north – a principle outlined in the NT Health Aboriginal Cultural Security Framework 2016-2026 (NT Government, 2016; NATSIHWA, 2017). The ACCHS model of health service delivery was widely recognised as an exemplar, adopting an approach to healthcare that values culture, spirit, country, family, community and language as critical determinants of physical, social and emotional health and wellbeing of Aboriginal, and Torres Strait Islander, people (KAPHF, 2018; QAIHC 2010).

Overall, inclusion of local community priorities into health policy, planning and implementation was recognised as important in the policy literature, however effective implementation of such aims into practice is often lacking. For example, a report on the roll-out of the National Disability Insurance Scheme (NDIS) in Aboriginal, and Torres Strait Islander, communities in Qld and the NT found significant issues in the on-the-ground implementation of the NDIS, particularly in remote locations, with fly-in-fly-out service providers often having little or no experience working with the communities in these settings (Ferdinand et al, 2019).

The research studies mapped to this category were focussed on the cultural preferences and approaches to health and wellbeing for Aboriginal, and Torres Strait Islander, peoples. One study developed a wellbeing model for Aboriginal and Torres Strait Islander peoples living with chronic disease with participants from NT, Qld and WA (Davey et al, 2017). Two core values – upholding peoples' identities in connection to culture, spirituality, families, communities and Country; and culturally safe PHC services – were identified as fundamental aspects of appropriate care. These values permeate all four key elements of the model – locally defined, culturally safe services; appropriately skilled and culturally competent staff; responsive, holistic care throughout the lifespan; and best practice care to address local needs. The outcome of the

collaborative effort is a Framework to guide primary healthcare services to develop locally relevant, flexible approaches to care which can respond to communities' and individuals' varied understandings of wellbeing.

A social and emotional well-being framework from western Qld highlighted the importance of adopting a "strengths" approach to health, finding that many existing frameworks in health focus on "deficits" which indicate only what is wrong or weak about people (PHN Western Queensland, 2019). Another paper similarly highlighted the need to conceptualise health and wellbeing as multi-faceted, framing healthcare services for Aboriginal people as a tool to get people home, to keep them well, to give them an opportunity to look after their country and lead their communities (Brown, 2018). A study on the use, effectiveness and acceptance of prescribed contraception in three remote WA Aboriginal communities found high acceptability of service delivery models that use community engagement and capacity building (Griffiths et al, 2016).

A study exploring Aboriginal community and service provider perspectives of wellbeing and ways to promote mental health care access among Aboriginal people at risk of depressive illness (Hinton et al, 2015) found that Aboriginal mental health and wellbeing is perceived as multifaceted and strongly linked to cultural identity. This study highlighted the importance of social and cultural determinants in health promotion and the healing process. Significant and substantial associations between caring for country and health outcomes were identified in another study (Burgess et al, 2009). "Going country", referring to spending time on the lands where there is traditional and spiritual connections, was also identified as a key element of "staying strong on the inside and outside" in a study on the experiences of Aboriginal people living with Machado Joseph Disease in the Groote Eylandt Archipelago (Carr et al, 2019).

Some tensions were identified in the literature between cultural preferences and biomedical models of health care. For example, a review of six practice manuals pertaining to maternal health care for pregnant Aboriginal women in remote NT (Ireland et al, 2015) found that the manuals demonstrate the use of predominantly scientific and clinical logic to sanction birthplace. The study found that planned birthplace choices have declined over time, with hospital now represented as the only place to give birth despite Aboriginal women's longstanding requests.

A similar finding was reported in a critical discourse analysis of policy documents informing maternity services policy and scholarly literature on the birthing experiences (including the provision of maternity services) of Aboriginal Australian women from remote communities from an Aboriginal standpoint (Felton-Busch and Larkins, 2019).

This study found that policy texts give voice and value to medical and maternity service practitioners and policymakers while simultaneously silencing the voices of Aboriginal Australians that pose a challenge to that power.

In a study on the barriers and solutions in the return of Aboriginal patients to community for end-of-life care at Top End Palliative Care Service (Waran et al, 2016), the authors found that a core consideration in the care of Aboriginal people at the end of life is their place of death: for many Aboriginal people from rural and remote areas, the need to 'finish up' on country is paramount. A similar NT study, reporting the preference of elderly Aboriginal people to remain "on country" at end of life (Bell et al, 2015), highlighted the need for health care delivery for Aboriginal people to occur under the direction of the community itself and be specific to people's values and practices, yet flexible enough to cater for individuals. This study cautioned that notions of "cultural safety" in health care models may not adequately cater to patients' needs and preferences.

Aboriginal peak bodies across the three jurisdictions provide a strong voice for Aboriginal, and Torres Strait Islander, people in regional service delivery, research and policy. For example, the Kimberley Aboriginal Medical Services Council and KAHPF have led the long-standing production of the Kimberley Chronic Disease Protocols, the Kimberley Maternal and Child Health Protocols and the Kimberley Standard Drug List (KAHPF, 2019). One current study, initiated by Aboriginal communities of the Fitzroy Valley in Western Australia, aims to provide a voice for remote-dwelling Aboriginal people of the Fitzroy Valley about health research, to ensure that research is conducted to embody respect for Aboriginal culture and values (Fitzpatrick et al, 2017). There are numerous other examples of locally led research designed to meet local health needs underway across the north – some of these projects are profiled in the section on research investment below.

3. Export and demand analysis

This analysis explored potential export investment and export income- generating opportunities for the health sector in northern Australia, drawing from a literature search on Australian government websites and analysis of a body of work developed by the project team.

Based on an analysis of demand from the Asia Pacific region and northern Australian capability, there is potential for cross-institutional partnerships to be fostered between northern Australia and neighbouring countries focussed on improving health and biosecurity. There is considerable untapped potential (economic, promoting and supporting regional cooperation, and in terms of health security) in investing in two-way learning between northern Australia and neighbouring countries. Northern Australia and neighbouring countries have experiences and expertise that could be shared to benefit both populations, and as such investing in development and support of the northern Australian health workforce and joint research on priority issues could potentially bring broader benefits to the region.

Health education, research and knowledge sharing partnerships across the region were broadly supported if approached from an ethical perspective. However, widespread concerns were expressed in the consultation phase of this project that a discussion about export income generation opportunities involving health may be premature given the extent of unmet need in northern Australia. The risks of investing in medical tourism were also highlighted in published analyses and were noted to likely outweigh any potential perceived benefits. This view was reinforced through the broad range of stakeholder consultations – especially the risk that it could divert resources away from local, high needs populations, thereby worsening the present health services availability in northern Australia. The stakeholders consulted represented a broad range of health service provider stakeholder groups, but did not include business development specialists, who may have different views on the opportunities or threats of exploring exporting northern Australian health services. Exploring these views was beyond the scope of this work's accepted tendered design.

The following sections will discuss, in turn, the demand for health system knowledge and services in the Asia Pacific region, and the export income generating capacity and capability of the northern Australian health sector. This will focus initially on knowledge transfer and exchange, health workforce education services; then on health services (including medical tourism); and finally, health products.

Demand for health system knowledge and services

The health export market of the Asia Pacific is comprised of 60 percent of the world's population and has had economic growth rates in emerging economies of five percent since 2008 (Lee, 2014). Both primary and higher-level care are needed to manage rising rates of non-communicable diseases such as diabetes, cardiovascular disease and cancer across the region, and aged care and disability services are increasingly occupying the attention of policymakers.

At the same time, many neighbouring countries (and northern Australia) are managing a high burden of communicable diseases such as tuberculosis (TB), vector borne diseases and HIV; for example, one-third of the world's burden of TB, or about 4.9 million prevalent cases, is found in the World Health Organisation South-East Asia Region (WHO, 2010).

Poverty remains a major challenge – the region contains most of the world's poor, with 1.63 billion people living in poverty (Lee, 2014) and over 20 percent of people in most Pacific Island countries are unable to meet their basic needs (Adelman et al, 2014). The growth of cities and megacities across the Asia Pacific region also means that there are growing public health threats related to air quality, road traffic injury, exposure to hazardous chemicals, along with persisting environmental threats relating to safe water and sanitation (State of the Tropics, 2013; State of the Tropics, 2019).

As countries in the Asia Pacific region develop economically, health sector responses are also becoming more ambitious in their coverage and equity aims. The goal of universal health coverage has been adopted by most countries of the region, with a related focus on essential medical benefit packages, minimising financial barriers to accessing care and revitalisation of primary health care (Lin et al, 2019). Health workforce training, particularly to support the delivery of primary health care to rural and dispersed populations using rural generalist models, are thus highly valued commodities, with northern Australia recognised as hosting considerable experience. Rapid population and economic growth, urbanisation, improvements in health and changing consumption patterns are driving demand for high quality health services and systems solutions in many Asian countries (Chongsuvivatwong et al, 2011).

Export capabilities and capacity

Recognising the strengths of the health service delivery sector in northern Australia and demands of near neighbours, the Northern Australian White paper suggests that the sector has the potential to "be at the forefront of tropical health solutions, delivered both

in Australia and across the booming middle-income markets of Asia and the Tropics"
(2015).

However, health care stakeholders in the north, including public, private and other non-government service providers, express caution about the ethical implications of developing opportunities to export health services or products, in view of the unmet health needs of the northern population and already overstretched resources. Again, consulting with business development specialists and health service users more broadly was beyond the scope of this analysis, and their perspectives may differ.

To facilitate further investigation about export income generating opportunities and risks, this section groups northern Australian export capabilities into knowledge, education and training, services and products (**Figure 7**).

Figure 7: Factors influencing Asia Pacific demand for health systems outputs, and export capabilities in northern Australia

Asia Pacific demand:

Universal health coverage commitments

Health workforce development

Human resources planning

Managing ageing population and increasing burden of non-communicable diseases

Adjusting to demographic changes and rapid economic development

Communicable disease control

Environmental threats, including climate change and natural disasters

Tropical and remote area primary health care

Leadership and administration skills gaps

Northern Australian export capabilities:

Knowledge transfer and exchange in: workforce models; human resources planning and health systems administration; tropical and remote area primary healthcare; aged care; non-communicable disease management; universal health coverage

Health workforce education and training in: primary health care, rural generalism, health security, tropical health, health and disasters

Services, including: health systems advisory, research and medical tourism

Products, including: digital health technology and diagnostics; new therapeutics and vaccines

Knowledge transfer and exchange

Northern Australian institutions have a track record in rural and remote health workforce development and health system innovations, medical retrievals, disaster response, managing tropical health and developing strategies to prevent and manage chronic diseases. Considerable capability in research and research training relevant to tropical, global health priority concerns is also present in northern Australia. This expertise in researching tropical conditions of major public health importance, and how best to address them, is of great interest to other countries in the region; leveraging our existing experience may assist other nations in efforts to strengthen health systems.

Priority themes for healthcare delivery in northern Australia that are closely aligned to those of northern Australia's regional neighbours, and therefore service export income generation possibilities include: producing rural workforce; clinical (medical and allied health) generalism; innovative workforce extension models; population health competencies; skills in surveillance and response; smart use of technology including e-health; lean and networked systems of delivery; and health systems management and leadership capabilities relevant to low resource contexts (JCU, 2015).

Building from this existing capacity and expertise, northern Australia has a lot to offer other nations striving to achieve the goal of universal health coverage and is well placed to develop these areas of expertise as service exports. Examples include:

- Curricula development suited to local health and professional training needs (e.g. development of curricula for biosecurity surveillance training, and for expanding the scope of practice for health workers in underserved populations, e.g. physician assistants and nurse practitioners);

- Education and training models (e.g. sub-degree and post registration/postgraduate level course offerings that address emerging healthcare needs such as aged care and diabetes education in specific locations);

- Innovative models for clinical service, workforce and clinical pathways redesign to reduce costs and better align service with patient needs, including telehealth, medical/allied health rural generalist training pathways and delegated practice models for rural health workforce (e.g. approaches to integrating tele-health into health care within remote and overseas settings);

- Policy approaches to the implementation of key programs (e.g. approaches to legislative frameworks to create professional pathways for rural generalist clinicians);

- Concepts and practices of comprehensive primary health care, community governance, community engagement and cultural responsiveness characteristic of the Indigenous health sector in northern Australia;

- Strengthening neighbouring countries' preparedness to implement the International Health Regulations and health aspects of disaster preparedness and response (e.g. strengthening infectious disease surveillance and early detection capacity, and supporting rapid, effective national and international outbreak responses);

- Public health expertise in policy, planning, communication and monitoring and evaluation, especially in environmental health and climate change adaptation, which could leverage resources associated with implementing the Australian Department of Foreign Affairs (DFAT) 2015-2020 Health for Development Strategy; and

- Decentralised models of research capacity strengthening and support on local priority health and biosecurity issues.

As well as developing knowledge transfer services for export, northern Australia, through partnerships fostered with key institutions in neighbouring countries, can learn from service delivery and workforce experiences in the Asia Pacific region, particularly in areas such as aged care services and community health worker models.

Health workforce education, training and professional development

International education is Australia's largest service export, and northern Australia is well positioned to meet the demand for specific educational exports to the Asia Pacific region. Northern Australia has decades of experience in training a fit-for-purpose health workforce to meet the needs of northern Australian populations, with a focus on primary health care, postgraduate training and rural and allied health generalist models. Many of our near neighbours in the Asia Pacific region have expressed interest in learning from Australian health workforce training. Recent initiatives are ensuring that this educational expertise is decentralised and extends to providing a health workforce fit for the region, with graduates possessing significant global, tropical, one health and public health skills.

Export of educational services includes growing international student numbers in northern Australian institutions (either on-campus or virtually) in courses that build essential skills for workforce development in neighbouring countries. For example, James Cook University (JCU) and Charles Darwin University have both doubled

international student numbers over the past decade, with JCU hosting a Singapore campus with over 2,500 students. Quality and reputation are key reasons international students choose Australia, and northern Australian academic institutions have an opportunity to lead the nation in developing innovative educational services that are recognised globally for their excellence and relevance to the broader region. In addition, initiatives that develop and encourage international clinical placements are important for intellectual and cultural harmonisation, and as such opportunities for expansion of these initiatives should be actively considered. Regulatory and funding frameworks that enhance and support mobility of students and the health workforce are important to optimise such initiatives. Whilst the New Colombo Plan is an example of this, further investment would be welcome.

The other element is development and marketing of northern Australian health professional training and education programs to international institutions with a need for these services. These could be marketed and sold as products, or in a partnership model where northern Australian experts partner with local educators in mentoring co-delivery arrangement. Whilst individual organisations are exploring these possibilities, there has been no northern Australia-wide coordination or exploration of this capacity.

Health services

International tourism is increasingly driven by motivations such as attending sporting events, undertaking education or accessing medical procedures, as well as the more traditional motivation to take a break and to visit other destinations (Hajkowicz et al, 2013). While "medical tourism"[6] is not yet a well-defined market in northern Australia, tropical northern Qld, particularly Cairns and the Whitsundays, is already identified as one of the major Australian destinations for international medical tourists (Deloitte Access Economics, 2011). Northern Australian hospitals also directly support telehealth services in some mining communities in Papua New Guinea and Indonesia.

A 2011 scoping study on medical tourism in Australia (Deloitte Access Economics, 2011) found that the current source markets for medical tourism in Australia are Papua New Guinea and New Caledonia, with potential source markets identified as the United States, New Zealand and the United Kingdom. Major medical tourism competitors for Australia are in South East Asia, some Western European countries and Central and South America. Australia's reputation as a provider of high-quality healthcare was identified in the study as a key competitive advantage, especially as

---

[6] Medical tourism is defined as the process of patients travelling abroad for medical care and procedures, usually because certain medical procedures are less available or less affordable in their own country (Voigt et al, 2010).

Australia's higher capital and labour cost make competition on pricing alone impossible when compared to other, more established, competitor countries such as South Korea, Singapore and Thailand which also offer high quality care but at much lower prices. The study identified a few niche specialties[7] that are emerging medical tourism services in Australia, which could be further explored or developed as part of the medical tourism industry.

However, Australia faces several capacity constraints and gaps which, overall, make it difficult for Australia to compete against its major competitors, namely:

- its supply chain,

- commercial and regulatory barriers;

- market failure due to the small size of the medical tourism market;

- limited capacity of Australia's private hospital system to accommodate medical tourism: in Qld, for example, which is identified as one of the major medical tourism destinations in Australia, bed occupancy rates in private hospitals are increasing towards 85 percent capacity, which already leads to inefficient patient flows, regular bed shortages and periodic bed crises (Deloitte Access Economics, 2011); and

- Existing widespread skilled health workforce shortages: federal and state governments have cautioned that efforts to grow medical tourism risk exacerbating workforce shortages by encouraging health professionals from the public sector to move to the more lucrative private sector (Deloitte Access Economics, 2011).

In northern Australia, where private facilities and workforce are even more limited and stretched than in southern parts of the country, these risks are particularly cogent, and in line with stakeholder concerns.

Despite these risks, there may also be an opportunity to explore the potential benefits and risks of growing medical tourism in northern Australia, remaining cognisant of the need to avoid overburdening the health system in an equity-reducing manner. Significant investments would likely be needed in private health facilities, workforce, tourism/accommodation facilities, and networking and coordination infrastructure to

---

[7] These include: cosmetic or plastic surgery, including full body lifts following bariatric surgery and corrective plastic surgery after complications arise from procedures done in other countries; fertility treatment, in which Australia already has a world-renowned reputation; bariatric surgery or weight loss surgery; dermatology including skin cancer checks and treatment; and to a lesser extent, cardiac surgery such as coronary artery stenting.

40

ensure capacity is able to meet demand. Importantly, efforts to build the industry would need to ensure that public health services are able to retain skilled staff and that profits are redistributed back to the Australian health and tourism sectors, rather than to offshore private hospital networks. At present, however, this is not seen as a health sector priority by stakeholders.

Products

Health products are more consistent with the traditional commercial concept of export and encompass tangible outputs such as therapeutics and innovative technologies. There is significant potential for discovery of proteins, peptides and small molecules derived from tropically based parasites, spiders and marine fauna that show promise as novel therapeutics for treating human inflammatory and chronic diseases or as vaccine targets, which are of relevance globally (JCU, 2015). Through its development assistance program, the Australian government is also investing in the development of new pharmaceutical products and diagnostic tools for malaria and tuberculosis (DFAT, 2019), again achieving triple objectives of investing in research and development, strengthening regional health security and securing regional support through "health service diplomacy".

There are examples across the northern Australian jurisdictions of capability in e-health including telehealth technologies to improve access to care, reduce transport, and to reduce preventable hospitalisations, particularly given the high demand and related importation of such devices in such settings as Indonesia, Myanmar and Vietnam (Austrade, 2019). Point of care testing devices and systems developed and trialled in northern Australia are another example of the potential for export of medical devices along with the related management and implementation expertise.

There are opportunities for investment in Research and Development (R&D) and potential exports based on research excellence and a collaborative research culture, with broad capabilities in northern Australian research institutions and groups in tropical health and medicine, medicinal chemistry, immunology, clinical trials and public health. These research groups have access to world-class research infrastructure, unique tropical biodiversity in the natural marine and terrestrial environment which provides potential for new drug discovery, proximity to regions where tropical diseases are endemic, and the Australian foundation of a strong patent system that protects novel intellectual property. This then provides opportunities for an additional export income generating product area, capitalising on potential markets for field studies, clinical trials and research commercialisation. Australia's first-rate

facilities and quality of medical research are internationally recognised, strengthening the attractiveness of Australia's research and clinical trials environment to the growing Asian market.

Capacity and capability currently in northern Australia, including state-of-the-art laboratories and leading researchers, could be harnessed through investment in clinical trials and research networks. Leveraging this infrastructure through incentivising the relocation of relevant small and medium-sized enterprises to the north may accelerate commercialisation of these opportunities, which will also generate local employment. Additionally, government support for commercialisation activities, securing intellectual property and supporting trade agreements with regional economies may help harness this potential.

However, research-intensive regional universities/institutes lack capacity to secure intellectual property, with each provisional application costing $10,000–20,000. Funding designated to secure intellectual property for northern Australian regional research groups, and for professorial and early career capacity in northern Australia (e.g. through targeted incentives), would make a significant difference. Additionally, support from governments would be useful for leveraging grant funding for peer-reviewed competitive joint research projects that have successfully attracted international funding (e.g. from Europe or Singapore). Support could also be provided to establish a pool of suitably skilled personnel who could provide executive-level operations and management support for northern Australian health research spinouts and other start-ups. These investments would further build the export income generation capacity of northern Australian R&D.

Building and developing international partnerships

Any export initiatives would build on a strong existing base of partnerships and strengthen relationships between northern Australian and Asia-Pacific institutions and countries. Future opportunities could be explored via a consortium of northern Australian institutions working in partnership with AusTrade and state and territory government investment agencies to promote the unique capabilities of the north across the region.

Existing linkages include relationships between northern Australian academic institutions and multiple universities and governments in the Asia Pacific in education and research. For example, the National Critical Care and Trauma Centre based in the NT has partnerships both nationally and internationally with Papua New Guinea, Timor-Leste and Indonesia, and is focussed on preparing the workforce in these

settings for disaster response (NT Government, 2019).

Several institutions in northern Australia, including the Menzies School of Health Research (2019) and the Australian Institute of Tropical Health and Medicine (2019) are currently implementing research capacity building and surveillance/response capacity-building projects in the Asia Pacific, in partnership with institutions in neighbouring countries. For example, the Tropical Partners Project initiative, led by James Cook University and funded through the Indo-Pacific Centre for Health Security, is working to build tropical partnerships and strengthen health system responses to infectious disease in the Indo-Pacific region.[8] These partnerships are enabling the implementation of a National tuberculosis Plan in Fiji, enhanced malaria control in the Solomon Islands and investigation of zoonotic diseases in Papua New Guinea.

Projects led by Menzies School of Health Research further demonstrate the breadth of partnerships that exist in the region. For example, Menzies plays a key leadership role in the Asia Pacific Malaria Elimination Network, including responsibility for coordinating the Vivax Working Group. The Network was established in 2009 and now consists of 21 country partners and more than 50 partner institutes. The Network acts as a platform to allow collaboration and exchange between regional malaria/vector control programs and a range of regional and international elimination partners from the academic, non-governmental and private sectors, as well as the World Health Organization.

Australia also has long-standing development assistance partnerships in the Asia Pacific region that are implemented through partner governments, non-government organisations, and global health agencies. James Cook University is part of a Qld government initiative (the Health Innovation, Investment and Research Office) and is presently involved in building the generalist medical practitioner capacity in southern China and Fiji through training of trainers.

Regional institutions such as Asia-Pacific Economic Cooperation and the Association of Southeast Asian Nations are also logical starting points for ambitious and innovative partnership projects focussed on a large and diverse sector such as health. Approaches should be cross-sectoral, cognisant of the social and cultural determinants of health, and involve cultural translation of any goods or services

---

[8] Key partners involve Australia's Department of Foreign Affairs and Trade, the Fiji Ministry of Health and Medical Services, Fiji National University, Solomon Islands Ministry of Health and Medical Services, the Secretariat of the Pacific Communities, the World Health Organisation, Papua New Guinea Institute of Medical Research, and the Udayana University in Bali.

43

exported.

Opportunities for further work/investigation

- Active investigation of opportunities in health workforce education, training and professional development and knowledge transfer and exchange, developed through both new and existing partnerships with institutions in neighbouring countries and through global partnership fora.

- Investigation of opportunities to support northern Australian universities and Academic Health Centres to grow Research and Development (R&D) partnerships with regional economies in the life sciences sector.

- Development of an ethical framework for bi-directional health system strengthening and health- related export involving northern Australia and regional neighbours.

- Investigation of current and potential exports, and delivery of medical tourism, cognisant of the ethical implications of developing opportunities to export health services or products, in view of the unmet health needs of the northern population and already overstretched resources.

4. Research investment

Investment snapshot

This section of the report provides a snapshot of some of the government-funded research activity and projects currently underway across northern Australia. Within the last five years, the major government research funding bodies for health in Australia (ARC 2019, NHMRC, 2019, MRFF, 2019)[9] spent $4.2 billion on health and medical research grants, of which just over $76 million was received by northern Australian institutions, representing less than two percent of national disbursements (**Table 1**). The expected outcomes of these research investments are new or improved medical products, services or technologies, public health interventions, and health system or service improvements.

Apart from the project-specific impacts of this research spending on northern populations, investments in health and medical research deliver more general health and economic returns. A 2018 analysis by consulting firm KPMG concluded that for Australia, for every $1 spent on research, an estimated return of $3.90 is delivered back to the population. Australia-wide, this translates to net present gains of $78 billion from 1990 to 2004: $52 billion in health gains and a further $26 billion in wider economic gains (KPMG, 2018). Furthermore, an analysis and modelling of the research work of the NT-based Menzies School of Health Research between 2002 and 2033 found that the work of the School generated $1.1 billion of total benefit and $698 million net benefit across the NT, Australia and the Asia-Pacific, with every dollar invested returning $2.70 to the economy (Deloitte Access Economics, 2015).

Although the figures in **Table 1** do not include research administered by institutions based outside of northern Australia, an analysis of the amount that southern-administered grants expended in northern Australia during the same period indicates that they would add no more than an additional 10 percent to these figures.[10] Overall, the proportion of funding received by northern institutions, and to health needs

---

[9] ARC: Australian Research Council; NHMRC: National Health and Medical Research Council; MRFF: Medical Research Future Fund.

[10] To support this, a detailed analysis of the NHMRC grants for 2019 found that northern based institutions were awarded 20 out of 768 competitive grants awarded, worth $26,165,795; or 2.96% of the total 2019 pool ($884,303,506). Whilst full budget data is not available for all grants, review of titles and summary data of the remaining 748 grants revealed only four that specifically mentioned some work in northern Australia or on issues specific to the northern Australia context. We attributed 20% of the grant value to northern Australia for these four grants, adding a potential $1,118,477. A further 18 funded grants indicated a possibility that some work could be occurring in northern Australia, so for these we generously allocated five percent of their grant value, adding a further $1,160,181. Adding this would bring the total up to $28,444,453 or 3.20% of the total 2019 pool.

contextualised for northern Australia, is well below what would be expected given northern Australia's population size (around five percent of the Australian population), its higher disease burden and proximity to the Asia Pacific region. Notably, the north has received less than one percent of MRFF disbursements since the first MRFF funding round in 2016/17.

Table 1: Health and medical research funding received by northern Australian administering institutions*, 2015- 2019

	NHMRC** 2015- 2019	ARC** 2015-2019	MRFF current grants**	Total
Health research funding received by northern institutions	70,350,773	1,419,484	4,597,340	76,367,597
National health research funding	3,535,467,324	102,008,185	574,475,970	4,211,951,479
% funding received by northern institutions	2.0%	1.4%	0.8%	1.8%

Notes:

NHMRC = National Health and Medical Research Council; ARC = Australian Research Council; MRFF = Medical Research Future Fund

*Northern-based administering institutions used in this analysis: Charles Darwin University, James Cook University, Central Queensland University and Menzies School of Health Research. Southern-based institutions that may include research sites in the north were not included as it is impossible to accurately quantify this with publicly available figures.

**NHMRC data were obtained from the NHMRC website, from the following spreadsheets accessed on 11 February 2020: "All Grants 2009 to 2018 updated May 2019" and "Summary of the results of the NHMRC 2019 Grant Application Round - Updated 07/12/2019". ARC data were obtained from the ARC Data Portal for grants commencing 2015-2019 within Field of Research Code 11. MRFF "current grants" refer to grants announced and under contract since 2016-17, as updated on 30 September 2019

As a result of the Our North Our Future: White Paper on Developing Northern Australia, there are two funding sources that target research in northern Australia. These are the Cooperative Research Centre for Developing Northern Australia (CRCNA), funded by the Department of Industry, Science, Energy and Resources (current health investments totalling $949,534)[11] and the NHMRC-funded Hot North Collaborative. Coordinated from Darwin, Hot North (grants totalling $5,997,915)[12] is an excellent example of cross-jurisdictional health research capacity and network

---

[11] The health-related CRCNA grants refer to two projects: this Situational Analysis ($149,534) and a project to implement retinal screening in remote communities using a telehealth platform ($800,000): https://crcna.com.au/research/current-projects
[12] The NHMRC Hot North grant is included in the NHMRC data column in Table 1.

building, and to date has 89 health research projects, fellowships and scholarships (Hot North, 2019). These initiatives represent important research capacity-building efforts in northern Australia and are further profiled below.

The Lowitja Institute Aboriginal and Torres Strait Islander Health Cooperative Research Centre also has most, but not all, of its partners in northern Australia. Other important research capacity-building initiatives include the establishment of Academic Health Centres[13] in northern Queensland, Central Australia and the Top End, which represent efforts to bring health service delivery organisations, universities and research institutes together to integrate and enhance service provision, education and research within specific geographic regions. Two of these (the Central Australia Academic Health Science Network in Central Australia and the Tropical Australian Academic Health Centre in northern Queensland) have been formally recognised by the NHMRC as Centres for Innovation in Regional Health. The Kimberley also demonstrates strong leadership in community-led research capacity building, with the Kimberley Aboriginal Health Research Alliance due to be launched in the coming months.

A total of 86 research grants and fellowships from the ARC and NHMRC (including 11 equipment grants) were administered by northern-based institutions between 2015 and 2019, representing a total investment of $71,770,257. **Figure 8** classifies this funding into four research categories: Biomedical Research; Clinical Research; Health Services Research; and Social, Cultural, Environmental and Population Health Research.[14] A fifth category shows the proportion of funding for equipment grants.

Around 60 percent of funding was for projects classified by the research team as being either Biomedical or Clinical Research, which includes pre-clinical studies and research on, or for the treatment of, patients. Around 30 percent of funding was for projects in the category of Social, Cultural, Environmental and Population Health Research, which were largely focussed on addressing risk factors for disease among northern population groups and studies describing epidemiological trends.

---

[13] Academic Health Centres are relatively new initiatives in Australia that are built around a "tripartite mission" of service delivery, education and training, and research. Although there are many different governance models, most Academic Health Centres in Australia are structured as collaborations between health service delivery organisations, universities and research institutes that operate within a defined geographic area. Enhancing and accelerating the translation of new knowledge and discoveries into clinical practice and patient and population health outcomes is a key aim. Academic Health Centres in the north of Australia include the Central Australian Academic Health Sciences Network, Top End Academic Health Partners, and the Tropical Australian Academic Health Centre.
[14] These classifications are used by the Canadian Institutes of Health Research http://www.cihr-irsc.gc.ca/e/48801.html

The smallest proportion of funding (11 percent) was for projects in the category of Health Services Research, which includes studies focussed on efficiency and effectiveness of the healthcare system, potentially highlighting underinvestment in policy-focussed evaluative research on health system functioning in the north.

Figure 8: NHMRC and ARC grant funding received by northern Australian institutions, % by research type, 2015- 2019
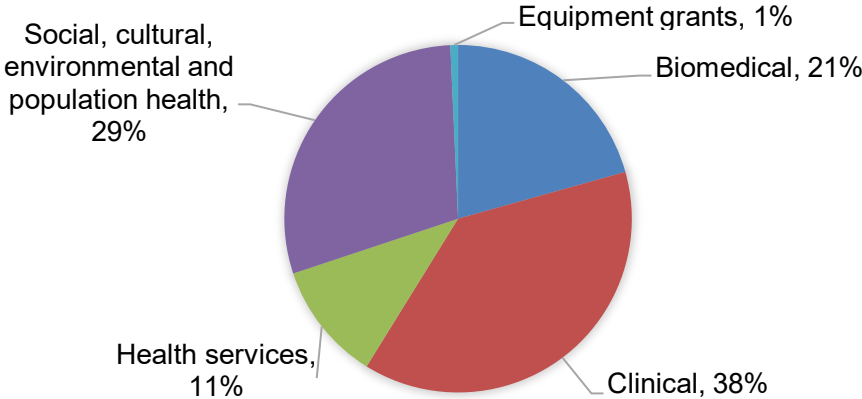
More research investment is needed to address the persisting systems challenges that contribute to the higher disease burden in the north, particularly targeting rural and remote populations. This investment must be northern led to ensure that the contexts and realities of the north are properly understood and to facilitate rapid implementation of findings into practice and policy. Findings from consultations also indicated a degree of fatigue associated with southern-led research which is often undertaken from a deficit point of view. When northern researchers and organisations are engaged (if at all) as associate investigators, they are often not properly resourced to interrogate, manage or oversee the research, strengthening the case for research to be driven and led by northern institutions.

A vast array of projects exists in the north and it is important that the excellent quality of health and medical research undertaken by institutions head-quartered in northern Australia are recognised. For example, Charles Darwin University, through the work of Menzies School of Health Research, achieved the highest ranking of 'well above world standard' in the 2018 Excellence in Research for Australia assessment for Medical and Health Sciences Research (Field of Research 11). Similarly, James Cook University achieved an above world standard ranking in Medical and Health Sciences, with particular strengths in Medical Microbiology and Public Health. Both organisations

are recognised leaders in research capacity strengthening across the north. For example, James Cook University, through the Australian Institute of Tropical Health and Medicine, hosts the nationally recognised cohort doctoral studies scheme. The scheme is a respected model for supporting clinicians, who remain embedded in health services across the north, to conduct research higher degrees with minimal time away from their posts on topics relevant to their local health services.

A selection of northern Australian research projects, currently underway, are profiled below including their anticipated impacts on health service delivery and workforce in northern Australia. These projects were selected for their participatory design and clear potential to address some of the key challenges and opportunities identified in the broader Situational Analysis. Although not profiled here, many other high quality and impactful projects are also underway across the north.

Examples of northern Australian research projects and initiatives

The Apunipima Early Childhood Early Intervention (ECEI) Support Program

Apunipima Cape York Health Council is partnering with the National Disability Insurance Agency (NDIA) to deliver Early Childhood Early Intervention (ECEI) services for 11 Aboriginal Cape York communities and Apunipima clients residing in Weipa and Cooktown in far north Queensland. Apunipima's planned service delivery of ECEI services is structured around engagement with families and carers with the aim of achieving outcomes that reduce need, build capacity and support a child to live a normal life and achieve their goals. Services include functional assessments, short-term, targeted speech and occupational therapy, information about local community and mainstream services, support for families and carers, and assistance to access the National Disability Insurance Scheme for those children who may need longer-term support.

The goals of the Apunipima-NDIA partnership are to provide ECEI supports and work collaboratively with key community stakeholders to improve the health and wellness outcomes for the families and children 0-6 years by:

- Providing a culturally appropriate early intervention program for children and parents;

- Delivering services from a range of settings including within the health facility, home and community environments; and

- Working in accordance with evidence based best practice and the 'Apunipima

Model of Care'.

The Apunipima-NDIA partnership will deliver a two-year pilot, providing a multidisciplinary (allied health, nursing and medical) team linking in with existing services and programs offered in each Cape York community. The team will undertake assessments community by community. They will then split into smaller units, travelling weekly to provide short-term interventions to children with developmental delays. Where longer-term supports are required, the ECEI facilitator will work with families to connect to community and mainstream supports including accessing NDIS supports where applicable. The ECEI outreach team will travel to all Apunipima's remote Cape York communities and will be supported by locally employed Allied Health Assistants and Aboriginal, and Torres Strait Islander, Health Workers and Health Practitioners.

Cooperative Research Centre for Developing Northern Australia (CRCNA)

The CRCNA, which commissioned this Situational Analysis, is investing $75 million of Commonwealth funds over ten years to support industry-led research collaborations. Research directed at health service delivery seeks to:

- Improve and support health-seeking behaviours of northern Australians by improving access to information, health care professionals, diagnostic tools, and treatment options;

- Improve the early detection and treatment of diseases through the development of new technologies which assist with the flow of information, support timely decision-making and treatment options, improve access and connectivity to existing technologies, enhance workforce skills and capability to use new or existing technologies; and

- Improve access to mental health treatment and diagnostic tools and technologies and enhance workforce skills and capabilities in delivering treatment and diagnosis.

To date, CRCNA have spent over $10 million on more than 30 research projects, two of which are related to health service delivery, representing less than 10 percent of total committed funds. CRCNA are currently in their third year of funding with investments to continue for another seven years.

Diabetes across the lifecourse: Northern Australian Partnership

Menzies School of Health Research is leading research across northern Australia to rethink approaches to improve the management of type 2 diabetes across the lifecourse.

One project within this focus is the NT and far north Qld Diabetes in Pregnancy (DIP) initiative, funded by NHMRC, with additional support from Hot North. The project partnership includes clinicians, researchers and policy makers - in both NT and far north Queensland - collaborating to inform methods of delivering evidence-based best practice antenatal and post-partum care for mothers with diabetes in pregnancy and their babies. The Partnership is developing a better understanding of antenatal and birth outcomes, as well as of challenges concerning antenatal and post-partum care in the setting of diabetes in pregnancy.

The Partnership includes PANDORA (Pregnancy and Neonatal Diabetes Outcomes in Remote Australia), a longitudinal cohort study that commenced in 2012 (in NT only). Another project within this Partnership is the Northern Australian Youth Type 2 diabetes collaboration – across the Kimberley, NT and far north Queensland, funded by the Commonwealth Department of Health, with initial support from Hot North.

Environmental attributable fractions in remote Australia: the potential of a new approach for local public health action

A recent study conducted by researchers in the Kimberley Population Health Unit in 2015 analysed the extent to which primary health care demand is attributable to local environmental health factors. The study found that, of the 150,357 reasons for attendance for patients of all ages, 31,775 (21.1 percent) were directly attributable to the environment. The study concludes that, by addressing environmental factors, 20 percent of the total primary health care demand could be prevented including a reduction of 25 percent of presentations by Aboriginal children. These findings provide a rationale and evidence base for locally based environmental health action.

Hot North (Improving Health Outcomes in the Tropical North)

Hot North is an NHMRC-funded research program led by the Menzies School of Health Research, involving a multidisciplinary collaboration between eight of Australia's leading health research organisations.[15] The aim of the program is to improve health outcomes in the tropical north through projects that link organisations, translate research into outcomes and create pathways for health professionals across northern Australia. Hot North's five core research themes are: skin health, respiratory health, antimicrobial resistance, chronic disease, vector borne and emerging diseases.

Between January 2017 and December 2019, 573 people participated in Hot North-

---

[15] In addition to Menzies, Hot North collaborators are: James Cook University, Telethon Kids Institute, Burnet Institute, the University of Sydney, the South Australian Health and Medical Research Institute, Doherty Institute, and QIMR Berghofer Medical Research Institute.

supported projects. Hot North also supported 47 research projects, 23 fellowships, 14 scholarships and 13 Indigenous capacity building training awards over this period. In addition, 15 regional workshops were held involving a total of 1,631 participants.

Hot North also supports the Northern Australia Research Network (NARN). NARN is a cross-jurisdictional collaborative network researching improvements in the health and wellbeing of northern Australians. By partnering with Indigenous Allied Health Australia to conduct collaborative research in the areas of Functioning, Disability and Health, NARN informs the delivery of community rehabilitation and lifestyle services in regional, rural and remote northern Australia, focussing on:

- Children developing well;

- Young people and adults growing well and staying strong; and

- Older people ageing well in place.

NARN comprises a small network of researchers, clinicians, health managers, Primary Health Network managers and consumers from the Northern Territory, Western Australia and Queensland; with allied health professionals forming the majority of the NARN membership.

Further funding for a similar arrangement to Hot North will benefit northern Australia by continuing and extending support for research capacity building.

Improving mental health screening for Aboriginal and Torres Strait Islander pregnant women and mothers of young children (NHMRC Partnership grant)

This study aims to improve screening for, and contribute to addressing, mental health issues during pregnancy and the first 12 months after the birth of the baby. The locally developed, culturally appropriate and user-friendly Kimberley Mum's Mood Scale (KMMS) was developed in the Kimberley as an alternative to the Edinburgh Postnatal Depression Scale and was validated against clinical assessment in a sample of 91 Kimberley Aboriginal women. Kimberley regional guidelines now recommend using the KMMS to screen Aboriginal women for anxiety and depression during the perinatal period. This project is implementing this change in policy across the Kimberley in a partnership between the Rural Clinical School of WA, Kimberley Aboriginal Medical Services and WA Country Health Services. The project is also trialling the KMMS in far north Queensland (in partnership with Apunipima Health Council), Nhulunbuy (with NT Health) and in the Pilbara region of Western Australia (with Mawarnkarra health service and WA Country Health Services).

Improving delivery of secondary prophylaxis for rheumatic heart disease in a high burden setting study

This stepped-wedge randomised trial, recently conducted in the NT, aimed to improve uptake of secondary prophylaxis among Aboriginal people with acute rheumatic fever (ARF) and rheumatic health disease (RHD) to reduce progression or worsening of RHD. The intervention in randomised clinics comprised a multi-faceted systems-based package, supporting clinics to develop and implement strategies to improve penicillin delivery, aligned with elements of the Chronic Care Model (a comprehensive system approach for chronic disease management which is the current framework for the NT Chronic Disease Strategy). Continuous quality improvement processes were used, including three-monthly feedback to clinic staff of adherence rates of their clients. Ultimately, the intervention did not improve adherence to RHD secondary prophylaxis within the study timeframe, which is an important finding that is likely to assist policymakers in determining investment priorities.

Integrating pharmacists within Aboriginal Community Controlled Health Services to improve chronic disease management (IPAC) study

The IPAC project is currently determining if including a registered non-dispensing practice pharmacist as part of the primary health care team within Aboriginal Community Controlled Health Services (ACCHS) leads to improvements in the quality of the care received by Aboriginal and Torres Strait Islander peoples. The project is a partnership between the Pharmaceutical Society of Australia, the National Aboriginal Community Controlled Health Organisation, and James Cook University, guided by a Memorandum of Understanding that outlines communication and governance processes.

The study design is an interventional, pragmatic, non-randomised, pre- and post- study with a cost-effectiveness analysis, where the pharmacist intervention is being added to standard primary health care practice within ACCHSs. The trial adopts a community-based participatory research design, to ensure clear benefits to project sites, acceptability and sustainability of the intervention within ACCHSs, and ultimately, transferability to other primary health care services. The findings of the project are likely to inform new funding streams to support patient- centred care and assist funding or commissioning bodies such as Primary Health Networks with their workforce financing decisions.

Kimberley Aboriginal Health Research Alliance (KAHRA)

The Kimberley Aboriginal Medical Services have partnered with the Rural Clinical School of WA, the WA Country Health Services-Kimberley, the University of Notre Dame

53

(Broome campus), Telethon Kids Institute and the Aboriginal Health Council of WA to form the Kimberley Aboriginal Health Research Alliance (KAHRA). KAHRA aims to improve the health of Kimberley Aboriginal people by bringing together major Kimberley healthcare services, Kimberley Aboriginal communities and research organisations. The objectives of KAHRA are:

- Aboriginal Leadership: Ensuring Aboriginal people are the leaders of Aboriginal health research in the Kimberley and Aboriginal culture is the foundation of all research practice.

- Community Ownership & Participation: Facilitating community ownership of research and the active participation of community members across all stages of the research process.

- Health Services Improvement: Facilitating and commissioning research aimed at improving the efficacy of health services and health care such as improved access, quality, staff retention and evaluation research.

- Workforce Development (Capability Building): Enhancing Aboriginal health research capability in the Kimberley across Aboriginal community members, non-Aboriginal researchers and health services staff, including by increasing the number of Kimberley Aboriginal community members working in research.

- Coordination & Collaboration: Increasing the coordination of Aboriginal health research across the Kimberley and promoting collaboration between Kimberley Aboriginal communities, researchers and health services.

- Creating Change (Translation): Ensuring the results of research are used to change what is done, whether through changes to policy or practices.

- Cultural Integrity and Research Rigour: Ensuring research in the Kimberley is of the highest quality and rigour, acknowledging that methods which incorporate Aboriginal cultural ways of knowing and doing deliver the most sustainable results.

Northern Australia Tropical Disease Collaborative Research Program

The Northern Australia Tropical Disease Collaborative Research Program was announced as a $6.8 million budget measure by the Minister for Trade and Investment in 2015 and contributes to implementing policies outlined in Australian Government's White Paper on Developing Northern Australia. The Program supports innovative high- quality research into the diagnosis, treatment and prevention of tropical disease, builds strong collaborations and capacity in the health and medical research workforce, and promotes

54

effective translation of this research into health policy and practice.

Key components of the Program are: building new research capability (including scholarships and fellowships) under the coordination of a high-quality research leadership team; focusing research on tropical diseases with a high potential impact on health in Australia and the region; promoting accelerated transfer of research outcomes into health policy and practice; and identifying opportunities for commercialising new health-related technologies and other innovations in northern Australia and internationally.

The Older Persons Enablement and Rehabilitation for Complex Health conditions (OPEN ARCH) project

More than 20 percent of the Cairns and Hinterland region's population is aged over 60 years, so research is being conducted to develop interventions to promote healthy ageing. The "Healthy Ageing Research Team" (HART) is a multidisciplinary team led by the Cairns and Hinterland Hospital and Health Service. HART focuses on clinical service delivery, healthy ageing research and community-led health initiatives for healthy ageing.

Impacts from research have included establishing a new acute care system navigation role, increased funding to expand geriatrician outreach services and development of an innovative model of integrated care for older people (OPEN ARCH), which is now being implemented in far north Qld through the Cairns and Hinterland Hospital and Health Service, the Torres and Torres and Cape Hospital and Health Service, and the Northern Queensland PHN.

Quality Improvement in Indigenous primary health care: The Leveraging Effective Ambulatory Practice (LEAP) project

The LEAP project responds to an identified priority of the Centre for Research Excellence in Integrated Quality Improvement in Indigenous Primary Health Care, involving partners from James Cook University, Menzies, the University Centre for Rural Health at the University of Sydney, University of Western Australia, the Aboriginal Medical Services Alliance Northern Territory (AMSANT), the Queensland Aboriginal and Islander Health Council, Top End Health and the four northern Australian Primary Health Networks. The project aims to develop understanding of what is needed for Continuous Quality Improvement initiatives to succeed in all services through development of a Learning Community focused on evidence-based actions to address barriers to improvement in service-identified priority areas.

WOmen's action for Mums and Bubs (WOMB): A trial of community women's groups to improve Aboriginal and Torres Strait Islander maternal and child health

The NHMRC-funded WOMB study involves a consortium of partners led by James Cook University and uses a non-randomised, cluster stepped-wedge implementation of a complex intervention to test the effectiveness of participatory women's groups in improving maternal and child health within ten Aboriginal, and Torres Strait Islander, primary care settings across northern Australia and how they operate in various contexts. The study models a two-way learning approach to research and is likely to produce new knowledge of how to facilitate improved quality of maternal and child health care in Aboriginal and Torres Strait Islander primary health care settings and how to best engage community in driving health care improvements.

Opportunities for further work/investigation:

- Investigate opportunities to grow funding and support for northern Australian led research and research capacity building initiatives focussed on priority health systems issues across the north.

- Investigate opportunities for increasing whole-of-system research, and research-focussed policy analysis and evaluation, such as in how to design policy in the context of resource, culture, geographic, demographic and epidemiologic needs unique to the north. Ensure that research capacity building is available for Aboriginal and Torres Strait Islander research, and ensure active engagement of Aboriginal and Torres Strait Islander people in ethics committees and as PI and AIs.

5. Stakeholder consultation report

Background and aim

This consultation report documents the health system-related challenges and opportunities identified by key health system stakeholders across northern Australia between 13 August and 11 December 2019. The aim of this engagement was to ensure that the Situational Analysis, initially developed from publicly available journal articles and grey literature, reflects the priorities of a wide range of stakeholders involved in delivering and planning health services and workforce across northern Australia.

Methods

The stakeholder engagement plan, developed in consultation with the CRCNA involved systematically selecting a range of health system stakeholders across northern Australia from public and private health service delivery (both government and community control systems), health agencies, regional educational institutions, local peak bodies and non-governmental organisations and local council members. These experts contributed in a range of ways, including in three Jurisdictional Expert Advisory Groups and in consultation workshops across the north as described below. Many of these local care providers and local organisation representatives have an additional role as local health system users, but on the advice of project reference and expert group members, the project team decided against broader "town-hall" style public consultations, due to a risk of falsely raising expectations and/or overburdening community members in light of several jurisdictional consultation activities that had been held with the communities within the past 12-24 months.

Consultation with health system stakeholders was undertaken and invited in four ways:

Jurisdictional expert advisory groups

Three expert jurisdictional advisory groups were established to enable participants to offer reflections and advice to the project team at all stages of the project. Membership of these groups was intended to be flexible and open to anyone interested in being involved with an interest in health service delivery in northern Australia. Potential invitees to these groups were initially identified through existing networks or from key organisations' websites and were contacted by phone or email, with additional invitees then suggested by these individuals. Invitees included a wide range of northern-based health system and community stakeholders from government and non-government health service providers, universities, research institutes, planning bodies, non-governmental organisations and regional councils.

Although not all invitees were able to participate, over 70 individuals took part in at least one of

the video conference meetings. **Table 2** shows the dates and purpose of the videoconference meetings of each of these groups.

Table 2: Expert jurisdictional advisory groups engagement schedule

Jurisdictional group	Videoconference 1: building awareness and understanding of the project (2 hrs)	Videoconference 2: seeking advice and feedback on emerging findings and workshop plans (2 hrs)	Email updates: dissemination of draft report and notes from meetings, reporting of final workshops schedule, update following workshops
Western Australia	13 August 2019	1 October 2019	October 2019 – January 2020
Northern Territory	14 August 2019	1 October 2019	
Queensland	21 August 2019	1 October 2019	

Facilitated workshops

Face-to-face facilitated workshops were held in 16 locations across the north between 25 October and 11 December 2019 (**Figure 9**). The locations, dates and number of participants in each workshop are listed in Table 4. Individuals who were not able to attend the in-person workshops (including those from very remote areas with no workshop) were invited to attend a cross-jurisdictional videoconference workshop and were also given an opportunity to call or meet with the project team individually.

Workshop participants numbered over 100 in total, with additional one-on-one meetings also held with individuals before or after workshops as needed. Each workshop was of two hours' duration, with more than one workshop scheduled in some locations to work around conflicting schedules. The workshops gave participants the opportunity to provide feedback on the pre-circulated draft Situational Analysis Report and for the team to seek advice from participants on prioritisation of project recommendations and timeframes for policy action. Feedback from participants was particularly sought on:

- The draft analysis of strengths, weaknesses, opportunities and threats;

- The draft recommendations; and

- Any work that has been done to highlight successful health sector programs and interventions (whether in northern Australia or other national/ international contexts).

Workshop and expert group participants worked in a wide range of northern-based organisations involved in health service delivery, workforce and planning in the north, including government health services, Aboriginal Community Controlled Health Services, commissioning bodies, universities, research institutes, workforce planning organisations and non-government organisations (Table 3). Across the 183 participants in workshops and jurisdictional advisory groups more than half were clinicians. These came from a variety of disciplines – medicine, nursing, allied health, pharmacy, paramedics, and Aboriginal Health workers/Aboriginal Health Practitioners. In addition council members, managers, educators/researchers and NGO representatives were involved. In line with service provision across the north, the majority worked in the public sector, followed by ACCHS, NGO and private sector. A small number of private general practitioners, pharmacists and psychologists across the north also participated.

Mirroring the approach used to convene the jurisdictional expert groups, potential invitees to the workshops were initially identified through existing networks or from organisations' websites and were contacted by phone or email, with additional invitees then suggested by these individuals. Due to the time limitations of the project, some organisations declined to participate in the workshops, instead directing the project team to publicly available documents.

Table 3: Organisations in which workshop and expert group participants were based

Apunipima Cape York Health Council	Northern Territory Primary Health Network
Central Australian Academic Health Sciences Network	Notre Dame University
Central Australian Health Service	Ord Valley Aboriginal Health Service
Central West Hospital and Health Service	Pilbara Mental Health and Drug Service
Centre for Rural and Remote Health (James Cook University)	Queensland Aboriginal and Islander Health Council
Cairns and Hinterland Hospital and Health Service	Queensland Health
Charles Darwin University	Royal Flying Doctor Service
Country Western Australia Primary Health Network	Rural Health West
Flinders University	Torres and Cape Hospital and Health Service
James Cook University	Torres Strait Island Regional Council
Katherine Regional Aboriginal Health and Related Services	Top End Health Service, Northern Territory Government
Kimberley Aboriginal Medical Service Ltd	Townsville Aboriginal and Islanders Health Service
Kimberley Mental Health and Drug Service	Townsville Hospital and Health Service
Mawarnkarra Health Service Aboriginal Corporation (Roeburne)	Tropical Australian Academic Health Centre
Menzies School of Health Research	Rural Clinical School of Western Australia
Mackay Regional Council	Western Australia Country Health Service
Mackay Hospital and Health Service	Western Australia Primary Health Alliance
North and West Remote Health (Mt Isa)	Western Queensland Primary Health Network
Northern Australian Primary Health Limited	Wunan Foundation (Kununurra)
Northern Queensland Primary Health Network	Yaandina Community Services (Roeburne)

Figure 9: Map of workshop locations across northern Australia
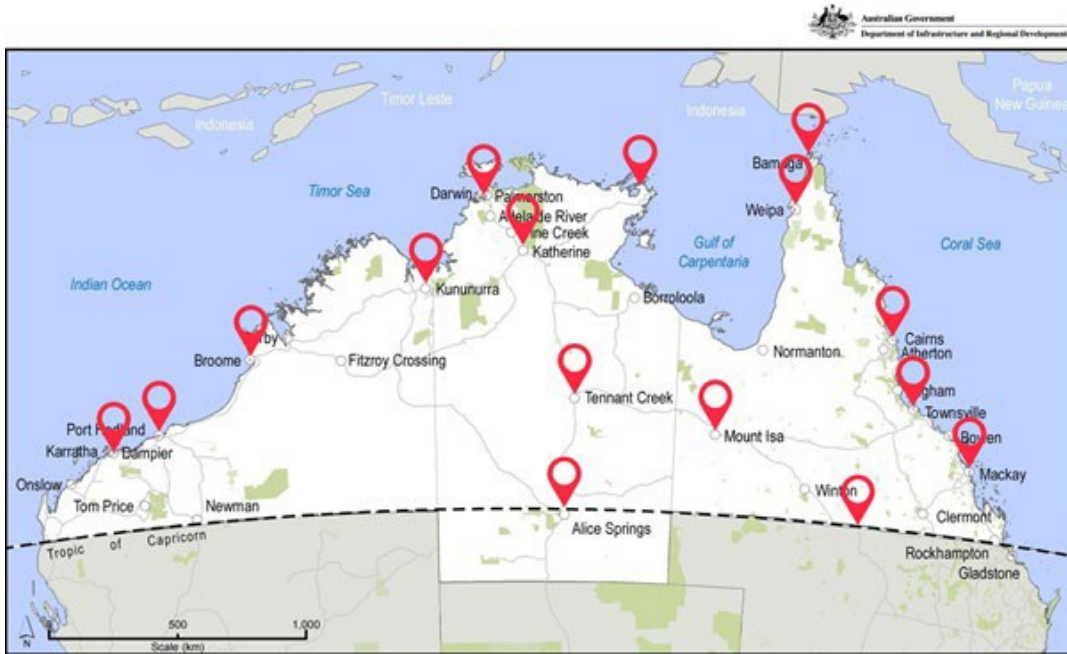
Map source: Department of Infrastructure and Regional Development, 2015, Map of northern Australia. Department of Infrastructure and Regional Development, Canberra (workshop locations overlayed).

Table 4: Workshops schedule and number of participants

Workshop location	Jurisdiction	Date (in 2019) and time	Number of participants	Number of facilitators
Mt Isa (1)	Qld	25 Oct 10:30am-12:30pm	3	1
Mt Isa (2)	Qld	28 Oct 10am-12pm	6	1
Townsville	Qld	31 October 12pm to 2pm	9	3
Mackay	Qld	6 Nov 10am to 12pm	6	1
Weipa	Qld	8 Nov 9am to 11am	4	1
Nhulunbuy	NT	11 Nov 10am to 12pm	6	1
Alice Springs	NT	12 Nov 10am to 12pm (and prior meetings)	4	2
Thursday Island	Qld	13 Nov 11am to 1pm	3	2
Darwin (1)	*NT*	*13 Nov 3pm to 5pm*	*Cancelled due to flight cancellation*	
Darwin (2)	NT	14 Nov 8:30am-10:30am	8	2
Katherine	NT	14 Nov 3pm to 5pm	4	2
Tennant Creek	NT	15 Nov 11am to 1pm	2	2
Cairns	Qld	19 Nov 10am to 12pm	7	2
Kununurra	WA	25 Nov 3pm to 5pm	9	2
Broome	WA	26 Nov 3pm to 5pm	7	3
Port Hedland	WA	27 Nov 2pm to 4pm	5	2
Karratha	WA	28 Nov 2pm to 4pm	5	2
Longreach	Qld	3 Dec 8:30am-10:30am	7	1
Virtual (using Zoom)	All	11 Dec 2pm to 4pm (AEST)	15	3
Total workshop participants			**110**	

Note: many of the workshop participants held multiple roles (e.g. clinician and researcher, Torres Strait Islander and academic, clinicians with rights to private practice).

Briefing papers

Briefing papers were prepared for northern-based Australian Academic Health Centre boards with an invitation offered to provide feedback on the draft report.

Website and virtual webinar

Information about the project, the workshops and a feedback form were made available on the Australian Institute of Tropical Health and Medicine (AITHM) website as information became available. A link to the website was sent (by email or briefing paper) to expert jurisdictional advisory group members, workshop invitees and the northern Academic Health Centre boards, with an offer made to forward the information on to colleagues. A recorded webinar introducing the project aims, commissioning body, team members and activities was also made available on the website.

Northern Australia Health Service Delivery Situational Analysis, 2020

Findings from workshops

Key issues discussed in the workshops were grouped into broad themes corresponding to the World Health Organization health systems building blocks (with the addition of "community"[16]). Sub-themes were then developed based on the conversations in the workshops.

Health Workforce

Workforce capacity

While there were many workforce strengths described by workshop participants, notably in the development of training pathways at all levels, a clear picture was presented of chronic workforce shortages and deficiencies across the north, across all disciplines and levels, and including administrative and operational roles. In many settings, service models were evolving but workforce numbers were not keeping pace with changes. Specific gaps mentioned included a lack of: general practitioners, Aboriginal Health Practitioners and social workers in Katherine; general practice obstetricians in Longreach; care coordination roles in Nhulunbuy; remote area nurses and allied health professionals across the NT; and social workers, dentists and podiatrists in Kununurra. In some places, participants felt that workforce shortages were getting worse. Workshop participants reflected that the challenge is not only that positions are not being filled by permanent staff, but that there were not enough positions in the first place – for example there are no permanent mental health positions in Kununurra.

Workforce gaps and turnover were a threat to both staff morale and patients in terms of their relationships with individual staff. From the patients' perspective, when different doctors were coming and going, *"you have to tell the whole story again"* which undermined continuity of care and trust (Tennant Creek workshop). Also, when staff are stretched, they are forced to prioritise their efforts to the *"absolutely acute"* work, rather than address risk factors or broader determinants of poor health (Kununurra workshop). In very remote areas, clinicians were described as essentially having *"no life"* due to a lack of available backfill (i.e. staff able to deliver the incumbent's clinical responsibilities temporarily in their absence). The challenges were compounded by activity-based financing models still used in larger towns in some jurisdictions, with low volumes of activity in some areas not conducive to maintaining a stable workforce (discussed further

---

[16] The WHO building blocks are: Leadership & Governance; Planning & Health Information Systems; Health Workforce; Essential Medicines & Technologies; Financing; Service Delivery; and the often-added Community Engagement.

below).

<u>Workforce models</u>

Workshop participants in all jurisdictions overwhelmingly supported rural generalist[17] workforce models across the different health professions. Existing expertise in training and use of this model was described as a key strength in the north. However, multiple challenges relating to generalist roles were described, the most widely discussed being the persistence of disciplinary silos or *"professional parochialism"*. Specifically, the professional colleges and professional registration systems were described as *"urban-biased and not suited to remote environments"* (Alice Springs workshop). Instances were described of accreditation and registration requirements inhibiting recruitment of locally trained health professionals into remote areas. Federal government policy was also described as preventing people from working to their full scope of practice in generalist roles. Other barriers included: unhelpful restrictions on using students under supervision to provide services in rural and remote areas; funding models rewarding occasions of service (described as a barrier to allied health professionals working to their full scope of practice); and the inability of non-government organisations to hire or train Aboriginal Health Workers/Practitioners to deliver services consistent with their scope of practice even where there were severe workforce shortages. Policy restrictions inhibiting staff from working to their full scope of practice were described in all jurisdictions, which limited the usefulness of remote clinical practice guidelines (e.g. the Central Australian Rural Practitioners Association (CARPA) manual).

Key opportunities included continuing to grow rural generalist pipelines in the different professions – not only in medicine, nursing and allied health but also in administration and operational roles. In allied health, generalist models needed to be more than just *"physios with a bit of other allied health sciences"* (Mackay workshop). The optimal approach to rural and remote workforce development was described in multiple workshops as *"growing your own"* – involving training local people rather than bringing in professionals from elsewhere in Australia or overseas. It was observed in one workshop that international medical graduates often lacked generalist training (as well as knowledge of context and culture) and therefore required re-training and support to work effectively in rural and remote areas. Participants in another workshop emphasised the need for similar such training of the fly- in-fly out (FIFO) workforce (e.g. locums with inner-city backgrounds). However, despite the best attempts of locally based staff, meeting training needs of all of these workforce groups was extremely challenging in the

---

[17] A rural generalist is a health practitioner who is trained to meet the specific current and future healthcare needs of Australian rural and remote communities as part of rural healthcare teams.

context of already over-stretched resources. Moreover, essential mentoring of junior staff was often challenged by the inexperience of mentors.

In some places (e.g. Alice Springs), the local workforce, involving locally-trained rural generalists, was beginning to replace the locums – but in other locations (e.g. Port Hedland and Karratha) there remained a strong reliance on FIFO workforce. FIFO workforce models were widely seen as essential to fill workforce gaps. Benefits of FIFO models included an injection of new knowledge and expertise into remote services, and a stabilised workforce if structured appropriately – for example as a permanent salaried workforce, or through use of fixed rotating rosters that fostered a good work-life balance. However, challenges with FIFO models included their potential unsuitability to (particularly female) health professionals with young families, and a risk of getting locums with limited rural experience and cultural competency. Locums may be keen, but in many cases *"they don't know what they don't know […] you can be really good at inner-city general practice but not good here"* (Karratha workshop). In practice this meant that local staff would need to make difficult decisions about whether recruiting to a short-term locum role was worth the effort given the additional training burden required.

Other models described as opportunities included "skills-share" models, workforce planning based on competencies, the role of volunteers in the workforce, greater investment in roles that involve task shifting to optimise use of available workforce, and redirecting recruitment towards chronic disease needs rather than just filling acute care posts.

Aboriginal and Torres Strait Islander health workforce

Workshop participants emphasised the importance of growing the Aboriginal, and Torres Strait Islander, health workforce – involving both Indigenous and non-Indigenous people working in a range of health professional roles. Aboriginal and Torres Strait Islander Health Workers and Practitioners were described as a very important workforce cadre in the north but staff in these positions faced multiple challenges. One challenge was the structure of Aboriginal and Torres Strait Islander Health Worker and Practitioner career pathways, which included over- reliance on qualification-based registration systems and relative inequity in career/pay levels compared with other professions (e.g. nurses). Another challenge related to the community pressures often faced by individuals in these roles that involved seeing people after hours and managing community politics.

Participants observed declining numbers of individuals in Aboriginal and Torres Strait Islander Health Workers and Practitioners roles and experiences of burnout, with Aboriginal and Torres Strait Islander Health Workers and Practitioners in the NT

described as *"voting with their feet"* and exiting these roles (Katherine workshop). Other challenges included unreasonable expectations relating to Aboriginal and Torres Strait Islander Health Workers' and Practitioners' ability to improve cultural capability of the broader workforce, and in limitations to Aboriginal and Torres Strait Islander Health Workers' and Practitioners' access to essential cultural training and mentoring. In many places, there were simply not enough Aboriginal and Torres Strait Islander Health Workers and Practitioners to meet community need due to a combination of limited available positions and insufficient numbers of trained staff.

The cultural capability and responsiveness of the broader health workforce was also discussed in all jurisdictions. Participants emphasised the need for cultural responsiveness/cultural safety training for all staff, and for this to be provided by local elders. One threat described was in recruitment of people in the Indigenous health space who were more interested in building their careers than helping the community. Another threat was a shift in some places to nurse-led models that both reduced Aboriginal and Torres Strait Islander Health Worker and Practitioner recruitment and limited community access to medical doctors (Nhulunbuy workshop).

Participants recognised a need for more Aboriginal and Torres Strait Islander people in all health professional roles: *"we're graduating more Indigenous doctors now but it's not enough"* (Katherine workshop). This was described as essential for both workforce stability and patient benefit – having an Aboriginal health workforce *"means that people come to the hospital"* (Darwin workshop). The Northern Territory Primary Health Network is currently undertaking a project to map the non-clinical Aboriginal workforce across the NT which is likely to help with planning and possible competency-based training pathways from non-clinical to clinical roles.

Education and training

Health professional education and training models in northern Australia and the expertise involved in delivering them was recognised as an important strength across the north. Participants emphasised the reliance on highly skilled workforce to meet the high health needs of rural communities, which requires fit-for-purpose education and training systems. More than new grants or other resources, health services in the north need *"reasonably trained staff"* (Kununurra workshop). A key principle articulated by participants was to achieve equity of education in rural and remote areas, which needed to come with funding.

Multiple opportunities for professional education and training were identified in the workshops. These included:

- improved cultural training and education for staff working with Indigenous communities;

- upskilling for the digital future of the workplace (embedding this into both undergraduate curricula and continuing professional development);

- use of telehealth models to offer support and training to rurally-based professionals – bringing education and supervision to staff in communities;

- occupational health and safety courses, trainers and training positions;

- micro-credentialing to improve scope of service, even at the earliest level of health coaching from non- clinical to entry-level clinical roles;

- adapting nursing and other curricula to reflect local needs;

- access to training resources between the jurisdictions;

- collaborative and cooperative approaches to training across different disciplines;

- use of mandatory rural and remote placements for undergraduate students;

- better targeting of resourcing and recruitment to health professional courses most needed in rural and remote communities (e.g. nurse practitioners);

- offering appropriate and equitable accommodation for all students on placement regardless of discipline area;

- clinical schools that are multi-disciplinary (not just focussed on medicine); and

- resourcing of genuine supervision for new graduates involving partnering with communities.

In addition, opportunities were identified to better meet the "grow your own" agenda by offering training and support to school students to enter a health career.

Key challenges included:

- inflexibility of health professional colleges and accreditation bodies around recruitment and supervision requirements in remote sites;

- cost of training for smaller non-government service providers (with a strong need for adequate resources of training taking into account the resources needed both before and during training);

- expense/inconvenience associated with travelling for training;

- service providers being "locked in" to particular universities thereby limiting individuals' choice of education provider;

- northern-based universities shifting courses/capabilities to southern states;

- "poaching" of work-ready graduates by southern institutions;

- variable quality of online/distance education for some professions (e.g. allied health assistants);

- changing current workforce and supervisory models to meet changing expectations of health workforce in terms of work-life balance and conditions; and

- excessive / unnecessary credentialing requirements for remotely based professionals (e.g. in emergency medicine).

Recruitment and retention

Issues relating to health workforce recruitment and retention in the north were major discussion topics in workshops reflecting concerns about high rates of workforce turnover. The challenges were thought to be worse in the smaller, more remote towns, and in those with fewer lifestyle attraction factors; *"the best incentives are social"* (Townsville workshop). As such, participants stressed that recruitment and retention strategies needed to be multi-sectoral, involving investments in childcare, education services and broader amenities. Other key attraction factors included good managers and the ability for staff to fly out with their partners (e.g. be financially supported to visit family/friends down south): *"It's about peoples' other halves as well"* (Broome workshop). The concept of *"fly-out- fly-in"* (the opposite of FIFO) was proposed in one workshop wherein rural and remote practitioners are supported to have regular time away from their home community (Cairns workshop). The ability to offer local amenities was noted to be out of the control of the health sector and was also seen to be more challenging for towns *"without palm trees"* and those that were subject to *"boom and bust"* mining cycles (Port Hedland; Karratha workshops). In the mining locations, there was seen to be a greater risk of turnover – *"they [the health professionals] leave when their partners go"* (Karratha workshop). Boom and bust cycles also affected living costs which were not reflected in service role salaries.

There were widespread concerns about salary levels and inequities between locations, service providers, and professions and the impact of this on recruitment and retention. A broad concern across jurisdictions was that Aboriginal Community Controlled Health Services and other non-government organisations were hampered by an inability to offer

prospective staff the same salaries and conditions as the government service providers; in one location, 22 people had been recently lost from the community-controlled sector to the Hospital and Health Service (Mt Isa workshop). While the social factors (above) were seen as being more important than pay level, if there were pay inequities within the same town this caused problems. In WA, another challenge was competition for staff even within the same government organisation between different services in different towns (Broome workshop). The way that district allowances are calculated for government services in WA also inhibited workforce recruitment in some areas – for example, the rural retention grant in Port Hedland (an incentive payment for new staff) was lower than for Broome, despite Port Hedland potentially being less attractive for prospective staff. Too much pay was also an issue – encouraging people to *"come for the wrong reasons"* (Karratha workshop).

The role of infrastructure in improving recruitment and retention of staff was also discussed at multiple workshops. Specifically, there was a need for adequate housing for both students on placement and for staff across all professions. The quality of available infrastructure varied between locations in an ad hoc way – accommodation in Tennant Creek for example was seen to be great but there was *"no housing"* available in Katherine, Mornington Island or Halls Creek (Katherine; Mt Isa; Kununurra workshops). Good accommodation needed to have internet access and accommodate pets. If accommodation was inequitable between health professionals, this also caused problems: *"there is a lot of inequity – the countrymen get nothing, the nurses get houses, and the doctors' houses are the best. Aboriginal Health Workers/Practitioners still miss out"* (Katherine workshop). Participants in Broome suggested that the police and education sectors had good models that health could learn from: *"their staff only pay for utilities, not rent. They are also reimbursed for a yearly flight"*.

Participants offered a range of suggestions on how to improve recruitment and retention. At the recruitment stage, some participants felt that recruiting practices needed to be more thorough: *"we need to vet people more on the way in, with a preference for people who have been trained up here"* (Kununurra workshop). In Katherine, comprehensive recruitment processes involving yarning with community had been trialled and were effective but were not able to be sustained. Taking the time to do the extra checks that were seen to be needed before recruiting people required resources that just weren't there: *"you're desperate – you just take what's coming"* (Karratha workshop). Some participants were also cognisant of the need for re-evaluation of recruitment strategies to reflect changing workforce demographics and expectations, with current career structures seen to be based around an old-fashioned concept of a *"lifetime government*

employee" (Nhulunbuy workshop). Career pathways across multiple professions were also seen to be poorly defined, reducing the attractiveness of rural careers. In government services, bureaucratic layers and rules combined with Commonwealth and state/territory requirements and processes meant that aligning available providers, full time equivalent calculations and resourcing was extremely difficult. In one workshop, it was observed that in the NT, position descriptions did not often reflect the real scope of skills desired/required and that recruitment processes were not responsive or dynamic (Nhulunbuy workshop).

In terms of retention, some participants in WA felt that the police and education sectors had good onboarding models for new staff that the health sector should look at (Broome workshop). Alice Springs Hospital was working to enable greater flexibility for staff in offering part-time roles to support work-life balance, to avoid burn out of staff: *"that's what happens – you burn people out and they don't come back"* (Alice Springs workshop). In Kununurra, an opportunity was identified *"to tap into young working mums"* who are looking for flexible work arrangements. There was also a need identified to improve safety and wellbeing of staff, especially in remote locations. There was a general sense that existing/previous rural retention strategies such as return of service obligations and bonded schemes did not really work or were too limited. An observation was also made that many of the recruitment, retention and training issues represented challenges across all sectors – not just health. Overall, succeeding in establishing a stable workforce was a great benefit to patients: *"the single most crucial factor for patients is being here and you know people"* (Karratha workshop).

Workforce mobility

Some participants reflected on the barriers to staff mobility between jurisdictions and also between services within the same location. Cross-jurisdictional barriers were described in cross-border industrial relations, registration processes, credentialing, and police-clearance checks. Many of these caused issues even within the same region: *"people can't even move from Port Hedland to Karratha without people asking for credentialing"* (Karratha workshop). Staff mobility was described as requiring a high degree of motivation and effort, which made no sense from a patient perspective. For example, participants in Karratha felt that locums contracted by the government should also be able to work in the local Aboriginal Medical Service if needed, but the *"siloing"* between the organisations meant this was not possible. Several initiatives aimed at facilitating mobility of staff between organisations had been trialled, including an initiative in Katherine to enable staff to retain their human resources benefits between organisations, but in general these were hard to sustain. Participants generally felt that

71

work was needed to remove bureaucratic red tape to enable movement of workforce between organisations and across jurisdictions.

Health Services

Models of care

Despite the strong suite of services available in the regional centres, a clear picture emerged from workshops of service fragmentation with organisational silos playing a big role in shaping service models. A need for greater integration of services, for example effecting greater connectivity between acute and chronic services, was identified across the jurisdictions. The concept of creating "corridors of care" was a suggestion in one workshop (Townsville). Connections between the government services and Aboriginal Community Controlled Health Services were seen as important, with the degree of connection and nature of relationships between these organisations varying greatly between locations. At the time of the workshops, the government primary health care clinics/services in the Top End of the NT were gradually transitioning to community control, with a plan to create efficiencies by enabling government departments to provide essential back-office functions (e.g. procurement systems). Generally, however, across all jurisdictions there was little coordination between organisations and significant duplication of services and inefficiencies. Bureaucratic silos also hampered flexibility in changing service models – with participants experiencing *"unreasonable obstructions"* to introduction of new processes or technologies (Alice Springs workshop).

A key concern for some sites was the proliferation of non-government organisations (NGOs) coming in to deliver some component of care, but without communicating with existing services. For example, an audiology service had come into a remote WA location without identifying what existing services were being offered or how they could integrate: *"they just walked in, and they're getting so much money […] you sometimes get services inflicted on the community"* (Kununurra workshop). Despite the large amount of resources flowing to these organisations, their capacity to do meaningful work was seen to be hampered because of their narrow, specialised focus (often only clinically based not preventive) and lack of integration. A situation was described in north western Queensland wherein the government and NGO services would sometimes separately go on long drives to see the same patients for the same issues (Longreach workshop). Similarly, despite the proliferation of audiology services in Kununurra, there were population groups who were not eligible to access any of them. The NGOs even had the potential to cause harm by creating the impression that services were being adequately funded. In Karratha, multiple examples were given of programs that were being funded to

do work in the region that the existing services had no idea about: *"big organisations have big money – they write the tenders – and then they screw us over locally"*. The proliferation of these services was therefore a major threat to providing integrated primary health care, and the local services were trying their best to work with them and to coordinate services.

Many participants saw a need for greater investment in comprehensive primary health care. However, in some locations investments and activity were observed to be more focussed on hospital services (Thursday Island workshop). The role of government health service providers in delivering primary health care services in some settings was also seen to be under-recognised by governments and funders (Weipa workshop). In Longreach, the government services were seen to be leading the way in terms of viewing comprehensive primary health care as an important solution and as a core responsibility of theirs. The important role of GP services was also highlighted. However, access to GP services was hampered for some populations where bulkbilling was not available for all populations. In some locations, the non-Indigenous GP practices did not offer bulkbilling, leading to greater use of emergency department facilities that were already stretched (Katherine workshop). Accessibility of allied health services (e.g. occupational therapy, physiotherapy, podiatry, social work)[18] in the larger population centres was also an issue – for example, in Townsville, *"if you want to see a podiatrist, you have to pay"*. Other participants drew attention to the complete lack of follow-up care and rehabilitation services in remote communities: *"if you get a stroke you're stuffed […] that's why people go back to hospital"* (cross-jurisdictional VC workshop).

Another key challenge was service models that were based on a north-south logic. For example, much of the service planning in WA was done from Perth, by people with little understanding of northern issues and with little input from local clinicians: *"It's amazing how things get pushed onto us from Perth"* (Broome workshop). Examples were given of north-south patient travel models that were costly and increased risks to patients when cross- jurisdictional transfer pathways would be safer, quicker and more cost-effective (Nhulunbuy; Broome workshops). Problems with patient travel schemes were also discussed in multiple locations more generally. There was also a reliance on 'evidence-based' guidelines and standards developed in high-resourced, high-population centres down south; and an absence of evidence-based practice guidelines relevant to the health needs, culture, geographies and health workforce profile of the north (Nhulunbuy

---

[18] Allied health professionals are health professionals that are not part of the medical, dental or nursing professions. They are university-qualified practitioners with specialised expertise in preventing, diagnosing and treating a range of conditions and illnesses.

workshop). The idea of "place-based planning" – planning based on identified community needs involving key stakeholders in the community – was widely supported. Linking this in with appropriate regional referral services along "corridors of care" to provide integrated service planning is vital. The necessity of creating culturally safe services was also emphasised in all locations. The Aboriginal Community Controlled Health Services were seen to do this best and offered a model of cultural safety to the government services. The degree of uptake of services was seen as a good measure of effectiveness of efforts in this space. Interpreter services were seen as crucial, but generally under-resourced.

<u>Social, environmental and cultural determinants of health and prevention</u>

Public health capacity was described as severely under-resourced in all jurisdictions. Emblematic of the gaps were the responses to outbreaks of syphilis across the region which were delayed and poor: *"we have managed cane toads across the north better than syphilis"* (cross-jurisdictional VC workshop). The need for improved communicable disease surveillance and epidemiological capacity was noted in some locations (Thursday Island; Weipa workshops); and in other locations, an urgent need for improved non-communicable disease surveillance and response capacity (Karratha; Mt Isa workshops). Another major gap was in health promotion activities, with some locations observing a decrease in funding and support for health promotion in recent years (Mt Isa workshop). A significant gap was also identified in prevention-focussed mental health services in multiple locations, with a need identified nearly everywhere for more social workers. In general, the health system was described as being very sickness-oriented rather than prevention- and wellness -oriented: *"the preventative side of service delivery doesn't get enough focus from anyone"* (Karratha workshop).

All jurisdictions emphasised the need to address the multiple root causes of illness and disease: *"It all comes down to addressing the underlying causes. If you're not addressing the underlying causes, you're not doing enough"* (Alice Springs workshop). These root causes included: food security; community development including housing and transport; school attendance; meaningful employment; overcrowding; experiences of trans-generational trauma and disempowerment; access to reliable clean water; reliable information and communication technology services; food security; literacy and numeracy; land rights and caring for country; and responding to changes in climate: *"If you don't fix overcrowding, doing some ear surgery doesn't do any good"* (Tennant Creek workshop). Nutrition was also described as a major issue with high obesity rates in many areas. The importance of recognising systems failures rather than blaming individuals was highlighted: in the Torres Strait, for example, *"it's cheaper to buy lollies*

and coke than meat and veggies" (Townsville workshop). The same issues were described on Palm Island, with the biggest margin in shops there being on refined carbohydrates. Participants noted that while people don't cook with fresh food, they also lose cooking skills. Bringing health providers together with other sectors (e.g. housing, legal aid, disability services, Centrelink, local councils, police, education, family services) was seen as essential to address the many challenges. Wunan, an Aboriginal-led initiative based in Kununurra, has commenced work on investigating how to integrate these issues in planning and communication with government agencies.

Financing

The way that health service delivery is funded in the north was a key underlying issue shaping many of the other challenges. The problems with current financing models were major discussion points in all workshops. A key challenge was inadequate distribution and use of funding, with significant duplication and inefficiencies in the system: *"The way we do things is so expensive […] we pour money in – but there's no actual system"* (Broome workshop). At a macro level, the key challenges involved: the multiple sources of funding to multiple poorly- coordinated organisations and services *("everyone has different buckets of funding to do different things"* (Townsville workshop)); funding models rewarding occasions of service rather than quality or outcomes of care; and the often-programmatic and episodic nature of funding ("pilot-itis").

Activity-based funding models were seen as necessary in some circumstances (e.g. hospitals) but by and large were unsuited to rural and remote settings. Program-based funding had the effect of building up capacity in an important area, and then taking it away – exacerbating existing health workforce and planning challenges. For example, services in Kununurra accessed funding for staff to manage the syphilis outbreak but this ended after three years: *"but sexual health is not going to go away – it's a permanent need"* (Kununurra workshop). Longer timeframes were needed: *"To really be successful, you need 20-year programs at least"* (Katherine workshop). There were also significant concerns about how funding for NDIS services would work and whether this would increase service fragmentation challenges. Medicare was also observed to have limited benefit in Indigenous communities because it does not support the clinical work of Aboriginal and Torres Strait Islander Health Workers: *"Medicare has failed remote communities"* (Thursday Island workshop). There were also problems described with commissioning models which reward clinic-based work rather than outreach and health promotion activity; instead of doing outreach, *"you are stuck in a clinic seeing people who want to see you"* (Mt Isa workshop). Funding for patient transport was also described as severely deficient across the jurisdictions. Funding models also did not

75

often take into account the additional costs of rural/remote service delivery, which include the time and costs associated with travel.

Overall, the funding system across all three major jurisdictions was described as very hospital-focussed rather than prevention-focussed, and also based on disease groups that drive siloed activity and service planning and inhibit care coordination efforts. Participants observed too much focus on outputs rather than outcomes and stressed the need for more economic modelling to clearly communicate the cost-savings to the system of prevention-focussed activity. Communities should expect an integrated package of care, but current funding structures do not enable this. Participants also recognised that these issues had been talked about for many years but nothing was being done: *"We need population-based funding based on equitable access and outcome. None of these conversations are new"* (Port Hedland workshop). Participants suggested a number of potential opportunities to improve the system, including providers being financially incentivised to implement evidence-based prevention work, and giving local areas control of funding buckets across multiple sectors to be able to buy/commission various services for their local community. Participants suggested that the overriding principle should be *"equal care and equal outcomes on the basis of need"* (Darwin workshop). The future of resourcing also needs to be bipartisan and survive electoral cycles (Nhulunbuy workshop).

Leadership & Governance

Leadership

The importance of good management and leadership was highlighted by multiple participants. Good management improved workforce recruitment and retention but in smaller towns reliance on individuals was a risk if successful initiatives were built around the person rather than embedded in the system. A need for Aboriginal, and Torres Strait Islander, leadership at various levels was identified. A key strength in Queensland was the recent appointment of a Chief Aboriginal and Torres Strait Islander Officer within Queensland Health, but it was also noted that this one person could not solve all the problems. There was a need identified for strategies to develop and support local emerging leadership, including adequate succession planning.

Governance

While the strengths and benefits of community controlled governance models were highlighted, there were important limitations to their "control" as these services still worked to government-defined KPIs and budgets (Katherine workshop). Participants also reflected that people need to be properly trained in governance in order for these

models to be effective. The transition of services to community control in the NT and in Cape York was noted to be a complex and slow process.

<u>Cross-jurisdictional and -institutional collaboration</u>

Multiple participants reflected on the opportunities for cross-jurisdictional and inter-institutional collaboration. Participants observed that not much looks east-west, with a predominance of a north-south view. Looking across jurisdictions, participants all articulated the potential benefits of greater linkages, including in access to training opportunities, harmonisation of clinical practice guidelines, sharing of evidence-based approaches to shared challenges, and sharing data/information across the north – *"because things are more similar than different"* (Darwin workshop).

Participants reflected that a governance model of an east-west body would be difficult to determine but would learn from previous experiences (e.g. the Greater Northern Australian Regional Training Network). The potential to build this body around planning and commissioning functions was suggested, ensuring that it is focussed on outcomes rather than being *"a chat-fest that lasts for as long as people are interested and their diary is empty"* (cross- jurisdictional VC workshop). There were also concerns that the political state/territory divides involving different regulations and policies could hamper collaboration efforts – for example, there are differences across jurisdictions in alcohol management plans which impact health services (Mt Isa). Some participants saw the NT's economic arrangements with South Australia as inhibiting greater collaboration between NT and Qld (Townsville workshop). It was also noted that there is a lot of knowledge in the PHNs, and substantial potential benefit in linking them, but linking universities could be more challenging as they tend to be very competitive with each other. A suggestion was made to trial a cross-jurisdictional initiative around sharing of disability and aged care across the north (Darwin workshop). Participants also saw a need to grow the voice of northern Australia in health-related policy.

There were multiple discussions about the need for better linkages between organisations within the same jurisdictions/localities, linked to service fragmentation and workforce mobility issues described earlier. In some locations, it was observed that different health service organisations and health systems and universities were not used to working closely together, and that initiatives to bring these organisations together were relatively new (Mackay workshop). Other locations highlighted formal and informal collaborations between government, community controlled and non-government service providers in the region as a strength (Nhulunbuy workshop). In Nhulunbuy, participants noted a need for clear mechanisms for multi-agency cooperation at Territory level and

down, across sectors (public, private, non-profile) and areas (education, training, infrastructure, housing, health) to enable meaningful approaches to social determinants of health.

Community

<u>Needs of community</u>

Participants were keen to reflect on community in a strengths-based way. The many strengths of community were recognised, including Aboriginal peoples and Torres Strait Islanders being *"strong in culture"* (Nhulunbuy workshop). Participants also reflected on many unmet health needs that needed to be addressed, including mental health, youth suicide and alcohol consumption.

<u>Community participation and engagement</u>

Participants in all workshops noted the importance of community engagement and participation in health care decision-making and in building community involvement and ownership in health service delivery. However, in many locations, this was seen to be lacking: the community and local sector often *"work under the table but do not have a voice at the table"* (Mt Isa workshop). As such, a major weakness of health service delivery is *"when government doesn't listen to community"* (Tennant Creek workshop). It was observed that people often give *"lip service"* to community participation, but this was not always properly followed through and there is no transparency (Katherine workshop). Many of the hospitals across the north were seen to have little community input. Some participants felt that cross-cultural communications between health services and Aboriginal communities were severely lacking in the Pilbara (cross-jurisdictional VC workshop). In other settings, however, "community engagement" was seen as a real strength (Weipa workshop). *"Starting from the community up"* was a seen in Alice Springs to be a key principle, because *"If you don't address this, you are just rearranging the deck chairs on the Titanic"*.

Challenges experienced in effecting adequate community input were also discussed. Sometimes community members put themselves forward for positions for the wrong reasons: *"some representatives have an axe to grind"* (Karratha workshop), or some families had louder voices than others (Longreach workshop). Another problem was the assumption of some providers that involving an Aboriginal person in meetings means they have achieved Indigenous representation from all communities. It was also observed that community members tended to believe that the best model of care is a doctor in a health centre and don't recognise other ways that care could be delivered that might be better (Mt Isa workshop).

78

Medicines & Technologies

Tele-health

While all participants saw tele-health capabilities as an important and evolving service component, they stressed the need to consider it as a complement to patient-focussed local service models rather than a model of care in itself: *"we should avoid designing the system around telehealth, rather than need"* (Darwin workshop). The risk of telehealth displacing outpatient services onto small rurally based primary health care teams without appropriate increases in resourcing was one concern. Another concern was that telehealth could limit patient choice if individuals wanted to travel for health care rather than stay in their community. There was also some reluctance reported of remote clients to go into the local primary health care services to use telehealth services, especially for mental health consults (Longreach workshop). Also, it was suggested that telehealth needed to be considered as something patients can use in their homes rather than just *"provider to provider"* (Townsville workshop).

The use of telehealth functionality varied greatly between the workshop locations – telehealth services were not available in remote sites in the Kimberley for example (Kununurra workshop). In other locations, telehealth was more widely used, for example, the government health services in Central Australia support more than 200 telehealth consultations a month (Alice Springs workshop). Other key considerations in using telehealth capabilities included: its ease of use/interoperability with other systems; the need for a stable primary healthcare workforce to use it properly; training needs of staff who use it; the availability of rooms/facilities needed to support its use; possible need for interpreters in the remote sites; availability of providers outside of government services; and internet connectivity/support. Participants also felt that telehealth models should be run out of centres in the north (using the usual referral pathways/corridors of care) rather than be southern led.

Broader digital health and other technologies

In addition to telehealth, participants discussed the potential benefits of a range of technological capabilities such as home monitoring and information and communication technology in rural areas. Digital technologies were broadly seen to offer the potential to empower patients to manage their own conditions and to improve access to services (Mt Isa; Mackay; Cairns workshops). Some participants were great supporters of point of care testing devices (Tennant Creek; Thursday Island workshops) while others saw both pros and cons (Alice Springs workshop). However, the ability of government services to trial and use these new approaches were seen to be hampered by risk-averse

government departments with multiple and unnecessary rules and firewalls that even made use of basic VC systems (e.g. Zoom or Skype) difficult (Nhulunbuy workshop). Some places had little access to technology (Weipa workshop).

<u>Medicines access</u>

Access to medicines was noted to be a real challenge in many northern locations, with variability in access largely linked to degree of remoteness. A key challenge is transporting medicines (particularly vaccines) in the heat and being able to maintain the necessary cold chains. In some cases, cold chains were being duplicated by multiple providers (e.g. flu vaccine). An opportunity was identified to monitor medications transport and use across borders, and as such medicines access was seen as a cross-northern issue. Access to good quality pharmaceutical care and continuity within primary care settings was seen as important particularly for complex cases, but capacity in this area was lacking (Mt Isa workshop). Participants in some locations talked about the benefits of using bush medicines, which community members were keen to access (Tennant Creek; Katherine workshops). However, there were some barriers encountered to their use in government facilities. Health literacy was also a key issue in relation to medicines access. Further, some participants talked about PBS restrictions on certain health professionals being able to prescribe essential medicines – and inequities in the PBS spend.

Planning & Information Systems

A key concern among multiple workshop participants in all jurisdictions was the limitations of e-records systems, many of which had little inter-operability and were not fit for purpose. Some services refused to use e-records systems because of all the gaps (Katherine workshop). All WA participants reflected that the e-records systems had become worse over time, as decisions had been made by Perth-based non-clinicians to switch to systems that were less user-friendly than the previous ones. Shifting from one system to another also meant that historical data was not accessible in the new system, and there was less inter-operability with other services (e.g. ACCHSs) because the other services were still using the old system. One of the key problems was that services were *"trying to retrofit systems"* to service contexts they were not designed for (Broome workshop). In many locations, paper records were also still required. Participants reflected the systems were so bad that clinicians were still reliant on faxing to communicate: *"We'll hold into that until we get something better […] it's too hot for carrier pigeons up here"* (Kununurra workshop). Some participants felt that the e-records systems were risking peoples' lives: *"It would be a nirvana if we had a system that we*

shared. It would save lives" (Broome workshop).

Many participants talked about the limitations of the My Health Record system, which was generally seen as a positive initiative but one that had not been fully realised. Concerns about data privacy were raised by some participants, with participants in Karratha suggesting that funding be provided to better educate communities about the initiative and what their choices are. Many participants highlighted the potential benefits of linking up data and information systems across the north, including to facilitate access to important clinical data and planning for populations that regularly move across jurisdictional borders. However, participants in Kununurra talked about *"that invisible border"* (between WA and NT) creating major data-sharing problems. More broadly, opportunities were identified to map emerging trends, and to *"share a conversation about using data to work together and plan"* (Townsville workshop). The use of "big data" for planning and more widespread quality improvement in the north was seen as a big opportunity (Townsville workshop). "Seamless integration" was mentioned in Longreach as the term currently being used in Rural Digital Health Strategy and participants felt that this term was useful (Longreach workshop)

Other

Importance of context

Despite recognising many similar issues and challenges, some participants were also keen to emphasise the differences between the different communities and towns in the north. As such, models of care needed to be contextualised and owned locally in order for them to be successful and sustainable. Participants talked about demographic and cultural factors, industry profiles, and environmental factors as issues that shaped the differences. Participants felt that efforts to improve systems needed to be cognisant of the differences between communities, as well as the similarities.

The project teams' own reflections during travel for workshops supported the notion of important differences across the north, but also emphasised the many commonalities. An issue for all sites was the time and expense involved in travelling east/west, limiting opportunities for face-to-face contact and collaboration. Such collaboration may also be hindered by evident politics between organisations and sites. Key differences included the different levels of isolation and social disadvantage faced by local communities, the different economic bases of different towns, and different health infrastructure. The importance of multiple sectors needing to work together to improve health in the north was evident in all locations.

<u>Research</u>

Participants were keen for research to be considered as part of health sector capacity, and for any research efforts to be northern led. The principle was that clinicians (all professions) and researchers in the north needed to have research skills to be able to improve services for patients, and that local centres of service, research and training activity could be important hubs for recruitment and retention. However, there were major gaps in support for research capacity building, and existing workforce limitations meant that clinicians were already stretched clinically. There was a strong preference for research focussed on implementation in practice and on finding solutions to the many health service and workforce challenges: *"we need to be making sense of why we're doing stuff"* (Alice Springs workshop). Big research funders like the NHMRC were seen to be urban-biased, although some more recent initiatives, such as "Hot North" had some support as building capacity in northern researchers. However, there was also a need for support for smaller projects from rurally focussed research and rurally based clinician researchers, perhaps located in local northern hubs of service, research and teaching excellence. Initiatives to establish academic health centres (which focussed on local research capacity building) in the north were seen as positive but these did not represent everyone and there was a broad need identified for more research-focussed investment and support.

Findings from expert jurisdictional group meetings

<u>Western Australia</u>

- Participants reflected that the preliminary project findings reflect most of the key issues that come up in the region.

- Participants outlined some key health workforce challenges, including recent changes to international medical graduate policy, which have led to a reduction of this important workforce in the Pilbara region.

- Participants also discussed difficulties in recruitment and retention of staff where appointments involved short term contracts with delays sometimes experienced in contract renewal. Another workforce issue is the impact of the resources sector on health workforce numbers and recruitment/retention in terms of boom and bust cycles and implications for housing access and affordability. There is also need for discussions about a 'fit-for-purpose' workforce for rural and remote services with a generalist skillset comprising not only primary care but also competencies in many specialised areas.

82

- Participants discussed opportunities relating to place-based care and working across different providers to improve continuity of care. Participants suggested that communication across care providers needs to be facilitated by sharing of data, to help address health system fragmentation.

- Whether activity-based funding models provide the right incentives for the care models that are needed, and resourcing differences between sectors, were key issues discussed.

- Participants suggested the possibility of profiling the successful model of community-led research in the ACCHO sector. Potential opportunities could involve extending this model to research and planning in other sectors.

Northern Territory

- Participants highlighted failure by governments at various levels to adequately address social and cultural determinants of health as an important threat. Another challenge is the feasibility of the 'grow your own' approach to health workforce development in areas where populations are relatively small – highlighting opportunities for inter-jurisdictional partnerships in health workforce development and mobility across the north. Participants suggested that a paradigm shift is needed to talk about 'East to West' (and vice versa) opportunities rather than 'North to South' in areas such as professional development and evidence-based practice.

- The need for stability in health service delivery, planning and commissioning structures was highlighted. The requirement to manage multiple funding sources was also described as a current challenge.

- There was a perception expressed that the uptake of digital health records within northern Queensland hospitals had been a success and should be viewed as a strength (although this was viewed with mixed opinions among the Queensland expert group participants).

- The high burden of mental health issues in the north was discussed with an observation that there may be a mismatch between public recognition of the issue and funding flow-through.

- Re the export and demand analysis: Participants suggested that although it is important to take a strengths-based approach in noting the capabilities in the north, we should be careful to avoid translating ideas and approaches to other national and international contexts without a two-way dialogue.

<u>Queensland</u>

- Preliminary findings reflect most of the key issues in the region.

- A key challenge discussed was the need to avoid piecemeal efforts and duplication in health service and workforce policy, which affect existing capacity and capability in the sector. This also applied to education and training of the health workforce. Participants also highlighted high nursing workforce turnover as a key challenge across the region. This (Situational Analysis) project was discussed as an opportunity to unravel some of these persisting challenges.

- Participants underscored the need to address social, environmental and cultural determinants of health in the northern Queensland context. Native Title was also suggested as a key issue to consider in the SWOT analysis.

- Participants highlighted the importance of developing and supporting small place-based hubs of service, research and teaching activity as an important tool to attract and retain workforce.

- Participants suggested that emerging areas of inquiry such as absorptive capacity could be usefully applied when thinking about remote workforce capacity challenges.

- Participants reflected that the theme of 'community' runs across many of the issues presented in the draft SWOT analysis.

6. SWOT analysis

Analysis of strengths, weakness, opportunities and threats (SWOT) utilised a model developed for the health care sector that builds analysis around three pillars: stakeholder expectations, resources, and contextual developments (van Wijngaarden et al, 2012). In this model, SWOT are identified from the "confrontation" between these pillars. **Table 5** presents the results of this analysis, which builds from the desktop-based study and consultation findings.

To differentiate between different community expectations relating to service delivery, the Modified Monash Model (MMM) classifications were used to identify regions by level of remoteness. Six MMM categories are applicable in northern Australia:[19]

- MM2-Regional Centres (areas that are in, or within a 20km drive of a town with over 50,000 residents);

- MM3-Large Rural Towns (areas that are not MM2 and are in, or within a 15km drive of a town between 15,000 to 50,000 residents);

- MM4-Medium Rural Towns (areas that are not MM2 or MM3, and are in, or within a 10km drive of a town with between 5,000 to 15,000 residents);

- MM5-Small Rural Towns (Australian Statistical Geographic Standard Remoteness Area categories 2 or 3, with fewer than 5,000 residents);

- MM6-Remote Communities (remote mainland areas and remote islands less than 5kms offshore); and

- MM7-Very Remote Communities (very remote areas and all other remote island areas more than 5kms offshore).

Notably, northern Western Australia is MM6-7 only, with only Darwin and proximate townships classified as MM2-5 in the NT. While the bulk of MM2-5 regions are located in northern Queensland, large areas of northern Queensland are also MM6-7.

Although all land areas in the north are represented in the MMM categories, two additional categories were added in this analysis to take into account the different contexts of discrete Aboriginal, and Torres Strait Islander, communities and "fly-in/fly out or drive-in/drive-out populations" (FIFO/DIDO) in mining towns. As shown in **Table 5**, these contexts have different types and quanta of health service resources, which influence community expectations about service availability and access. Health service

---

[19] There are seven Modified Monash Model Categories but MM1 "Metropolitan Areas" is not applicable in northern Australia.

and policy-maker expectations are similar across the various contexts and include a focus on health service efficiency and population productivity.

Strengths largely reflect the health service delivery and education and training expertise unique to northern Australia, developed in the region out of necessity based on geographic and population factors. Other strengths were the wide range of services available, particularly in MM2 areas. Strengths also include national attributes such as commitments to universal health coverage and reasonably well-developed infrastructure, including health service facilities and equipment. Policymakers across the north are also increasingly adopting e-health technologies to facilitate and enhance planning, information-sharing and patients' access to services regardless of service context.

Weaknesses include siloed systems of governance, finance and planning that impact on services and ultimately health outcomes, which are reflected in fragmentation of efforts and funding both within and across jurisdictions. Health workforce shortages and high turnover are also apparent, particularly in the Aboriginal, and Torres Strait Islander, health workforce. Key service weaknesses include the failure of many health services in the north to provide integrated and optimal care across stages of the patient journey, including coordination of quality health services from hospital settings to community-based chronic and rehabilitative care, or to involve communities in co-design. Additional weaknesses include under-resourcing, particularly of critical prevention services, and an inadequate focus within the health sector on addressing the social, cultural and environmental determinants of health.

Opportunities include improving the stability and cultural responsiveness of health workforce in the north and supporting locally led needs-based planning and research. Sustainable staffing in comprehensive primary health care would substantially improve quality of care at minimal or no overall cost. Attention is also warranted to review financing mechanisms, and financing distribution, to ensure greater resourcing of prevention.

Threats include challenges in financing models. For example, some services and locations do not have block grant funding models so occasions of service are rewarded rather than prevention or quality of care and outcomes, thus limiting flexibility. Threats also include those stemming from the higher disease burden, which represent risks to health service organisations and policymakers in terms of rising costs of health care and lost productivity, and ultimately to the development of northern Australia. More existential threats in terms of vulnerability to emerging infectious diseases, natural disasters and climate change are also cogent.

Table 5: Strengths, weaknesses, opportunities and threats (SWOT) analysis of health service delivery and workforce across northern Australia

HEALTH SERVICE DELIVERY AND WORKFORCE CONTEXTS:
MM2. Regional Centres (Cairns, Darwin, Mackay and Townsville). Current resources: public referral hospitals; private general practice and allied health/pathology/Xray services; private hospitals; Community Controlled Health Services; aged care; some shared staff between public and private systems.
MM3-5. Small, Medium and Large Rural Towns (e.g. Ayr, Airlie Beach, Atherton, Bowen, Cardwell, Charters Towers, Emerald, Ingham, Innisfail, Mareeba, Vernon Islands, Yeppoon). Current resources: Public referral hospitals; private general practice and allied health/path/X-ray services; private hospital in the larger towns; Community Controlled Health Services.
MM6. Remote Communities (e.g. Alice Springs, Broome, Cloncurry, Cooktown, Karratha, Katherine, Mt Isa, Port Hedland). Current resources: Public referral hospitals; private general practice and allied health/path/X-ray services; Community Controlled Health Services.
MM7. Very Remote Communities (e.g. Derby, Halls Creek, Fitzroy Crossing, Kununurra, Longreach, Nhulunbuy, Palm Island, Tennant Creek, Thursday Island, Weipa). Current resources: Visiting or on-site general practice services; general practitioner or nurse-led primary care clinic; Community Controlled Health Services; variable allied health service provision; Royal Flying Doctor Service.
Discrete Aboriginal, and Torres Strait Islander, communities. Current resources: Usually remote nurse-led clinic, with Aboriginal, and Torres Strait Islander, Health Workers and Health Practitioners and visiting or onsite general practitioners; multiple visiting services including specialist medical, allied health, Royal Flying Doctor Service and Community Controlled Health Services.
Fly-in/fly out; drive-in/drive-out (FIFO/DIDO) populations (e.g. Karratha, Mackay, Port Hedland) Current resources: mixed, with mining context influencing lifestyle as well as availability of, and access to, services.
STAKEHOLDER EXPECTATIONS AND SWOT:

Stakeholder expectations		Strengths	Weaknesses	Opportunities	Threats
Health services and policymakers	**Community**	**Service delivery:** • Expertise in rural and remote service delivery. • Expertise in disaster management and communicable disease surveillance and control. • Increasingly rigorous processes for managing occupational health checks and managing exposures and safety risks. **Health workforce:** • Expertise in training and supporting a fit-for-purpose health workforce. • Strong health workforce attraction in regional centres– good educational options and high liveability indexes. • Involvement of local community members as Aboriginal, and Torres Strait Islander, Health Workers/Practitioners in local health teams. **Financing:** • Commitments to universal coverage - Medicare and Pharmaceutical Benefits Scheme and patient travel assistance, underpinned by reasonably well-developed facilities and equipment. **Medicines and technologies:** • Increasing experience and commitments among services to use digital and other technologies to support access to care closer to home. **Leadership and governance; community:** • Community-controlled governance mechanisms and use of models of cultural responsiveness that strengthen community participation and health care access.	**Service delivery:** • Comparatively high rates of preventable hospitalisations across the north. • Systems failure in capacity to provide integrated and optimal care across various stages of patient journey. • Limited accessibility of allied health services outside of public hospitals in regional centres. • Limited health promotion activities in context of high modifiable risk factor prevalence. • Limited availability of comprehensive primary health care. • Insufficient mental health, oral health and community rehabilitation services in remote areas. **Health workforce:** • High staff turnover and shortages in some health disciplines (especially allied health) and health-related roles, especially in rural/remote communities. • Insufficient Aboriginal, and Torres Strait Islander, health workforce. • Limited occupational health and safety training systems and coordination. **Information systems and planning:** • Limited utility and inter-operability of e-records systems. **Financing; Leadership and governance:** • Fragmentation of resourcing, programming and planning due to multiple sources of financing and multiple jurisdictions leading to duplication and inefficiency. • Health services most under-resourced in locations with highest health needs (rural and remote areas). • Not addressing multiple complex social, environmental and economic factors contributing to poor health outcomes. **Community:** • Limited health and social research on perceptions of community of health and illness, and limited inclusion of community perspectives and preferences in strategic and operational planning.	**Service delivery:** • Establishing coherent integrated models of care for remote communities including seamless integration of comprehensive primary health care services and hospital services. • Strengthening mental health, oral health, community rehabilitation and sub-acute services in remote areas. • Improving communicable and non-communicable disease risk factor surveillance and response capacities. • Expanding public health capacity at all levels of government, including a focus on prevention and health literacy. • Improving accessibility of allied health services in regional centres. **Health workforce:** • Redesigning recruitment, training and support for Aboriginal, and Torres Strait Islander, health workforce. • Enhancing rural retention strategies for health workforce outside of regional centres. • Trialling and scale up of innovative health workforce models for rural and remote contexts. • Leveraging training and health systems expertise as an export opportunity with neighbouring countries. **Information systems and planning:** • Increasing data linkage and sharing across jurisdictions to study patient flows. • Developing and implementing coordinated, cross-sectoral population-based local area planning systems, including collective place-based approaches to preventive health. **Financing:** • Exploring new funding models for packages of services for integrated primary healthcare. **Medicines and technologies:** • Expansion of telehealth models to expand access to services in rural/remote locations and provide remote supervision. **Leadership and governance:** • Shared governance across health service providers. • Developing cross-jurisdictional linkages, strategies and research programs. • Expanding research capacity-building initiatives to develop clusters of service, teaching and research excellence across the north. • Supporting research that meets locally identified needs.	**Service delivery:** • Failure to deal with risk factors for chronic disease. • Vulnerability to biosecurity threats, emerging infectious diseases and extreme weather events. • Lack of integration of not-for-profit sector services with government and community-controlled services in remote areas. **Health workforce:** • Inability to attract, retain and locally recruit professional health workforce in rural and remote areas. • "Poaching" of work-ready graduates by southern institutions. • Not enough health-related posts in remote areas (e.g. social work, disability services). **Information systems and planning:** • Multiple funding sources, jurisdictions, programs present a threat to efficient and equitable coordinated planning. • Inflexibility of planning systems to respond and adapt to demographic and other contextual changes, including increasing frailty and ageing. **Financing:** • Lack of resourcing/consideration of social and cultural determinants of health across sectors. • Small fraction of resources allocated to prevention. • Increased costs due to increasing rates of preventable hospital admissions. • Unsustainable financing trajectory due to growing demand for health services. • Perverse incentives rewarding occasions of service rather than effective quality care and prevention of poor health. • Increasing out-of-pocket expenditure with impacts on equity of health care access. • Funding models do not support a viable business base for allied health services outside of regional centres. **Leadership and governance:** • Competition between health system stakeholder across the north inhibiting collaboration to address shared challenges. • Imposition of guidelines, benchmarks and policies from the south which are poorly suited to remote regions in the north. • Success/failure of programs defined by expectations for urban, densely population contexts.
All contexts: Meeting quality and service efficiency targets, including expected volume of services within activity-based funding models; Business viability (private services); Coordination between services; Services meet expectations of constituents; Cost containment – efficient care; workforce productivity.	**MM2**: Full range of primary health care, secondary and most tertiary services; high quality, efficient services close to home. **MM3-5**: Full range of primary health care services (essential "basket of services"); access to referral services in major centres with some visiting services. **MM6**: Same as MM3-5 but with access to specialists usually through visiting services; birthing services in communities. **MM7**: Range of primary health care services and access to specialty services as needed. **Discrete Aboriginal, and Torres Strait Islander, communities**: Range of primary health care services; some visiting health promotion and specialist services. **FIFO/DIDO**: Full primary health care services including occupational health and health promotion through employment; links to usual source of health care at home.				

7. Costing analysis: costing Potentially Preventable Hospitalisations in northern Australia

Potentially Preventable Hospitalisations (PPH)[20] are a health system performance indicator measuring accessibility and effectiveness in the Australian National Healthcare Agreement (AIHW 2016; COAG 2008). As a component of the National Health Performance Framework, PPH are used to monitor the quality and effectiveness of health care services in Australia. PPH rates are higher among Indigenous populations and across the north. A report released by the Grattan Institute identifies northern Queensland as a 'hot spot' for PPH with rates more than 50 percent higher than the annual state average for the last 10 years (Duckett, 2016). The report advocates for investment in health services to be prioritised to areas that demonstrate these persistent and costly health inequities (Duckett, 2016).

The aim of this analysis is to quantify the PPH in northern Australia and to assign costs to them, with a view to implementing strategies to reduce these costs. A broader analysis of interventions, and development of an implementation strategy was not part of the tendered design of this work, and would need extensive consultation and collaborations with the stakeholders within these jurisdictions and federally, over an extended period of time and with appropriate resourcing. This realisation has informed the eight priority actions recommended. Potential strategies are discussed at the end of the section based on the evidence base from peer reviewed literature. Sources of funding for this would require, as suggested in the eight priority actions, broader review of the existing funding mechanisms of the health sector in northern Australia, with re-investment of savings into comprehensive primary health care and appropriate models for financing services in rural and remote settings.

Understanding preventable hospitalisations is likely to help in identifying the key health conditions that drive health expenditure across the north, thus providing quantitative information to contribute to priority setting in the next phase of the broader project. The analysis was conducted for 2016-2017 with PPH data drawn from the AIHW website (AIHW, 2019) and associated costs estimated from the literature. The PPH are broadly referred to in three categories: vaccine preventable; acute; and chronic conditions (**Box 1**). Stratifying PPH by condition, population and geographic location can allow for the development of targeted policies.

---

[20] The Australian Commission on Safety and Quality in Health Care defines PPH as: "an admission to hospital for a condition where the hospitalisation could potentially have been prevented through the provision of appropriate individualised preventative health interventions and early disease management, usually delivered in primary care and community-based care settings (including by general practitioners, medical specialists, dentists, nurses and allied health professionals)" (Falster et al, 2017).

Box 1: Potentially preventable hospitalisations defined (Falster et al, 2017)

In Australia, the indicator is often reported using three broad categories:

- **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, 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.

In the 2016-17 financial year, there were 45,702 hospital separations documented as PPH across northern Australia (crude rate of 4,073 per 100,000 population). Across the north, these recorded (AIHW data) separations (from formal admissions) cost an estimated $241.8 million, or 6.6 percent of national PPH expenditure.[21] Most PPHs were for acute (50.7 percent) and chronic (39.2 percent) conditions (**Table 6**), with acute and chronic conditions together accounting for 41,709 (89.9 percent) of PPH separations. Qld reported the majority of PPH cases (57.7 percent) in northern Australia. The crude rate of PPH was the highest in the NT (5,049 per 100,000 population), followed by 4,282 per 100,000 in WA.

Table 6: Potentially Preventable Hospitalisations in northern Australia*, 2016-2017

	Qld	NT	WA	Totals	%
Vaccine preventable conditions	1,686	2,314	623	4,623	10
Acute conditions	13,448	6,094	3,625	23,167	51
Chronic conditions	11,224	4,386	2,302	17,912	39
Totals by state/ territory	26,358	12,794	6,550	45,702	100
%	58	28	14	100	

*Data shown reflects the whole of NT, and northern areas of WA and Qld.

Table 7 classifies the PPH cases by state or territory. Cellulitis (n= 6,839; 15.0 percent) was the most commonly reported condition followed by chronic obstructive pulmonary disease (COPD) (n=4,726; 10.3 percent) and urinary tract infections (UTI) (n=4,346; 386; 9.5 percent). The top

---

[21] At greater than 5 percent, this is higher than the national average per person.

five conditions account for 22 825 (50 percent) cases in northern Australia. Cellulitis features prominently across all jurisdictions and comprises 29.9 percent of the PPH disease burden in northern Australia. The same five conditions top the list of most commonly occurring diseases across all jurisdictions (apart from 'other VPD' replacing 'dental conditions' in the NT).

Across northern Australia, acute conditions were the greatest cost driver accounting for 46.1 percent ($111.6 million) of the total expenditure on PPH, or $4817 per acute PPH. Acute conditions are also major contributors to antimicrobial use, and potentially avoidable contributors to the growing global problem of antimicrobial resistance. Chronic conditions were the second greatest cost driver at $92.7 million (38.3 percent of PPH expenditure; or $5175 per chronic PPH). Several factors could be considered pertinent in reducing PPH including adequate numbers of doctors, ensuring continuity of care, appropriate management plans and subsidised community health services (Zhao 2014; Katterl 2012).

Although PPH has been adopted internationally as a useful health system performance indicator, definitions have varied over the years and by regions and countries, impacting on the generalisability of the indicator. PPH also assumes availability and accessibility of hospital infrastructure, with some workshop participants in the consultation phase of the project expressing concerns that the PPH figures in the north might under-represent the scale of unmet need.

Reducing hospitalisations for the conditions responsible for PPH requires vaccination, early diagnosis and treatment, and good ongoing management of risk factors and conditions in community settings (AIHW, 2019). The findings of this costing study therefore suggest a need to strengthen community-led comprehensive primary healthcare across the north to address the higher burden of both acute and chronic conditions. Successful interventions will reduce unnecessary hospitalisations, reflecting better health outcomes and substantial cost savings in the health system. This and other costing studies on PPH show that even small percentage reductions in PPH can translate to millions of dollars in cost savings (CEHSEU, 2009). Furthermore, each $1 invested in remote Indigenous primary health care is likely deliver a return of $4-$12 in saved public hospital expenses (Zhao et. al, 2014). Conservatively, this suggests that targeted investment of $10 million in comprehensive primary health care in northern Australian remote communities might be expected to deliver around $80 million of public hospital cost savings, quite apart from the cost savings from better health and productivity. In addition, Wakerman et al. (2019) have demonstrated that investing in workforce strategies to halve the rate of remote health workforce turnover in the NT could deliver direct annual cost savings of $32 million. This workforce turnover in turn adds $50 to the cost of each primary care consultation and contributes to unnecessary hospitalisations and poor health outcomes (Zhao et al, 2019).

<u>Opportunities for further work/investigation:</u>

- Continuous costing and tracking of PPH in the north to inform investment priorities.

- Exploration of the limitations of PPH as a planning tool in the context of prevention goals.

- Strengthen community-led comprehensive primary healthcare and workforce stability across the north to reduce unnecessary hospitalisations. These are likely to deliver better outcomes, fewer PPH and lower costs.

Northern Australia Health Service Delivery Situational Analysis, 2020

Table 7: Summary of Potentially Preventable Hospitalisations in northern Australia

	QUEENSLAND							NORTHERN TERRITORY							WESTERN AUSTRALIA						
	SEPARATIONS			COSTS (AU$)				SEPARATIONS			COSTS (AU$)				SEPARATIONS			COSTS (AU$)			
	n	%	Crude rate*	Median cost	Median LOS	Total cost†	%	*n*	%	Crude rate*	Median cost	Median LOS	Total cost†	%	*n*	%	Crude rate*	Median cost	Median LOS	Total cost†	%
Total PPH	**26358**	**100.0**	**3643**	**5068**	**3.5**	**133.6**	**100.0**	**12 794**	**100.0**	**5049**	**5535**	**4.0**	**73.2**	**100.0**	**6 550**	**100.0**	**4282**	**5351**	**3.2**	**35.1**	**99.9**
Total vaccine-preventable	**1686**	**6.4**	**233**	**7930**	**6.9**	**13.4**	**10.0**	**2 314**	**18.1**	**942**	**8148**	**5.8**	**19.0**	**26.0**	**623**	**9.5**	**407**	**8149**	**5.2**	**5.1**	**14.5**
Pneumonia and influenza	1096	4.2	151	7832	6.6	8.6	6.4	719	5.6	293	7832	5.4	5.6	7.6	238	3.6	156	7832	4.1	1.9	5.3
Other vaccine preventable	578	3.4	80	8280	7.7	4.8	3.6	1 623	12.7	660	8280	6.1	13.4	18.3	388	5.9	254	8280	4.9	3.2	9.2
Total acute	**13448**	**51.0**	**1860**	**4653**	**2.9**	**62.6**	**46.8**	**6 094**	**47.6**	**2480**	**5028**	**3.3**	**30.9**	**42.2**	**3 625**	**55.3**	**2370**	**5005**	**2.7**	**18.1**	**51.7**
Cellulitis	4066	15.4	562	4663	3.1	19.0	14.2	1 663	13.0	677	4663	2.9	7.8	10.7	1 110	16.9	726	4663	2.5	5.2	14.7
Convulsions and epilepsy	1578	6.0	218	3730	2.3	5.9	4.4	909	7.1	370	3730	2.6	3.4	4.7	334	5.1	218	3730	1.9	1.2	3.5
Dental conditions	2169	8.2	300	3490	1.2	7.6	5.7	794	6.2	323	3490	1.6	2.7	3.7	615	9.4	402	3490	1.1	2.1	6.1
ENT infections	1806	6.8	250	3425	1.4	6.2	4.6	980	7.7	399	3425	1.4	3.5	4.7	560	8.5	366	3425	1.2	1.9	5.5
Gangrene	605	2.3	84	17183	12.8	10.4	7.8	484	3.8	197	17183	12.3	8.3	11.3	314	4.8	205	17183	6.7	5.4	15.4
PID	223	0.8	31	3980	2.8	0.9	0.7	240	1.9	98	3980	3.0	1.0	1.3	87	1.3	57	3980	0.0	0.0	0.0
Perforated/bleeding ulcer	151	0.6	21	7174	6.2	1.1	0.8	39	0.3	16	7174	0.0	0.0	0.0	33	0.5	22	7174	0.0	0.0	0.0
Pneumonia	59	0.2	8	7832	0.0	0.0	0.0	24	0.2	10	7832	7.1	0.2	0.3	39	0.6	25	7832	0.0	0.0	0.0
UTI‡	2812	10.7	389	4129	3.0	11.6	8.7	986	7.7	401	4129	3.5	4.0	5.5	548	8.4	358	4129	3.0	2.3	6.4
Total chronic	**11224**	**42.6**	**1551**	**5134**	**3.8**	**57.6**	**43.1**	**4 386**	**34.3**	**1785**	**5246**	**4.3**	**23.3**	**31.8**	**2 302**	**35.1**	**1505**	**5139**	**3.4**	**11.8**	**33.7**
Angina	1301	4.9	180	3307	1.8	4.3	3.2	525	4.1	214	3307	1.9	1.7	2.3	225	3.4	147	3307	1.6	0.7	2.1
Asthma	941	3.6	130	3060	1.6	2.9	2.2	379	3.0	154	3060	1.8	1.1	1.6	281	4.3	184	3060	2.1	0.9	2.4
Bronchiectasis	323	1.2	45	6559	6.6	2.1	1.6	227	1.8	92	6559	4.9	1.5	2.0	47	0.7	31	6559	0.0	0.0	0.0
CCF	1785	6.8	247	6718	6.1	12.0	9.0	566	4.4	230	6718	6.0	3.8	5.2	378	5.8	247	6718	1.5	2.5	7.2
COPD	2796	10.6	386	6559	4.2	18.3	13.7	1 323	10.3	538	6559	4.0	8.7	11.9	607	9.3	397	6559	3.8	4.0	11.3
Diabetes complications	1741	6.6	241	7381	4.9	12.9	9.6	592	4.6	241	7381	7.9	4.4	6.0	382	5.8	250	7381	3.5	2.8	8.0
Hypertension	400	1.5	55	3611	2.0	1.4	1.1	93	0.7	38	3611	1.6	0.3	0.5	51	0.8	33	3611	1.3	0.2	0.5
Iron deficiency anaemia	1662	6.3	230	1776	1.3	3.0	2.2	305	2.4	124	1776	1.4	0.5	0.7	221	3.4	144	1776	1.1	0.4	1.1
Nutritional deficiencies	43	0.2	6	17535	0.0	0.0	0.0	20	0.2	8	17535	0.0	0.0	0.0	0	0.0	0	17535	0.0	0.0	0.0
Rheumatic heart disease	230	0.9	32	3252	8.6	0.7	0.6	356	2.8	145	3252	5.9	1.2	1.6	95	1.4	62	3252	4.4	0.3	0.9

*per 100 000, † in millions, ‡ includes pyelonephritis, LOS length of stay, median costs = per episode

UTI = urinary tract infection, PID = pelvic inflammatory disease, COPD = chronic obstructive pulmonary disease, CCF = congestive cardiac failure, ENT = ears, nose and throat

8. Priority action areas

Eight priority actions (**Table 8**) were identified in the project, which drew from the findings of the desktop-based analysis and stakeholder consultations across the jurisdictions. Additional evidence relevant to the priority actions is in **Appendix 1**.

The priority actions reflect the following CRCNA guidance in terms of approach and structure:

- Priority actions for sector development:
    - Must be a strong sector consensus;
    - Must have cross northern significance;
    - Must be realistic, impactful and measurable;
    - Anything more than four or five key prioritised and impactful recommendations will be getting too complex to achieve.

- Action owner and key partners:
    - Key owner should be in bold;
    - Key owner must have agreed to take a lead role in negotiation progressing and implementation, and be accepted and acceptable to sector stakeholders;
    - Key partners must be agreed as consortium style supporters.

- Pathways to implementation and timeline:
    - Must be clear, unambiguous, agreed and realistic pathway to secure investment and implementation.

- Intended industry impacts:
    - Must be demonstrated benefit defined in terms of growth in G1DP, jobs, investment, productivity or wellbeing.

Table 8: Health Service Delivery Situational Analysis Priority Actions

Key priority actions for sector development	Action owner and key partners	Pathways to implementation and timeline	Intended industry impacts

1. Support and enhance formal education and training of a fit-for-purpose health workforce across all health disciplines and elements of rural health training pipelines
 	
WHO building blocks: Health Workforce
Key areas of focus:
 	
• Addressing all elements of the training pathway, including targeted selection, primary health care-focussed and regionally based curricula and clinical placements, exposure to inspirational role models, and rural and remote post-graduate training pathways;
 	
• Entry-level skills-based training, with a specific focus on provision of training for Aboriginal, and Torres Strait Islander, staff from non-clinical roles into highly skilled Aboriginal and Torres Strait Islander Health Worker and Health Practitioner roles;
 	
• Medical, nursing and allied health rural generalist training pathways;
	Action owner: **Professor Ian Wronski**, with planned transition to ownership within new cross-northern body once established
	
	Key consortium partners:
	
	• Registered training organisations (RTOs);
	
	• Universities (especially the Innovative Research Universities based in the north);
	
	• Vocational education and training sector;
	
	• Accreditation bodies;
	
	• Specialist colleges;
	
	• Peak Aboriginal, and Torres Strait Islander, health workforce groups;
	
	• Jurisdictional workforce departments.
		• With start-up funding support from the commonwealth, state and NT governments (and with research analysis investment from CRCNA), establish a consortium with clear terms of reference and project capability (consortium operational by October 2020), to:
		
		  - Conduct research to map current health workforce and gaps and capacity in health workforce education and training across the north, including professional and vocational sectors, on-site and online delivery systems (January 2021-December 2021);
		
		  - Develop an implementation plan (by April 2021);
		
		  - Present plan to cross northern body/rural health commission for funding (by June 2021);
		
		  - Advocate for and implement a program of work to meet identified training and workforce gaps, designed to be implemented by training
			Implementing this recommendation will:
			
			• Provide a cross-northern approach to developing fit-for-purpose health workforce;
			
			• Address a need for data on health workforce gaps across the north;
			
			• Maximise the availability of suitably trained health workforce to address chronic workforce gaps – students who are recruited from and train in areas of workforce need are more likely to remain in those areas post-graduation;
			
			• Ensure a culturally responsive health workforce;
			
			• Increase the number and proportion of Aboriginal, and Torres Strait Islander, members of the health workforce;
			
			• Improve population access to suitably trained health professionals;
			
			• Increase efficiencies in service provision across the north through reduced locum costs.

		providers and funders (commence January 2022); and	
• Fostering multidisciplinary teams with all members operating at maximum scope of practice; • Including health research, biomedical, disability and support workforce.		- Conduct fully resourced, regular and independent research evaluations of progress, involving monitoring and mapping of health workforce (recruitment/ retention/vacancy rates) across north (June 2022-ongoing).	
2. Enhance professional support, career development and career pathways for rural and regional health workforce across all health disciplines *WHO building blocks: Health Workforce* Key areas of focus: • Opportunities to enhance context-based recruitment and retention investments across all health disciplines; • Opportunities to support career pathways of Aboriginal, and Torres Strait Islander, health workforce (both Indigenous and non-Indigenous), such as by improving recognition of qualifications and skills of Aboriginal and Torres Strait Islander Health Workers and Health Practitioners, ensuring availability of	Action owner: **Professor Sabina Knight** **Key consortium partners:** • Aboriginal, and Torres Strait Islander, peak bodies – Aboriginal Health Council of Western Australia, Kimberley Aboriginal Medical Service Ltd, Aboriginal Medical Services Alliance Northern Territory, Queensland Aboriginal and Islander Health Council; • Australian College of Rural and Remote Medicine (ACRRM); • CRANAPlus;	• With start-up funding support from the commonwealth, state and NT governments (and with research analysis investment from CRCNA), establish consortium with clear terms of reference and project capability (consortium operational by October 2020), to drive forward two workstreams: 1) Career development and support: - Undertake research analysis that explores key opportunities, including a costed sustainable mechanism to identify and share best practice approaches in cultural responsiveness training and capability development of health workforce (by June 2021); - Develop business case and funding model and present to	Implementing this recommendation will produce: • A stronger, more sustainable, health workforce; • Lower staff turnover rates, resulting in lower costs for locums, on-boarding and recruitment – reducing staff turnover could save northern Australian health services millions of dollars (Zhao et al, 2018; Wakerman et al, 2019); • Increased recruitment and stability of the health workforce, enabling better continuity of care; • Strengthened cultural responsiveness of all health services resulting in better primary care attendance and reduced Potentially Preventable Hospitalisations – cultural capability of healthcare services

posts in areas of need and broader role development;

- Improving retention incentives such as through regular fly-out/flexible rosters, eased mobility across the north and discounted registration/training fees;
- Addressing capability gaps in health workforce such as in cultural responsiveness and clinical and corporate governance.

Key guiding principles:

- Availability of continuing professional development opportunities regardless of location;
- Equitable access to essential supporting infrastructure (e.g. housing, internet) for all health workforce;
- Innovation in health service delivery to make use of available workforce;
- Innovation in health workforce models that involve ancillary health workforce roles (e.g. social work, disability, aged care, early childhood education, health interpreters and cultural brokers).

- Services for Australian Rural and Remote Allied Health (SARRAH);
- Rural Doctors Association of Australia;
- National Aboriginal and Torres Strait Islander Health Worker Association (NATSIHWA);
- Jurisdictional heads of health workforce units in government departments and health services;
- Chief Aboriginal and Torres Strait Islander health officers or equivalent at jurisdictional level;
- Jurisdictional representative bodies for Aboriginal, and Torres Strait Islander, health;
- Health Workforce Queensland;
- Rural Health Workforce Australia.

cross jurisdictional body (by December 2021);

- Advocacy by consortium and cross jurisdictional body for investment from mixed jurisdictional resourcing and implementation by key health workforce units and health employers (December 2021-March 2022).

2) Workforce mobility:

- Conduct research to investigate key barriers to workforce mobility across service providers and jurisdictions and develop program of work to address (by June 2021);
- CRCNA to transition the costed program of work to the cross-jurisdictional body by 2021;
- Mechanisms and financing arrangements established to facilitate implementation of findings within health services across the north (commencing December 2021).

and professionals is associated with increased likelihood that Aboriginal people will access those services (Nguyen and Gardiner, 2008);

- Support for greater numbers of Aboriginal, and Torres Strait Islander, staff (clinical and non-clinical) across the health sector;
- Increased attractiveness of the region for employees and new businesses and improved retention of productive workforce in northern Australia.

3. Establish a cross-jurisdictional northern Australian health system network as an independent body *WHO building blocks: Leadership and Governance; Health Information Systems and Planning; Essential Medicines and Technologies* Key areas of focus: • Mechanisms to share and create knowledge across the north; • Data linkage and data interoperability/seamless integration; • Health information and management systems; • Joined up credentialing/registration processes to support effective health workforce mobility; • Cross-border service provision to account for population movements across jurisdictional borders; • Uniform/shared clinical practice guidelines; • Advocacy around effective financing models and northern-focussed health policy.	Action owner: **Commonwealth, state and NT governments with CRCNA initially as action owner to support building a business case** **Key consortium partners:** • Rural health commissioners; • Office for Northern Australia; • Key jurisdictional government and educational partners; • Council of Australian Governments (COAG).	• Through a co-design process call a tender to build a business case and develop a sustainable resourcing model for this body to ensure its longevity and utility (July 2020-December 2020), involving: - Research to investigate effective governance/operational models drawing from experience of past initiatives; and - Drawing on best available research evidence on effective governance models and networks. • CRCNA present to COAG meeting (first meeting 2021); • Assuming model accepted by COAG and jurisdictions, oversee the establishment and commencement of operations (by July 2021 to 2026 and ongoing).	Implementing this recommendation will: • Facilitate a "coalition of the willing" to harmonise processes between jurisdictions (focus will be on joint priorities and easier wins initially); • Provide accountability for equitable health service delivery and improvements in population health outcomes; • Reduce duplication and streamline service and workforce planning across the north; • Facilitate uniformity of clinical care, quality and safety and smoothed patient journey; • Facilitate mobility of health workforce and patient records across the north for continuity of care; • Support health services in the translation of their strategic intent to implement comprehensive primary health care into concrete planning actions, including lobbying for financing reform at Federal level; • Facilitate better coordination of health workforce training and support.

4. Determine need and mechanisms to finance appropriate health service delivery models for rural and remote health service delivery *WHO building blocks: Financing; Information Systems and Planning* Key guiding principles: • Equal care and outcomes based on need; • Allocation of funding close to point of care; • Continuity of funding pipelines; • Joined up planning incorporating co-design with communities; • Inclusion of financing of disability, aged care, early childhood development and other support services in funding models.	Action owner: **senior public service employee with COAG as the key implementation partner** **Key consultation partners:** • Northern Australian Senior Officer Networking Group (NASONG); • Northern Australian Health Ministers; • Health service delivery organisations across the northern jurisdictions.	• Action lead to convene working group funded by COAG to articulate clear principles that should underpin financing of health care in rural and remote northern Australia informed by Situational Analysis and consultations (by December 2020); • Building on the articulated principles, the working group develop an investment and implementation plan, retaining funding models where effective and redesigning where failing, involving stakeholder consultation and engagement (by December 2021); • The working group (or COAG) monitor and evaluate outcomes in terms of actual health outcomes, satisfaction and efficiency as part of an ongoing evaluation and reporting strategy.	Implementing this recommendation will: • Offer a more equitable and efficient funding model for health service delivery in rural and remote northern Australia, leading to better health outcomes and reduced costs; • Address waste related to duplication of funding streams and inefficiencies in service provision; • Strengthen access to preventive, primary and rehabilitative care involving improved access to essential services like private general practice, pharmacist and allied health services.
5. Improve local amenities and infrastructure across sectors to reduce effects of adverse social determinants on health outcomes *WHO building blocks: Community* Key areas of focus: 'health hardware' (e.g. water, sanitation), public transport networks, telecommunications/ICT, school-level education, housing, tax incentives, land ownership, and food security.	Action owner: **CRCNA (TBC)** **Key consortium partners:** • Health service organisations; • Local councils;	• CRCNA provide funding/tender to develop a cross-sectoral consortium to conduct research to identify key infrastructure development concerns and opportunities (commencing July 2020); • Through consultations with key consortium partners and stakeholders, develop a five-year costed development plan and undertake annual mapping of	Implementing this recommendation will: • Empower Aboriginal peoples and Torres Strait Islanders through better health and more control over their health and wellbeing; • Improve attractiveness of rural centres to workers and families;

Key guiding principles: • Equity in access to the social and cultural determinants of health; • Intersectoral action and coordination to address determinants; • Planning and action informed by local communities including through formal partnerships with community organisations to empower communities in decision-making processes.	• Community organisations.	achievements, needs and changes. This plan would identify appropriate funding and implementation agencies (e.g. local, state/territory, federal governments) and provide plans through budget cycles (by June 2021); • Evaluation of progress, outcomes, facilitators and barriers undertaken every 3 years.	• Improve recruitment/retention of health workforce; • Prevent poor health leading to greater productivity and cost savings to the health system – a one-year increase in life expectancy corresponds to a four percent increase in labour productivity (Bloom et al, 2004).
6. Undertake trials to develop and scale up place-based planning models *WHO building blocks: Community; Service Delivery; Health Information Systems and Planning; Financing* Key areas of focus: • Local comprehensive primary health care – including preventive, acute, subacute and rehabilitative/ disability services and aged care; supplemented by additional service delivery methods as best suited, e.g. telehealth services (following local referral pathways), fly-out and outreach models; • Exploration and trialling of financing models to follow people and clinical need rather than activity; and	Action owner: **CRCNA (TBC)**, whose role would be to commission place-based planning work across the north **Key consortium partners:** • Academic Health Centres; • University Departments of Rural Health and Rural Clinical Schools; • Local Health Networks and Hospital and Health Services;	• Terms of reference for the commissioned work developed (by December 2020): - Objectives to explore optimal models and principles for place-based planning, involving a review of present models of place-based health services/workforce planning for lessons learnt (this includes contexts in which they are being trialled). • Commissioning work commences (January 2021); • Consultation across the various health service delivery and workforce contexts as to scalability (by June 2021);	Implementing this recommendation will: • Improve health equity; • Reduce service duplication and inefficiencies in remote services; • Strengthen delivery of comprehensive primary health care, which will provide social and economic benefits: investing $1 in PHC in remote Aboriginal communities could realise a saving of between $3.95 and $11.75 in public hospital expenses, over and above the health and social benefits for patients (Zhao et al, 2014).

• Reporting based on actual health outcomes rather than number of services delivered. Key guiding principles: • Strong community co-design, ownership and engagement; • Focus on addressing social and cultural determinants of health across multiple sectors (not just health care delivery); • Focus on improving the patient journey and creating healthcare neighbourhoods and corridors of care.	• Aboriginal, and Torres Strait Islander, peak bodies and health services; • Primary Health Networks; • Local governments.	• Call for expressions of interest to trial recommended approaches (January 2022); • Implement trials with strong monitoring and evaluation frameworks involving an expert advisory group with key stakeholder representation (2022-2025); • Regular feedback of lessons learnt and progress through the cross jurisdictional body (6-monthly).	• Enable competency-based health workforce planning; • Deliver more acceptable and needs-based services; • Improve quality and safety and the patient journey through strengthened communication between providers along "corridors of care"; • Reduce costs through a reduction in Potentially Preventable Hospitalisations.

7. Strengthen and grow northern-led research capacity and funding
 	
WHO building blocks: Leadership and Governance; Health Information Systems and Planning
 	
Key guiding principles:
• Focus on addressing local issues and contextually informed implementation of evidence;
• Led by northern-based researchers, including clinician-researchers (across health disciplines and involving both public and private health workforce);
• Provision of adequate funding to account for higher costs of research
	Action owner: **Professor John Wakerman,** to activate CRCNA process
	
	Key consortium partners:
	
	• Academic Health Centres;
	
	• Research institutes,
	
	• Universities (including medical schools, University Departments of Rural Health and Rural Clinical Schools);
		• With start-up investment from CRCNA, establish consortium with clear terms of reference and project capability (by December 2020), to:
		  - Commission/undertake research (conducted between January 2021-June 2021) to:
		    o Investigate options to develop and support local hubs of service, research and training activity, and to grow support for research capacity and capability building for northern-based clinicians and researchers;
		    o Explore the potential to increase the current integrative investment in health services research;
			Implementing this recommendation will:
			
			• Generate a return of investment of $3.90 per $1.00 invested (KPMG, 2018);
			
			• Build long-term, sustainable research capacity and capability of the north;
			
			• Improve national distribution of research funding to meet needs of the north, including research focussing on Indigenous-determined priorities for improving the health of Aboriginal and Torres Strait Islander Australians.

and skills development in rural and remote settings; • Provision of support for research capacity strengthening at multiple levels.	• Aboriginal, and Torres Strait Islander, peak bodies and health services; • Health service research departments.	- Present findings to cross jurisdictional body with business case (July 2021); - Implement findings and guidelines/assessment criteria for funding schemes, including identification of appropriate funding body (commencing July 2021). • Funding body to support first call for funding bids for support of local research hubs under scheme/s (October 2021); • Support for funded hubs commences Feb 2022; • Six-monthly progress reports from funded hubs.	
8. Explore potential areas of export opportunity that deliver value for northern Australia *WHO building blocks: Leadership and Governance* Key focus areas: • Export of workforce development strengths (e.g. remote generalist training; surveillance and response; implementation research and research training); • Health service models; and • Placement/interchange of health service workers with near neighbours.	Action owner: **AusTrade (TBC)** **Key consortium partners:** • Jurisdictional trade representatives at government and health department levels; • Health services; • Universities.	• CRCNA commission research to collect details on existing health exports and potential from jurisdictional authorities, Austrade and university/TAFE/health sector/hospitals (public and private); • Document activities, opportunities, gaps and develop prioritised plan for market engagement (end Dec 2020); • CRCNA work with DFAT and others to comprehensively analyse demand and then market capability and skills to neighbouring countries (by June 2021 and ongoing).	Implementing this recommendation will: • Build health system capacity of regional neighbours and strengthen regional linkages; • Support regional neighbours to achieve WHO Sustainable Development Goals; • Strengthen health security for northern Australia;

Key guiding principles: • Enhance two-way health system strengthening with regional neighbours; • Does not detract from meeting local needs; • Provides financial return to providers to complement other funding sources.			• Strengthen Australia's position as a leading influence in the Western Pacific region; • Direct financial return for exported services.

References

Introduction sources

AUSTRALIAN BUREAU OF STATISTICS (ABS), 2019. *Regional Population Growth, Australia, 2017-2018*. Cat. No. 3218.0. Accessed 20 January 2020: https://www.abs.gov.au/ausstats/abs@.nsf/0/B7616AB91C66CDCFCA25827800183B7B?Opendocument

AUSTRALIAN GOVERNMENT, 2019. *Closing the Gap Report 2019*. Accessed 20 January 2020: https://ctgreport.niaa.gov.au/sites/default/files/ctg-report-20193872.pdf?a=1

AUSTRALIAN HEALTH MINISTERS' ADVISORY COUNCIL (AHMAC), 2017. *Aboriginal and Torres Strait Islander Health Performance Framework 2017 Report*. Canberra: AHMAC; 2017. Accessed 15 September 2019: https://www1.health.gov.au/internet/main/publishing.nsf/Content/oatsih_heath-performanceframework

AUSTRALIAN INSTITUTE OF HEALTH AND WELFARE (AIHW), 2018a. *Potentially preventable hospitalisations 2015–16*. Accessed 23 September 2019: https://www.aihw.gov.au/reports/hospitals/potentially-preventable-hospitalisations-2015-16/data).

AIHW, 2018b. *Life expectancy and potentially avoidable deaths in 2014–2016*. Accessed 23 September 2019: https://www.aihw.gov.au/reports/life-expectancy-deaths/life-expectancy-avoidable-deaths-2014-2016/contents/summary.

AIHW, 2018c. *Health Community Indicators 2018*. Accessed 23 September 2019: https://www.aihw.gov.au/reports-data/indicators/healthy-community-indicators

AIHW, 2018d. *Health Community Indicators. Breast Screening*. Accessed 10 October 2019: https://www.aihw.gov.au/reports-data/indicators/healthy-community-indicators/national/all-australia/canscreen/cancer-screening

AIHW, 2016. *Medical practitioner workforce 2015*. Accessed 1 October 2019: https://www.aihw.gov.au/reports/workforce/medical-practitioners-workforce-2015/contents/how-many-medical-practitioners-are-there

COMMONWEALTH OF AUSTRALIA, 2019. "Native Title". Accessed 1 October 2019: https://www.austrade.gov.au/land-tenure/Native-title/native-title

COMMONWEALTH OF AUSTRALIA, 2018. *Our North, Our Future: 2018 Implementation Report*. Accessed 28 August 2019: https://www.industry.gov.au/sites/g/files/net3906/f/2018-10/our-north-our-future-developing-northern-australia-2018-implementation-report.pdf

COMMONWEALTH OF AUSTRALIA, 2015. *Our North, Our Future: White Paper on Developing Northern Australia*. Accessed 28 August 2019: https://www.industry.gov.au/sites/g/files/net3906/f/June%202018/document/pdf/nawp-fullreport.pdf

COOPERATIVE RESEARCH CENTRE FOR DEVELOPING NORTHERN AUSTRALIA (CRCNA), 2019. "About". Accessed 23 September 2019: http://www.crcna.com.au/about/

CUMMINGS ECONOMICS, 2015. *Long-Term Population Growth in Northern Australia. Report prepared by Cummings Economics for the Cairns Regional Council,* Cairns. Accessed 20 August 2019: http://www.cummings.net.au/pdf/recent/J2806NthnAusLongTermPopulationGrowth.pdf

GEORGES N, GUTHRIDGE SL, QIN LI S, CONDON JR, BARNES TM ZHAO Y. 2017. Progress in closing the gap in life expectancy at birth for Aboriginal people in the Northern Territory, 1967–2012. *Medical Journal of Australia*, 207 (1): 25-30.

QUEENSLAND DEPARTMENT OF HEALTH (Qld DOH), 2015. *Native Title and Indigenous Cultural Heritage: Standard QH-IMP-353-1:2015*. Accessed 22 January 2020: https://www.health.qld.gov.au/__data/assets/pdf_file/0031/397354/qh-imp-353-1.pdf

NATIONAL ENVIRONMENTAL SCIENCE PROGRAM (NESP), 2019. *Earth Systems and Climate Change Hub: Climate Change Science for Northern Australia*. Aspendale. Accessed 1 October 2019: www.http://nespclimate.com.au/climate-change-science-for-northern-australia/

WESTERN QUEENSLAND PRIMARY HEALTH NETWORK (WQPHN), 2017. Technical Paper: 2017 Health Needs Assessment. Accessed 1 October 2019: https://wqphn.com.au/uploads/documents/20171115_WQPHN%20HNA%20Technical%20Report_FINAL.pdf

WORLD HEALTH ORGANIZATION (WHO). 2010. Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies. Geneva, Switzerland.

Literature review sources

Methods:

WORLD HEALTH ORGANIZATION (WHO). 2010. Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies. Geneva, Switzerland.

PHAM MT, RAJIC A, GREIG JD, SARGEANT JM, PAPADOPOULOS A, MCEWEN SA. 2014. A scoping review of scoping reviews: advancing the approach and enhancing the consistency. *Research synthesis methods*, 5(4):371-85.

Peer-reviewed literature and expert opinion:

AH CHEE, D. 2019. Given this history of strength and success, why do Aboriginal health dollars keep going to NINGOs? *Croakey Health Media*. Accessed 10 October 2019: https://croakey.org/given-this-history-of-strength-and-success-why-do-aboriginal-health-dollars-keep-going-to-ningos/

AMARASENA, N., KAPELLAS, K., SKILTON, M. R., MAPLE-BROWN, L. J., BROWN, A., BARTOLD, M., O'DEA, K., CELERMAJER, D. & JAMIESON, L. M. 2016. Factors Associated with Routine Dental Attendance among Aboriginal Australians. *Journal of Health Care for the Poor & Underserved*, 27**,** 67-80.

ANDERSON, E., ELLARD, J. & WALLACE, J. 2016. Torres Strait Islanders' understandings of chronic hepatitis B and attitudes to treatment. *Australian Journal of Primary Health,* 22**,** 316-319.

BAILEY, B. E. S., WHARTON, R. G. & HOLMAN, C. D. A. J. 2016. Glass half full: Survival analysis of new rural doctor retention in Western Australia. *Australian Journal of Rural Health,* 24**,** 258-264.

BAILIE, J., MATTHEWS, V., LAYCOCK, A., SCHULTZ, R., BURGESS, C. P., PEIRIS, D., LARKINS, S. & BAILIE, R. 2017. Improving preventive health care in Aboriginal and Torres Strait Islander primary care settings. *Globalization and Health,* 13**,** 48.

BAILIE, R., MATTHEWS, V., LARKINS, S., THOMPSON, S., BURGESS, P., WEERAMANTHRI, T., BAILIE, J., CUNNINGHAM, F., KWEDZA, R. & CLARK, L. 2017. Impact of policy support on uptake of evidence-based continuous quality improvement activities and the quality of care for Indigenous Australians: a comparative case study. *BMJ Open,* 7, e016626.

BAILIE, R. S. & WAYTE, K. J. 2006. Housing and health in Indigenous communities: key issues for housing and health improvement in remote Aboriginal and Torres Strait Islander communities. *Aust J Rural Health,* 14**,** 178-83.

BARKER, R. N., SEALEY, C. J., POLLEY, M. L., MERVIN, M. C. & COMANS, T. 2017. Impact of a person-centred community rehabilitation service on outcomes for individuals with a neurological condition. *Disabil Rehabil,* 39**,** 1136-1142.

BELL, D., LINDEMAN, M. A. & REID, J. B. 2015. The (mis)matching of resources and assessed need in remote Aboriginal community aged care. *Australasian Journal on Ageing,* 34**,** 171-176.

BELTON, S., DE COSTA, C. M. & WHITTAKER, A. 2015. Termination of pregnancy: a long way to go in the Northern Territory. *Medical Journal of Australia,* 202**,** 130-1.

BONNER, A. & BOYLE, J. 2017. Are women's needs being met by specialist health services managing urinary incontinence in the remote Top End NT? *Australian & New Zealand Journal of Obstetrics & Gynaecology,* 57**,** 351-357.

BRISCOE, K. 2019. Unrecognised potential of Indigenous health workers and practitioners. *MJA InSight.*

BROWN, S. 2018. Remote possibilities: from a Pintupi dream to Medicare funding. *Renal Society of Australasia Journal,* 14**,** 105-107.

BURGESS, C. P., JOHNSTON, F. H., BERRY, H. L., MCDONNELL, J., YIBARBUK, D., GUNABARRA, C., MILERAN, A. & BAILIE, R. S. 2009. Healthy country, healthy people: the relationship between Indigenous health status and "caring for country". *Med J Aust,* 190**,** 567-72.

BURGESS, C. P., SINCLAIR, G., RAMJAN, M., COFFEY, P. J., CONNORS, C. M. & KATEKAR, L. V. 2015. Strengthening Cardiovascular Disease Prevention in Remote Indigenous Communities in Australia's Northern Territory. *Heart Lung and Circulation,* 24**,** 450-457.

BURNS, C. L., KULARATNA, S., WARD, E. C., HILL, A. J., BYRNES, J. & KENNY, L. M. 2017. Cost analysis of a speech pathology synchronous telepractice service for patients with head and neck cancer. *Head & Neck,* 39**,** 2470-2480.

CAMERON, M., RAY, R. & SABESAN, S. 2015. Remote supervision of medical training via videoconference in northern Australia: a qualitative study of the perspectives of supervisors and trainees. *BMJ Open,* 5**,** e006444.

CAMPBELL, M. A., HUNT, J., SCRIMGEOUR, D. J., DAVEY, M. & JONES, V. 2018a. Contribution of Aboriginal Community-Controlled Health Services to improving Aboriginal health: an evidence review. *Aust Health Rev,* 42**,** 218-226.

CAMPBELL, N., ELEY, D. S. & MCALLISTER, L. 2016. How Do Allied Health Professionals Construe the Role of the Remote Workforce? New Insight into Their Recruitment and Retention. *PLoS One,* 11**,** e0167256.

CAMPBELL, S., MCCALMAN, J., REDMAN-MACLAREN, M., CANUTO, K., VINE, K., SEWTER, J. & MCDONALD, M. 2018b. Implementing the Baby One Program: a qualitative evaluation of family-centred child health promotion in remote Australian Aboriginal communities. *BMC Pregnancy & Childbirth,* 18**,** 73.

CANUTO, K., BROWN, A., HARFIELD, S. & WITTERT, G. 2018. "I feel more comfortable speaking to a male": Aboriginal and Torres Strait Islander men's discourse on utilizing primary health care services. *International Journal for Equity in Health,* 17**,** N.PAG-N.PAG.

CAREY, T. A., SCHOUTEN, K., WAKERMAN, J., HUMPHREYS, J. S., MIEGEL, F., MURPHY, S. & ARUNDELL, M. 2016. Improving the quality of life of palliative and chronic disease patients and carers in remote Australia with the establishment of a day respite facility. *BMC Palliative Care,* 15**,** 62.

CARLISLE, K., LARKINS, S. & CROKER, F. 2017. Disparities in dental health of rural Australians: hospitalisation rates and utilisation of public dental services in three communities in North Queensland. *Rural & Remote Health,* 17**,** 3807.

CARR, J. J., LALARA, J., LALARA, G., O'HARE, G., MASSEY, L., KENNY, N., POPE, K. E., CLOUGH, A. R., LOWELL, A. & BARKER, R. N. 2019. 'Staying strong on the inside and outside' to keep walking and moving around: Perspectives from Aboriginal people with Machado Joseph Disease and their families from the Groote Eylandt Archipelago, Australia. *PLoS One,* 14**,** e0212953.

CARROLL, V., MANSOUR, R., HUMPHRIES, J., WAKERMAN, J., CARTER, M. & REEVE, C. 2017. Reducing primary health care outpatient "did not attends": Responding to community preferences. *Australian Journal of Rural Health,* 25**,** 187-188.

CARROLL, V., REEVE, C. A., HUMPHREYS, J. S., WAKERMAN, J. & CARTER, M. 2015. Re-orienting a remote acute care model towards a primary health care approach: key enablers. *Rural & Remote Health,* 15**,** 2942.

CHAMBERLAIN-SALAUN, J., MILLS, J., KEVAT, P. M., RÉMOND, M. G. W. & MAGUIRE, G. P. 2016. Sharing success - understanding barriers and enablers to secondary prophylaxis delivery for rheumatic fever and rheumatic heart disease. *BMC Cardiovascular Disorders,* 16.

CHAN, B. A., LARKINS, S. L., EVANS, R., WATT, K. & SABESAN, S. 2015. Do teleoncology models of care enable safe delivery of chemotherapy in rural towns? *Medical Journal of Australia,* 203**,** 406-6.e6.

CHENG, E., LONGMORE, D. K., BARZI, F., BARR, E. L. M., LEE, I. L., WHITBREAD, C., BOYLE, J. A., OATS, J., CONNORS, C., MCINTYRE, H. D., KIRKWOOD, M., DEMPSEY, K., ZHANG, X., THOMAS, S., WILLIAMS, D., ZIMMET, P., BROWN, A. D. H., SHAW, J. E. & MAPLE-BROWN, L. J. 2019. Birth outcomes in women with

gestational diabetes managed by lifestyle modification alone: The PANDORA study. *Diabetes Res Clin Pract,* 157, 107876.

CHENG, W., NAZARETH, S. & FLEXMAN, J. P. 2015. Statewide hepatitis C model of care for rural and remote regions. *Journal of Gastroenterology & Hepatology,* 30 Suppl 2, 1-5.

CHERRY, J. J., RICH, W. C. & MCLENNAN, P. L. 2018. Telemedicine in remote Australia: The Royal Flying Doctor Service (RFDS) Medical Chest Program as a marker of remote health. *Rural & Remote Health,* 18, 4502.

CLOUGH, A. R., MARGOLIS, S. A., MILLER, A., SHAKESHAFT, A., DORAN, C. M., MCDERMOTT, R., SANSON-FISHER, R., TOWLE, S., MARTIN, D., YPINAZAR, V., ROBERTSON, J. A., FITTS, M. S., BIRD, K., HONORATO, B. & WEST, C. 2016. Alcohol control policies in Indigenous communities: A qualitative study of the perceptions of their effectiveness among service providers, stakeholders and community leaders in Queensland (Australia). *International Journal of Drug Policy,* 36, 67-75.

CLOUGH, A. R., MARGOLIS, S. A., MILLER, A., SHAKESHAFT, A., DORAN, C. M., MCDERMOTT, R., SANSON-FISHER, R., YPINAZAR, V., MARTIN, D., ROBERTSON, J. A., FITTS, M. S., BIRD, K., HONORATO, B., TOWLE, S. & WEST, C. 2017. Alcohol management plans in Aboriginal and Torres Strait Islander (Indigenous) Australian communities in Queensland: community residents have experienced favourable impacts but also suffered unfavourable ones. *BMC Public Health,* 17, 55.

COLLES, S. L., BELTON, S. & BRIMBLECOMBE, J. 2016. Insights into nutritionists' practices and experiences in remote Australian Aboriginal communities. *Australian & New Zealand Journal of Public Health,* 40 Suppl 1, S7-13.

CONLAN, L., THOMPSON, J. & FARY, R. 2016. An exploration of the efficacy of telehealth in the assessment and management of stress urinary incontinence among women in rural locations. *Australian & New Zealand Continence Journal,* 22, 58-64.

CRESP, R., CLARKE, K., MCAULEY, K. E., MCAULLAY, D., MOYLAN, C. A., PETER, S., CHANEY, G. M., COOK, A. & EDMOND, K. M. 2016. Effectiveness of the Koorliny Moort out-of-hospital health care program for Aboriginal and Torres Strait Islander children in Western Australia. *Medical Journal of Australia,* 204, 197.

DAVIS, S., REEVE, C. & HUMPHREYS, J. S. 2015. How good are routinely collected primary healthcare data for evaluating the effectiveness of health service provision in a remote Aboriginal community? *Rural & Remote Health,* 15, 2804.

DAVY, C., CASS, A., BRADY, J., DEVRIES, J., FEWQUANDIE, B., INGRAM, S., MENTHA, R., SIMON, P., RICKARDS, B., TOGNI, S., LIU, H., PEIRIS, D., ASKEW, D., KITE, E., SIVAK, L., HACKETT, M., LAVOIE, J. & BROWN, A. 2016. Facilitating engagement through strong relationships between primary healthcare and Aboriginal and Torres Strait Islander peoples. *Australian & New Zealand Journal of Public Health,* 40, 535-541.

DAVY, C., KITE, E., SIVAK, L., BROWN, A., AHMAT, T., BRAHIM, G., DOWLING, A., JACOBSON, S., KELLY, T., KEMP, K., MITCHELL, F., NEWMAN, T., O'BRIEN, M., PITT, J., ROESCH, K., SADDLER, C., STEWART, M. & THOMAS, T. 2017. Towards the development of a wellbeing model for aboriginal and Torres Strait islander peoples living with chronic disease. *BMC Health Serv Res,* 17, 659.

DE SILVA, A. M., MARTIN-KERRY, J., GEALE, A. & COLE, D. 2016. Flying blind: Trying to find solutions to Indigenous oral health. *Australian Health Review,* 40, 570-583.

DOLE, K., CASILLI, A., TINSLEY, N., COLLETT, J. & MAJONI, S. W. 2018. Improving access to renal transplantation among Indigenous patients with end-stage renal disease: A review from the Top End of Northern Australia where graft and patient outcomes have generally been poor. *Transplant Journal of Australasia,* 27, 14-22.

DOSSETOR, P. J., MARTINIUK, A. L. C., FITZPATRICK, J. P., OSCAR, J., CARTER, M., WATKINS, R., ELLIOTT, E. J., JEFFERY, H. E. & HARLEY, D. 2017. Pediatric hospital admissions in Indigenous children: a population-based study in remote Australia. *BMC Pediatrics,* 17, 195.

EDELMAN, A., TAYLOR, J., OVSEIKO, P. V. & TOPP, S. M. 2019. "'Academic' is a dirty word": Intended impact pathways of an emerging academic health centre in tropical regional Australia. *Int J Health Plann Manage,* 34, e661-e678.

EDIRIPPULIGE, S., REYNO, J., ARMFIELD, N. R., BAMBLING, M., LLOYD, O. & MCNEVIN, E. 2016. Availability, spatial accessibility, utilisation and the role of telehealth for multi-disciplinary paediatric cerebral palsy services in Queensland. *Journal of Telemedicine & Telecare,* 22, 391-6.

ELLEM, K., BAIDAWI, S., DOWSE, L. & SMITH, L. 2019. Services to young people with complex support needs in rural and regional Australia: Beyond a metro-centric response. *Children & Youth Services Review,* 99, 97-106.

FATEHI, F., MARTIN-KHAN, M., SMITH, A. C., RUSSELL, A. W. & GRAY, L. C. 2015. Patient satisfaction with video teleconsultation in a virtual diabetes outreach clinic. *Diabetes Technology & Therapeutics,* 17, 43-8.

FELTON-BUSCH, C. & LARKINS, S. 2019. Remote dwelling Aboriginal Australian women and birthing: A critical review of literature. *Women and Birth,* 32, 6-15.

FITZPATRICK, E. F. M., CARTER, M., OSCAR, J., LAWFORD, T., MARTINIUK, A. L. C., D'ANTOINE, H. A. & ELLIOTT, E. J. 2017a. Research protocol for the Picture Talk Project: a qualitative study on research and consent with remote Australian Aboriginal communities. *BMJ Open,* 7, e018452.

FITZPATRICK, J. P., LATIMER, J., OLSON, H. C., CARTER, M., OSCAR, J., LUCAS, B. R., DONEY, R., SALTER, C., TRY, J., HAWKES, G., FITZPATRICK, E., HAND, M., WATKINS, R. E., TSANG, T. W., BOWER, C., FERREIRA, M. L., BOULTON, J. & ELLIOTT, E. J. 2017b. Prevalence and profile of Neurodevelopment and Fetal Alcohol Spectrum Disorder (FASD) amongst Australian Aboriginal children living in remote communities. *Research in Developmental Disabilities,* 65, 114-126.

FORMOSA, J., JENNER, R., NGUYEN-THI, M. D., STEPHENS, C., WILSON, C. & ARIYAWARDANA, A. 2015. Awareness and Knowledge of Oral Cancer and Potentially Malignant Oral Disorders among Dental Patients in Far North Queensland, Australia. *Asian Pacific Journal of Cancer Prevention: Apjcp,* 16, 4429-34.

FREEMAN, T., BAUM, F., LAWLESS, A., JAVANPARAST, S., JOLLEY, G., LABONTÉ, R., BENTLEY, M., BOFFA, J. & SANDERS, D. 2016. Revisiting the ability of Australian primary healthcare services to respond to health inequity. *Australian Journal of Primary Health,* 22, 332-338.

GEORGES, N., GUTHRIDGE, S. L., LI, S. Q., CONDON, J. R., BARNES, T. & ZHAO, Y. 2017. Progress in closing the gap in life expectancy at birth for Aboriginal people in the Northern Territory, 1967-2012. *Medical Journal of Australia,* 207, 25-30.

GORHAM, G., HOWARD, K., ZHAO, Y., AHMED, A. M. S., LAWTON, P. D., SAJIV, C., MAJONI, S. W., WOOD, P., CONLON, T., SIGNAL, S., ROBINSON, S. L., BROWN, S. & CASS, A. 2019. Cost of dialysis therapies in rural and remote Australia – a micro-costing analysis. *BMC Nephrology,* 20, 231.

GORHAM, G., MAJONI, S. W., LAWTON, P., BROWN, S., DUBE, B., CONLON, T., SAJIV, C., WOOD, P., SIGNAL, S. & CASS, A. 2018. Interesting times -- evolution of dialysis in Australia's Northern Territory (1980-2014). *Renal Society of Australasia Journal,* 14, 108-116.

GRIFFITHS, E. K., MARLEY, J. V., FRIELLO, D. & ATKINSON, D. N. 2016. Uptake of long-acting, reversible contraception in three remote Aboriginal communities: a population-based study. *Med J Aust,* 205, 21-5.

GUPTA, A., BAXI, S. & HOYNE, C. 2017. Assessing feasibility, compliance and toxicity of concomitant chemo-radiotherapy in head and neck cancers in the Northern Territory: initial experience and challenges. *Journal of Medical Radiation Sciences,* 64, 131-137.

GUY, R. J., WARD, J., CAUSER, L. M., NATOLI, L., BADMAN, S. G., TANGEY, A., HENGEL, B., WAND, H., WHILEY, D., TABRIZI, S. N., SHEPHARD, M., FAIRLEY, C. K., DONOVAN, B., ANDERSON, D. A., REGAN, D. G., MAHER, L. & KALDOR, J. M. 2018. Molecular point-of-care testing for chlamydia and gonorrhoea in Indigenous Australians attending remote primary health services (TTANGO): a cluster-randomised, controlled, crossover trial. *Lancet Infect Dis,* 18, 1117-1126.

HAFEEZ, U., JOSHI, A., BHATT, M., KELLY, J., SABESAN, S. & VANGAVETI, V. 2017. Clinical profile and treatment outcomes of advanced neuroendocrine tumours in rural and regional patients: a retrospective study from a regional cancer centre in North Queensland, Australia. *Internal Medicine Journal,* 47, 284-290.

HAIGH, K., MCDERMOTT, R., SINHA, A. & MCLEAN, A. 2019. Diagnosis and management of type 2 diabetes in youth in North Queensland and the Northern Territory: A health professional survey. *Australian Journal of Rural Health,* 27, 42-48.

HALL, F., GORDON, S., HULCOMBE, J. & STEPHENS, C. 2019. Compression garment service model: Facilitating access to compression garments through workforce and service redesign. *Australian Journal of Rural Health,* 27, 257-261.

HAMILTON, S., MILLS, B., MCRAE, S. & THOMPSON, S. 2016. Cardiac Rehabilitation for Aboriginal and Torres Strait Islander people in Western Australia. *BMC Cardiovascular Disorders,* 16, 150.

HAREN, M. T., SETCHELL, J., JOHN, D. L. & DANIEL, M. 2015. The impacts of withdrawal and replacement of general practitioner services on aeromedical service trends: a 13-year interrupted time-series study in Tennant Creek, Northern Territory. *BMC Health Services Research,* 15, 456.

HEGNEY, D., ELEY, R., OSSEIRAN-MOISSON, R. & FRANCIS, K. 2015. Work and personal well-being of nurses in Queensland: Does rurality make a difference? *Australian Journal of Rural Health,* 23, 359-65.

HILL, K., HARVEY, N., FELTON-BUSCH, C., HOSKINS, J., RASALAM, R., MALOUF, P. & KNIGHT, S. 2018. The road to registration: Aboriginal and Torres Strait Islander health practitioner training in north Queensland. *Rural & Remote Health,* 18, 3899.

HINTON, R., KAVANAGH, D. J., BARCLAY, L., CHENHALL, R. & NAGEL, T. 2015. Developing a best practice pathway to support improvements in Indigenous Australians' mental health and well-being: A qualitative study. *BMJ Open,* 5.

HOST, B. K., TURNER, A. W. & MUIR, J. 2018. Real-time teleophthalmology video consultation: an analysis of patient satisfaction in rural Western Australia. *Clinical & Experimental Optometry,* 101, 129-134.

IHLE, I. R., NEIBLING, E., ALBRECHT, K., TRESTON, H. & SHOLAPURKAR, A. 2019. Investigation of radiation-protection knowledge, attitudes, and practices of North Queensland dentists. *Journal of Investigative & Clinical Dentistry,* 10, e12374.

IRELAND, S., BELTON, S. & SAGGERS, S. 2015. The logics of planned birthplace for remote Australian Aboriginal women in the northern territory: A discourse and content analysis of clinical practice manuals. *Midwifery,* 31, 993-9.

IYNGKARAN, P., MAJONI, W., CASS, A., SANDERS, P., RONCO, C., BRADY, S., KANGAHARAN, N., ILTON, M., HARE, D. L. & THOMAS, M. C. 2015. Northern Territory perspectives on heart failure with comorbidities - understanding trial validity and exploring collaborative opportunities to broaden the evidence base. *Heart, Lung & Circulation,* 24, 536-43.

JACUPS, S. P., KINCHIN, I. & MCCONNON, K. M. 2018. Ear, nose, and throat surgical access for remote living Indigenous children: What is the least costly model? *Journal of Evaluation in Clinical Practice,* 24, 1330-1338.

JAINULLABUDEEN, T. A., LIVELY, A., SINGLETON, M., SHAKESHAFT, A., TSEY, K., MCCALMAN, J., DORAN, C. & JACUPS, S. 2015. The impact of a community-based risky drinking intervention (Beat da Binge) on Indigenous young people. *BMC Public Health,* 15, 1319.

JHAVERI, D., LARKINS, S., KELLY, J. & SABESAN, S. 2016. Remote chemotherapy supervision model for rural cancer care: perspectives of health professionals. *European Journal of Cancer Care,* 25, 93-8.

JOHNSON, D. R., MCDERMOTT, R. A., CLIFTON, P. M., D'ONISE, K., TAYLOR, S. M., PREECE, C. L. & SCHMIDT, B. A. 2015a. Characteristics of Indigenous adults with poorly controlled diabetes in north Queensland: implications for services. *BMC Public Health,* 15, 325.

JOHNSON, K. A., MEYER, J., YAZAR, S. & TURNER, A. W. 2015b. Real-time teleophthalmology in rural Western Australia. *Australian Journal of Rural Health,* 23, 142-9.

JOHNSTON, K., HARVEY, C., MATICH, P., PAGE, P., JUKKA, C., HOLLINS, J. & LARKINS, S. 2015. Increasing access to sexual health care for rural and regional young people: Similarities and differences in the views of young people and service providers. *Australian Journal of Rural Health,* 23, 257-64.

JONES, C., SHARMA, M., HARKUS, S., MCMAHON, C., TAUMOEPEAU, M., DEMUTH, K., MATTOCK, K., ROSAS, L., WING, R., PAWAR, S. & HAMPSHIRE, A. 2018. A program to respond to otitis media in remote Australian Aboriginal communities: a qualitative investigation of parent perspectives. *BMC Pediatrics,* 18**,** 99.

JOSIF, C. M., KRUSKE, S., KILDEA, S. V. & BARCLAY, L. M. 2017. The quality of health services provided to remote dwelling aboriginal infants in the top end of northern Australia following health system changes: a qualitative analysis. *BMC Pediatrics,* 17**,** 93.

KELLY, J., DOWLING, A., MCBRIDE, K., KEECH, W. & BROWN, A. 2018. 'We get so task orientated at times that we forget the people': Staff communication experiences when caring for Aboriginal cardiac patients. *Australian Health Review*.

KEOGH, K., CLARK, P., VALERY, P. C., MCPHAIL, S. M., BRADSHAW, C., DAY, M. & SMITH, A. C. 2016. Use of telehealth to treat and manage chronic viral hepatitis in regional Queensland. *Journal of Telemedicine & Telecare,* 22**,** 459-464.

KILDEA, S., GAO, Y., ROLFE, M., JOSIF, C. M., BAR-ZEEV, S. J., STEENKAMP, M., KRUSKE, S., WILLIAMS, D., DUNBAR, T. & BARCLAY, L. M. 2016. Remote links: Redesigning maternity care for Aboriginal women from remote communities in Northern Australia - A comparative cohort study. *Midwifery,* 34**,** 47-57.

KINGSTON, G. A., JUDD, J. & GRAY, M. A. 2015. The experience of medical and rehabilitation intervention for traumatic hand injuries in rural and remote North Queensland: a qualitative study. *Disability & Rehabilitation,* 37**,** 423-9.

KIRKHAM, R., MACKAY, D., BARZI, F., WHITBREAD, C., KIRKWOOD, M., GRAHAM, S., VAN DOKKUM, P., MCINTYRE, H. D., SHAW, J. E., BROWN, A., O'DEA, K., CONNORS, C., OATS, J., ZIMMET, P., BOYLE, J. & MAPLE-BROWN, L. 2019a. Improving postpartum screening after diabetes in pregnancy: Results of a pilot study in remote Australia. *Aust N Z J Obstet Gynaecol,* 59**,** 430-435.

KIRKHAM, R., TRAP-JENSEN, N., BOYLE, J. A., BARZI, F., BARR, E. L. M., WHITBREAD, C., VAN DOKKUM, P., KIRKWOOD, M., CONNORS, C., MOORE, E., ZIMMET, P., CORPUS, S., HANLEY, A. J., O'DEA, K., OATS, J., MCINTYRE, H. D., BROWN, A., SHAW, J. E., MAPLE-BROWN, L. & ON BEHALF OF THE, N. T. D. I. P. P. 2019b. Diabetes care in remote Australia: the antenatal, postpartum and inter-pregnancy period. *BMC Pregnancy and Childbirth,* 19**,** 389.

KIRKHAM, R., BOYLE, J. A., WHITBREAD, C., DOWDEN, M., CONNORS, C., CORPUS, S., MCCARTHY, L., OATS, J., MCINTYRE, H. D., MOORE, E., O'DEA, K., BROWN, A. & MAPLE-BROWN, L. 2017. Health service changes to address diabetes in pregnancy in a complex setting: Perspectives of health professionals. *BMC Health Services Research,* 17.

KLEIN, J., BOYLE, J. A., KIRKHAM, R., CONNORS, C., WHITBREAD, C., OATS, J., BARZI, F., MCINTYRE, D., LEE, I., LUEY, M., SHAW, J., BROWN, A. D. H. & MAPLE-BROWN, L. J. 2017. Preconception care for women with type 2 diabetes mellitus: A mixed-methods study of provider knowledge and practice. *Diabetes Research and Clinical Practice,* 129**,** 105-115.

KOTZ, J., MUNNS, A., MARRIOTT, R. & MARLEY, J. V. 2016. Perinatal depression and screening among Aboriginal Australians in the Kimberley. *Contemp Nurse,* 52**,** 42-58.

KRUSKE, S., SCHULTZ, T., EALES, S. & KILDEA, S. 2015. A retrospective, descriptive study of maternal and neonatal transfers, and clinical outcomes of a Primary Maternity Unit in rural Queensland, 2009-2011. *Women & Birth: Journal of the Australian College of Midwives,* 28**,** 30-9.

KUIPERS, P., HURWOOD, A. & MCBRIDE, L. J. 2015. Audit of allied health assistant roles: suggestions for improving quality in rural settings. *Australian Journal of Rural Health,* 23**,** 185-8.

KWEDZA, R. K., LARKINS, S., JOHNSON, J. K. & ZWAR, N. 2017. Perspectives of rural and remote primary healthcare services on the meaning and goals of clinical governance. *Australian Journal of Primary Health,* 23**,** 451-457.

LACK, B. M., SMITH, R. M., ARUNDELL, M. J. & HOMER, C. S. 2016. Narrowing the Gap? Describing women's outcomes in Midwifery Group Practice in remote Australia. *Women & Birth: Journal of the Australian College of Midwives,* 29**,** 465-470.

LAFFIN, N., SMYTH, W., HEYER, E., FASUGBA, O., ABERNETHY, G. & GARDNER, A. 2015. Effectiveness and Acceptability of a Moisturizing Cream and a Barrier Cream During Radiation Therapy for Breast Cancer in the Tropics: A Randomized Controlled Trial. *Cancer Nursing,* 38**,** 205-14.

LANGE, F. D., JONES, K., RITTE, R., BROWN, H. E. & TAYLOR, H. R. 2017. The impact of health promotion on trachoma knowledge, attitudes and practice (KAP) of staff in three work settings in remote Indigenous communities in the Northern Territory. *PLoS Neglected Tropical Diseases [electronic resource],* 11**,** e0005503.

LENTHALL, S., WAKERMAN, J., DOLLARD, M. F., DUNN, S., KNIGHT, S., OPIE, T., RICKARD, G. & MACLEOD, M. 2018. Reducing occupational stress among registered nurses in very remote Australia: A participatory action research approach. *Collegian,* 25**,** 181-191.

LI, M. & MCDERMOTT, R. 2015. Smoking, poor nutrition, and sexually transmitted infections associated with pelvic inflammatory disease in remote North Queensland Indigenous communities, 1998-2005. *BMC Women's Health,* 15**,** 31.

LOH, T. L., RENGER, L., LATIS, S. & PATEL, H. 2019. Malignant otitis externa in Australian Aboriginal patients: A 9-year retrospective analysis from the Northern Territory. *Australian Journal of Rural Health,* 27**,** 78-82.

LOWE, M. & COFFEY, P. 2019. Effect of an ageing population on services for the elderly in the Northern Territory. *Australian Health Review,* 43**,** 71-77.

MANN, C. 2019. Some days I feel I have the best job in the world – a Friends 'My Place' story. *Partyline: the magazine for healthy and sustainable rural, regional and remote communities*.

MAPLE-BROWN, L., LEE, I. L., LONGMORE, D., BARZI, F., CONNORS, C., BOYLE, J. A., MOORE, E., WHITBREAD, C., KIRKWOOD, M., GRAHAM, S., HAMPTON, V., SIMMONDS, A., VAN DOKKUM, P., KELAART, J., THOMAS, S., CHITTURI, S., EADES, S., CORPUS, S., LYNCH, M., LU, Z. X., O'DEA, K., ZIMMET, P., OATS, J., MCINTYRE, H. D., BROWN, A. D. H. & SHAW, J. E. 2019. Pregnancy And Neonatal Diabetes Outcomes in Remote Australia: the PANDORA study-an observational birth cohort. *Int J Epidemiol,* 48**,** 307-318.

MARLEY, J. V., DENT, H. K., WEARNE, M., FITZCLARENCE, C., NELSON, C., SIU, K., WARR, K. & ATKINSON, D. 2010. Haemodialysis outcomes of Aboriginal and Torres Strait Islander patients of remote Kimberley region origin. *Med J Aust,* 193, 516-20.

MARLEY, J. V., NELSON, C., O'DONNELL, V. & ATKINSON, D. N. 2012. Quality indicators of diabetes care: an example of remote-area Aboriginal primary health care over 10 years. *Medical Journal of Australia,* 197, 404-408.

MARTIN, K., DONO, J., RIGNEY, N., RAYNER, J., SPARROW, A., MILLER, C., MCKIVETT, A., O'DEA, K., RODER, D. & BOWDEN, J. 2017. Barriers and facilitators for health professionals referring Aboriginal and Torres Strait Islander tobacco smokers to the Quitline. *Australian & New Zealand Journal of Public Health,* 41, 631-634.

MATICH, P., HARVEY, C., PAGE, P., JOHNSTON, K., JUKKA, C., HOLLINS, J. & LARKINS, S. 2015. Young people's perceptions of sexual and reproductive health in regional and rural Queensland: Capturing the views of adolescents through reference groups and a user-friendly electronic survey. *Sexual Health,* 12, 231-239.

MATTHEWS, V., BURGESS, C. P., CONNORS, C., MOORE, E., PEIRIS, D., SCRIMGEOUR, D., THOMPSON, S. C., LARKINS, S. & BAILIE, R. 2017. Integrated Clinical Decision Support Systems Promote Absolute Cardiovascular Risk Assessment: An Important Primary Prevention Measure in Aboriginal and Torres Strait Islander Primary Health Care. *Front Public Health,* 5, 233.

MAVRIDIS, C. 2017. Patients give us thumbs up for telehealth...but are we convinced?...Roberts S, Spain B, Hicks C, London J, Tay S. Telemedi- cine in the Northern Territory: an assessment of patient perceptions in the preoperative anaesthetic clinic. Aus- tralian Journal of Rural Health 2015 (June); 23 : 136 – 141. *Australian Journal of Rural Health,* 25, 71-71.

MCCALMAN, J., SEARLES, A., BAINBRIDGE, R., HAM, R., MEIN, J., NEVILLE, J., CAMPBELL, S. & TSEY, K. 2015. Empowering families by engaging and relating Murri way: a grounded theory study of the implementation of the Cape York Baby Basket program. *BMC Pregnancy & Childbirth,* 15, 119.

MCDERMOTT, R. A., SCHMIDT, B., PREECE, C., OWENS, V., TAYLOR, S., LI, M. & ESTERMAN, A. 2015. Community health workers improve diabetes care in remote Australian Indigenous communities: results of a pragmatic cluster randomized controlled trial. *BMC Health Serv Res,* 15, 68.

MCFARLAND, R. 2017. Telepharmacy for remote hospital inpatients in north-west Queensland. *Journal of Telemedicine & Telecare,* 23, 861-865.

MCFARLANE, K., DEVINE, S., JUDD, J., NICHOLS, N. & WATT, K. 2017. Workforce insights on how health promotion is practised in an Aboriginal Community Controlled Health Service. *Australian Journal of Primary Health,* 23, 243-248.

MCFARLANE, K. A., JUDD, J. A., WAPAU, H., NICHOLS, N., WATT, K. & DEVINE, S. 2018. How primary health care staff working in rural and remote areas access skill development and expertise to support health promotion practice. *Rural & Remote Health,* 18, 23-29.

MCGRAIL, M. R., RUSSELL, D. J., O'SULLIVAN, B. G., REEVE, C., GASSER, L. & CAMPBELL, D. 2018. Demonstrating a new approach to planning and monitoring rural medical training distribution to meet population need in North West Queensland. *BMC Health Services Research,* 18, 993.

MCGRATH, P. 2015. 'You never leave work when you live on a cattle property': Special problems for rural property owners who have to relocate for specialist treatment. *Australian Journal of Rural Health,* 23, 286-90.

MCGRATH, P., RAWSON, N. & ADIDI, L. 2015. Diagnosis and treatment for vulvar cancer for indigenous women from East Arnhem Land, Northern Territory: bioethical reflections. *Journal of Bioethical Inquiry,* 12, 343-52.

MCKAY, C. C., CHANG, A. B., VERSTEEGH, L. A. & MCCALLUM, G. B. 2015. Culturally appropriate flipcharts improve the knowledge of common respiratory conditions among Northern Territory Indigenous families. *Health Promotion Journal of Australia,* 26, 150-153.

MCLEAN, A., KIRKHAM, R., CAMPBELL, S., WHITBREAD, C., BARRETT, J., CONNORS, C., BOYLE, J., BROWN, A., MEIN, J., WENITONG, M., MCINTYRE, H. D., BARZI, F., OATS, J., SINHA, A. & MAPLE-BROWN, L. 2019. Improving Models of Care for Diabetes in Pregnancy: Experience of Current Practice in Far North Queensland, Australia. *Frontiers in public health,* 7, 192-192.

MCMULLEN, C., EASTWOOD, A. & WARD, J. 2016. Environmental attributable fractions in remote Australia: the potential of a new approach for local public health action. *Aust N Z J Public Health,* 40, 174-80.

MCWILLIAMS, T., HENDRICKS, J., TWIGG, D., WOOD, F. & GILES, M. 2016. Telehealth for paediatric burn patients in rural areas: a retrospective audit of activity and cost savings. *Burns,* 42, 1487-1493.

MERVIN, M. C., BARKER, R. N., SEALEY, C. J. & COMANS, T. 2017. Introduction of the Community Rehabilitation Northern Queensland Service. *Asia-Pacific Journal of Health Management,* 20.

MIHRSHAHI, S., VAUGHAN, L., FA'AVALE, N., DE SILVA WELIANGE, S., MANU-SIONE, I. & SCHUBERT, L. 2017. Evaluation of the Good Start Program: a healthy eating and physical activity intervention for Maori and Pacific Islander children living in Queensland, Australia. *BMC public health,* 17, 77-77.

MOYNIHAN, V. & TURNER, A. 2017. Coordination of diabetic retinopathy screening in the Kimberley region of Western Australia. *Aust J Rural Health,* 25, 110-115.

NANCARROW, S. A., MORAN, A. M. & GRAHAM, I. 2014. Preparing a 21st century workforce: is it time to consider clinically based, competency-based training of health practitioners? *Aust Health Rev,* 38, 115-7.

NATTABI, B., GIRGIS, S., MATTHEWS, V., BAILIE, R. & WARD, J. E. 2018. Clinic predictors of better syphilis testing in Aboriginal primary healthcare: A promising opportunity for primary healthcare service managers. *Australian Journal of Primary Health,* 24, 350-358.

O'DAY, R., SMITH, C., MUIR, J. & TURNER, A. 2016. Optometric use of a teleophthalmology service in rural Western Australia: comparison of two prospective audits. *Clinical & Experimental Optometry,* 99, 163-7.

O'DONNELL, V., MORRIS, S. & WARD, J. 2016. Mass Drug Administration for Scabies Control. *N Engl J Med,* 374, 1689-90.

O'HARA, R. & JACKSON, S. 2017. Integrating telehealth services into a remote allied health service: A pilot study. *Australian Journal of Rural Health,* 25, 53-57.

ONNIS, L. L. 2015. An examination of supportive management practices promoting health workforce stability in remote northern Australia. *Australasian psychiatry : bulletin of Royal Australian and New Zealand College of Psychiatrists,* 23**,** 679-682.

ORDA, U., ORDA, S., SEN GUPTA, T. & KNIGHT, S. 2017. Building a sustainable workforce in a rural and remote health service: A comprehensive and innovative Rural Generalist training approach. *Australian Journal of Rural Health,* 25**,** 116-119.

PAGE, B. J., BOWMAN, R. V., YANG, I. A. & FONG, K. M. 2016. A survey of lung cancer in rural and remote Aboriginal and Torres Strait Islander communities in Queensland: health views that impact on early diagnosis and treatment. *Internal Medicine Journal,* 46**,** 171-6.

PAIN, T., PLUMMER, D., PIGHILLS, A. & HARVEY, D. 2015. Comparison of research experience and support needs of rural versus regional allied health professionals. *Australian Journal of Rural Health,* 23**,** 277-85.

PANARETTO, K. S., DELLIT, A., HOLLINS, A., WASON, G., SIDHOM, C., CHILCOTT, K., MALTHOUSE, D., ANDREWS, S., MEIN, J., AHKEE, B. & MCDERMOTT, R. 2017. Understanding patient access patterns for primary health-care services for Aboriginal and Islander people in Queensland: a geospatial mapping approach. *Australian Journal of Primary Health,* 23**,** 37-45.

PANDIT, T., SABESAN, S. & RAY, R. A. 2018. Medical emergencies in rural North Queensland: Doctors perceptions of the training needs. *Australian Journal of Rural Health,* 26**,** 422-428.

PANZERA, A. J., MURRAY, R., STEWART, R., MILLS, J., BEATON, N. & LARKINS, S. 2016. Regional health workforce planning through action research: lessons for commissioning health services from a case study in Far North Queensland. *Australian Journal of Primary Health,* 22**,** 63-68.

PASSEY, M. E. & SANSON-FISHER, R. W. 2015. Provision of antenatal smoking cessation support: A survey with pregnant Aboriginal and Torres Strait Islander women. *Nicotine and Tobacco Research,* 17**,** 746-749.

PATEL, J., HEARN, L. & SLACK-SMITH, L. M. 2015. Oral health care in remote Kimberley Aboriginal communities: the characteristics and perceptions of dental volunteers. *Australian Dental Journal,* 60**,** 328-35.

PHAM MT, RAJIC A, GREIG JD, SARGEANT JM, PAPDOPOULOS A AND MCEWEN SA. 2014. A scoping review of scoping reviews: advancing the approach and enhancing the consistency. Res Synth Methods: 5(4):371-385; 10.1002/jrsm.1123

PIDGEON, F. 2015. Occupational therapy: what does this look like practised in very remote Indigenous areas? *Rural & Remote Health,* 15**,** 3002.

PIDGEON, F. M. 2017. Use of telehealth videoconferencing as a supplement to visiting allied health services. *Australian Journal of Rural Health,* 25**,** 58-59.

PIGHILLS, A., TYNAN, A., FURNESS, L. & RAWLE, M. 2019. Occupational therapist led environmental assessment and modification to prevent falls: Review of current practice in an Australian rural health service. *Australian Occupational Therapy Journal,* 66**,** 347-361.

PIGHILLS, A. C., BRADFORD, M., BELL, K., FLYNN, L. J., WILLIAMS, G., HORNSBY, D., TORGERSON, D. J. & KALTNER, M. 2015. Skill-sharing between allied health professionals in a community setting: A randomised controlled trial. *International Journal of Therapy and Rehabilitation,* 22.

PLATT, V., O'CONNOR, K. & COLEMAN, R. 2015. Improving regional and rural cancer services in Western Australia. *Australian Journal of Rural Health,* 23**,** 32-9.

PLAYFORD, D., NGO, H., GUPTA, S. & PUDDEY, I. B. 2017. Opting for rural practice: the influence of medical student origin, intention and immersion experience. *Medical Journal of Australia,* 207**,** 154-158.

PLAYFORD, D. E., NICHOLSON, A., RILEY, G. J. & PUDDEY, I. B. 2015. Longitudinal rural clerkships: increased likelihood of more remote rural medical practice following graduation. *BMC Medical Education,* 15**,** 55.

POULSEN, K. A., MILLEN, C. M., LAKSHMAN, U. I., BUTTNER, P. G. & ROBERTS, L. J. 2015. Satisfaction with rural rheumatology telemedicine service. *International Journal of Rheumatic Diseases,* 18**,** 304-14.

QUILTY, S., BACHMAYER, L. & CONGDON, A. 2015. Telehealth in remote Northern Territory: Bridging the gap. *Medical Journal of Australia,* 203**,** 1.

QUINN, L. & READ, D. 2017. Paediatric surgical services in remote northern Australia: an integrated model of care. *ANZ Journal of Surgery,* 87**,** 784-788.

RALPH, A. P., LOWELL, A., MURPHY, J., DIAS, T., BUTLER, D., SPAIN, B., HUGHES, J. T., CAMPBELL, L., BAUERT, B., SALTER, C., TUNE, K. & CASS, A. 2017. Low uptake of Aboriginal interpreters in healthcare: exploration of current use in Australia's Northern Territory. *BMC Health Services Research,* 17**,** 733.

RAMAMOORTHI, R. & JAYARAJ, R. 2015. Epidemiology, etiology, and motivation of alcohol misuse among Australian Aboriginal and Torres Strait Islanders of the Northern Territory: a descriptive review. *Journal of Ethnicity in Substance Abuse,* 14**,** 1-11.

RAY, R. A., YOUNG, L. & LINDSAY, D. B. 2015. The influences of background on beginning medical students' perceptions of rural medical practice. *BMC Medical Education,* 15**,** 58.

REEVE, C., BANFIELD, S., THOMAS, A., REEVE, D. & DAVIS, S. 2016. Community outreach midwifery-led model improves antenatal access in a disadvantaged population. *Australian Journal of Rural Health,* 24**,** 200-6.

REEVE, C., HUMPHREYS, J., WAKERMAN, J., CARTER, M., CARROLL, V. & REEVE, D. 2015. Strengthening primary health care: Achieving health gains in a remote region of Australia. *Medical Journal of Australia,* 202**,** 483-488.

RIKARD-BELL, C. & WOOLLEY, T. 2018. Aligning an undergraduate psychological medicine subject with the mental health needs of the local region. *BMC Medical Education,* 18**,** 118.

ROBERTS, S., SPAIN, B., HICKS, C., LONDON, J. & TAY, S. 2015. Telemedicine in the Northern Territory: an assessment of patient perceptions in the preoperative anaesthetic clinic. *Australian Journal of Rural Health,* 23**,** 136-41.

ROBINSON, R. 2018. The evolution of perioperative telehealth in Katherine, Northern Territory, Australia. *ACORN: The Journal of Perioperative Nursing in Australia,* 31**,** 47-50.

RUMBOLD, A. R., WILD, K. J., LAWURRPA MAYPILAMA, E., KILDEA, S. V., BARCLAY, L., WALLACE, E. M. & BOYLE, J. A. 2015. Challenges to Providing Fetal Anomaly Testing in a Cross-Cultural Environment: Experiences of Practitioners Caring for Aboriginal Women. *Birth: Issues in Perinatal Care,* 42, 362-368.

RUSSELL, D. J., ZHAO, Y., GUTHRIDGE, S., RAMJAN, M., JONES, M. P., HUMPHREYS, J. S. & WAKERMAN, J. 2017. Patterns of resident health workforce turnover and retention in remote communities of the Northern Territory of Australia, 2013-2015. *Human Resources for Health,* 15, 1-12.

SABESAN, S., LARKINS, S., EVANS, R., VARMA, S., ANDREWS, A., BEUTTNER, P., BRENNAN, S. & YOUNG, M. 2012. Telemedicine for rural cancer care in North Queensland: bringing cancer care home. *Aust J Rural Health,* 20, 259-64.

SAV, A., KING, M. A., KELLY, F., MCMILLAN, S. S., KENDALL, E., WHITTY, J. A. & WHEELER, A. J. 2015. Self-management of chronic conditions in a rural and remote context. *Australian Journal of Primary Health,* 21, 90-95.

SCHOEN, D. E., GAUSIA, K., GLANCE, D. G. & THOMPSON, S. C. 2016. Improving rural and remote practitioners' knowledge of the diabetic foot: findings from an educational intervention. *Journal of Foot & Ankle Research,* 9, 26.

SEEAR, K. H., LELIEVRE, M. P., ATKINSON, D. N. & MARLEY, J. V. 2019. 'It's Important to Make Changes.' Insights about Motivators and Enablers of Healthy Lifestyle Modification from Young Aboriginal Men in Western Australia. *International Journal of Environmental Research & Public Health [Electronic Resource],* 16, 24.

SEGAL, L., NGUYEN, H., SCHMIDT, B., WENITONG, M. & MCDERMOTT, R. A. 2016. Economic evaluation of Indigenous health worker management of poorly controlled type 2 diabetes in north Queensland. *Medical Journal of Australia,* 204, 1961e-9.

SHAHID, S., TENG, T. H., BESSARAB, D., AOUN, S., BAXI, S. & THOMPSON, S. C. 2016. Factors contributing to delayed diagnosis of cancer among Aboriginal people in Australia: a qualitative study. *BMJ Open,* 6, e010909.

SHARMA, D. K., VANGAVETI, V. N. & LARKINS, S. 2016. Geographical access to radiation therapy in North Queensland: a retrospective analysis of patient travel to radiation therapy before and after the opening of an additional radiotherapy facility. *Rural & Remote Health,* 16, 3640.

SMITH, G., KIRKHAM, R., GUNABARRA, C., BOKMAKARRAY, V. & BURGESS, C. P. 2018. 'We can work together, talk together': an Aboriginal Health Care Home. *Aust Health Rev.*

SMITH, K., FATIMA, Y. & KNIGHT, S. 2017. Are primary healthcare services culturally appropriate for Aboriginal people? Findings from a remote community. *Australian Journal of Primary Health,* 23, 236-242.

SMYTH, W., HARTIG, V., HAYES, M. & MANICKAM, V. 2015. Patients' adherence to aspects of haemodialysis regimens in tropical north Queensland, Australia. *Journal of Renal Care,* 41, 110-8.

SMYTH, W., LINDSAY, D., HOLMES, C., GARDNER, A. & RAHMAN, K. M. 2016. Self-reported long-term conditions of nurses and midwives across a northern Australian health service: A survey. *International Journal of Nursing Studies,* 62, 22-35.

SOOFUL, P., WILLIAMS, J. & MOORE, R. 2018. Supporting Northern Territory Top End allied health graduates and early career staff by means of an interprofessional graduate program. *Australian Health Review.*

SPAETH, B. & SHEPHARD, M. 2016. Clinical and operational benefits of international normalized ratio point-of-care testing in remote Indigenous communities in Australia's Northern Territory. *The Journal of Near-Patient Testing & Technology,* 15, 30-34.

SPAETH, B. A., KAAMBWA, B., SHEPHARD, M. D. & OMOND, R. 2018. Economic evaluation of point-of-care testing in the remote primary health care setting of Australia's Northern Territory. *Clinicoecon Outcomes Res,* 10, 269-277.

SPRINGER, A. M., CONDON, J. R., LI, S. Q. & GUTHRIDGE, S. L. 2017. Frequent use of hospital inpatient services during a nine year period: a retrospective cohort study. *BMC Health Services Research,* 17, 348.

STARMER, G. & SCHRALE, R. 2016. Heart of the tropics: delivering evidence-based care for acute coronary syndromes in northern Australia. *Rural & Remote Health,* 16, 3938.

STUART, J., HA, H., CROCOMBE, L. & BARNETT, T. 2017. Relationships between dental personnel and non-dental primary health care providers in rural and remote Queensland, Australia: dental perspectives. *BMC Oral Health,* 17, 1-10.

SU, J.-Y., HE, V. Y., GUTHRIDGE, S., HOWARD, D., LEACH, A. & SILBURN, S. 2019. The impact of hearing impairment on Aboriginal children's school attendance in remote Northern Territory: a data linkage study. *Australian and New Zealand Journal of Public Health,* 43, 544-550.

SUSHAMES, A., ENGELBERG, T. & GEBEL, K. 2017. Perceived barriers and enablers to participation in a community-tailored physical activity program with Indigenous Australians in a regional and rural setting: A qualitative study. *International Journal for Equity in Health,* 16.

TAYLOR, S., THOMPSON, F. & MCDERMOTT, R. 2016. Barriers to insulin treatment among Australian Torres Strait Islanders with poorly controlled diabetes. *Australian Journal of Rural Health,* 24, 363-370.

THOMAS, L., BOWEN, A. C., LY, M., CONNORS, C., ANDREWS, R. & TONG, S. Y. C. 2019. Burden of skin disease in two remote primary healthcare centres in northern and central Australia. *Internal Medicine Journal,* 49, 396-399.

THOMAS, S. L., ZHAO, Y., GUTHRIDGE, S. L. & WAKERMAN, J. 2014. The cost-effectiveness of primary care for Indigenous Australians with diabetes living in remote Northern Territory communities. *Med J Aust,* 201, 450.

TITMUSS, A., DAVIS, E. A., BROWN, A. & MAPLE-BROWN, L. J. 2019. Emerging diabetes and metabolic conditions among Aboriginal and Torres Strait Islander young people. *Med J Aust,* 210, 111-113.e1.

TORKINGTON, A. M., LARKINS, S. & GUPTA, T. S. 2011. The psychosocial impacts of fly-in fly-out and drive-in drive-out mining on mining employees: a qualitative study. *Aust J Rural Health,* 19, 135-41.

TURNER, N. N., TAYLOR, J., LARKINS, S., CARLISLE, K., THOMPSON, S., CARTER, M., REDMAN-MACLAREN, M. & BAILIE, R. 2019. Conceptualizing the Association Between Community Participation and CQI in Aboriginal and Torres Strait Islander PHC Services. *Qual Health Res,* 29, 1904-1915.

TUTTLE, C. S. L., CARRINGTON, M. J., STEWART, S. & BROWN, A. 2016. Overcoming the tyranny of distance: An analysis of outreach visits to optimise secondary prevention of cardiovascular disease in high-risk individuals living in Central Australia. *Australian Journal of Rural Health,* 24**,** 99-105.

VAJTA, B., HOLBERG, M., MILLS, J. & MCBRIDE, W. J. 2015. Weighing up the costs of seeking health care for dengue symptoms: a grounded theory study of backpackers' decision-making processes. *Australian Journal of Primary Health,* 21**,** 245-8.

VALERY, P. C., WHOP, L. J., MORSEU-DIOP, N., GARVEY, G., MASTERS, I. B. & CHANG, A. B. 2016. Carers' perspectives on an effective Indigenous health model for childhood asthma in the Torres Strait. *Australian Journal of Rural Health,* 24**,** 170-5.

VERMA, R., PATHMANATHAN, S., OTTY, Z. A., BINDER, J., VANGAVETI, V. N., BUTTNER, P. & SABESAN, S. S. 2018. Delays in lung cancer management pathways between rural and urban patients in North Queensland: a mixed methods study. *Internal Medicine Journal,* 48**,** 1228-1233.

VON SCHUCKMANN, L. A., SMITHERS, B. M., KHOSROTEHRANI, K., BEESLEY, V. L., VAN DER POLS, J. C., HUGHES, M. B. & GREEN, A. C. 2017. Use of support services in a sample of patients with high-risk primary melanomas in urban, regional and rural Queensland. *Australian & New Zealand Journal of Public Health,* 41**,** 315-319.

WAKERMAN, J., HUMPHREYS, J., RUSSELL, D., GUTHRIDGE, S., BOURKE, L., DUNBAR, T., ZHAO, Y., RAMJAN, M., MURAKAMI-GOLD, L. & JONES, M. P. 2019. Remote health workforce turnover and retention: what are the policy and practice priorities? *Human Resources for Health,* 17**,** 99.

WAKERMAN, J., HUMPHREYS, J. S., WELLS, R., KUIPERS, P., ENTWISTLE, P. & JONES, J. 2008. Primary health care delivery models in rural and remote Australia: a systematic review. *BMC Health Serv Res,* 8**,** 276.

WAKERMAN, J., SPARROW, L., THOMAS, S. L., HUMPHREYS, J. S. & JONES, M. 2017. Equitable resourcing of primary health care in remote communities in Australia's Northern Territory: a pilot study. *BMC Family Practice,* 18**,** 75.

WAPAU, H., JANS, D., HAPEA, E., MEIN, J., CURNOW, V. & MCDONALD, M. 2018. Coming to town: Reaching agreement on a thorny issue. *Australian Journal of Rural Health,* 26**,** 416-421.

WARAN, E., O'CONNOR, N., ZUBAIR, M. Y. & MAY, P. 2016. 'Finishing up' on country: challenges and compromises. *Internal Medicine Journal,* 46**,** 1108-1111.

WOOLLEY, T., LARKINS, S. & GUPTA, T. S. 2019. Career choicse of the first seven cohorts of JCU MBBS graduates: producing generalists for regional, rural and remote northern Australia. *Rural & Remote Health,* 19**,** 31-40.

WOOLLEY, T., SEN GUPTA, T. & LARKINS, S. 2018. Work settings of the first seven cohorts of James Cook University Bachelor of Medicine, Bachelor of Surgery graduates: Meeting a social accountability mandate through contribution to the public sector and Indigenous health services. *Australian Journal of Rural Health,* 26**,** 258-264.

ZHAO, Y., RUSSELL, D. J., GUTHRIDGE, S., RAMJAN, M., JONES, M. P., HUMPHREYS, J. S., CAREY, T. A. & WAKERMAN, J. 2017a. Long-term trends in supply and sustainability of the health workforce in remote Aboriginal communities in the Northern Territory of Australia. *BMC Health Services Research,* 17**,** 1-10.

ZHAO, Y., VEMURI, S. R. & ARYA, D. 2016. The economic benefits of eliminating indigenous health inequality in the Northern Territory. *Medical Journal of Australia,* 206**,** 186-186.e1.

ZHAO, Y., CONNORS, C., LEE, A. H. & LIANG, W. 2015. Relationship between primary care visits and hospital admissions in remote indigenous patients with diabetes: A multivariate spline regression model. *Diabetes Research and Clinical Practice,* 108**,** 106-112.

ZHAO, Y., GUTHRIDGE, S., FALHAMMAR, H., FLAVELL, H. & CADILHAC, D. A. 2017b. Cost-effectiveness of stroke care in Aboriginal and non-Aboriginal patients: an observational cohort study in the Northern Territory of Australia. *BMJ Open,* 7**,** e015033.

Grey literature:

Queensland

Central Australian Rural Practitioners Association (CARPA), 2017. *CARPA Standard Treatment Manual 7th Edition*, Central Australian Aboriginal Congress, Central Australian Rural Practitioners Association Inc, CRANAplus Inc, Flinders University through the Centre for Remote Health. Accessed 31 August 2019: https://www.crh.org.au/the-manuals/carpa-standard-treatment-manual-7th-edition 2019

AUSTRALIAN INSTITUTE FOR PRIMARY CARE AND AGEING, 2011. *Connecting Healthcare in Communities (CHIC) State-wide Evaluation Final Report.* Australian Institute for Primary Care and Ageing, Melbourne.

AUSTRALIAN INSTITUTE OF HEALTH AND WELFARE (AIHW), 2017. *Aboriginal and Torres Strait Islander Health Performance Framework (HPF) 2017 report: Queensland.* Accessed 11 October 2019: https://www.aihw.gov.au/reports/indigenous-health-welfare/health-performance-framework-2017-qld/contents/table-of-contents

CAIRNS AND HINTERLAND HOSPITAL AND HEALTH SERVICE (CHHHS), 2018. *Cairns and Hinterland Hospital and Health Service (CHHHS) Strategic Plan 2018-2022 June 2018.* Accessed 11 October 2019: https://www.health.qld.gov.au/__data/assets/pdf_file/0016/721204/CHHHS-Strategic-Plan_Print.pdf

CHHHS, 2018. *Clinical Services Plan 2018-2020.* Accessed 11 October 2019: https://www.health.qld.gov.au/cairns_hinterland/html/resources/clinical-services-plan-2018-2022

HEALTH WORKFORCE QUEENSLAND, 2019. *Health Workforce Needs Assessment.* Accessed 11 October 2019: https://www.healthworkforce.com.au/workforce-data

HOLLAND C, 2018. *Close the Gap 2018 - A Ten-Year Review: The Closing the Gap Strategy and Recommendations for Reset.* Close the Gap Campaign Steering Committee for Indigenous Health Equality. Accessed 11 October 2019: https://apo.org.au/node/131816

MACKAY HOSPITAL AND HEALTH SERVICE, 2018. *Mackay Public Health Unit.* Accessed 30 August 2019: http://www.mackay.health.qld.gov.au/your-hospitals/mackay-base-hospital/public-health/

MCNAMARA KE, SMITHERS SG, WESTOBY R, PARNELL K, 2011. *Limits to Climate Change Adaptation for Low-Lying Communities in the Torres Strait.* National Climate Change Adaptation Research Facility and James Cook University. Accessed 11 October 2019: https://www.nccarf.edu.au/publications/limits-adaptation-low-lying-communities-torres-strait

NORTH WEST HOSPITAL AND HEALTH SERVICE, 2019. *Strategic Plan 2017-2021 - Revised 2019.* Accessed 11 October 2019: https://www.health.qld.gov.au/__data/assets/pdf_file/0030/155865/stratplan20172021.pdf

NORTHERN QUEENSLAND PRIMARY HEALTH NETWORK (NQPHN), 2018. *Strategic Plan 2018-2023.* Accessed 30 July 2019: https://www.nqphn.com.au/wp-content/uploads/2019/07/NQPHN-Strategic-plan-2018-2023.pdf

NQPHN, 2018. *NQPHN Annual Report 2017–18.* Accessed 10 October 2019: https://www.nqphn.com.au/nqphn-annual-report-2017-2018

NQPHN, 2019. *Health Needs Assessment 2019-2022.* Accessed 11 October 2019: https://www.nqphn.com.au/wp-content/uploads/2019/05/NQPHN-Health-Needs-Assessment-HNA-2019-2022.pdf

NQPHN, 2019. *Integrated Team Care - Assessment, Evaluation and Co Design Consultation.* Accessed 11 October 2019. https://www.nqphn.com.au/wp-content/uploads/2019/07/ITC-Review-NQPHN-Final-public-report-July-2019.pdf

WESTERN QUEENSLAND PRIMARY HEALTH NETWORK (WQPHN), 2016. *Strategic Plan 2016 – 2020.* Accessed 11 October 2019: https://wqphn.com.au/uploads/documents/WQPHN%20Strategic%20Plan_June%2011_FINAL_WEB.pdf

WQPHN, 2018. *Commissioning for Better Health.* Accessed 10 October 2019: https://www.wqphn.com.au/commissioning/commissioning-for-better-health

WQPHN, 2017. *2017-2018 Health Needs Assessment Summary.* Accessed 11 October 2019: https://wqphn.com.au/uploads/documents/WQPHN_2017-2018%20HNA_Final%20Report_web.pdf

WQPHN, 2018. *Nukal Murra Social and Emotional Wellbeing Framework.* Accessed 30 July 2019: https://wqphn.com.au/uploads/documents/SEWB-Framework-SPREADS-10_8_18.pdf

QUEENSLAND ABORIGINAL AND ISLANDER HEALTH COUNCIL (QAIHC), 2016. *2016-2019 Strategic Plan.* Accessed 11 October 2019: https://www.qaihc.com.au/media/1049/0016-qaihc-strategic-plan-v2_hi-res.pdf

QAIHC, 2010. *QAIHC Strategic Plan 2010-2013.* Brisbane: Queensland Aboriginal and Islander Health Council.

QUEENSLAND DEPARTMENT OF HEALTH (QLD DOH), 2019. *Health and Wellbeing Strategic Framework 2017 to 2026.* Accessed 10 October 2019: https://www.health.qld.gov.au/system-governance/strategic-direction/plans/health-wellbeing

QLD DOH, 2018. *Annual Report 2017-2018.* Accessed 10 October 2019: https://www.health.qld.gov.au/__data/assets/pdf_file/0031/728374/doh-annual-report-2017-2018.pdf

QLD DOH, 2019. *Advancing Rural and Remote Service Delivery Through Workforce: A Strategy for Queensland 2017-2020.* Accessed 10 October 2019: https://www.health.qld.gov.au/system-governance/strategic-direction/plans/rural-remote-workforce-strategy

QLD DOH, 2015. *21st Century Healthcare: eHealth Investment Strategy.* Accessed 10 October 2019: https://www.health.qld.gov.au/__data/assets/pdf_file/0031/442939/ehealthinvestmentstrategy.pdf

QLD DOH, 2018. *The Health of Queenslanders 2018 Report of the Chief Health Officer Queensland.* Accessed 10 October 2019: https://www.health.qld.gov.au/__data/assets/pdf_file/0032/732794/cho-report-2018-full.pdf

QUEENSLAND GOVERNMENT, 2019. *Queensland Budget 2019-20.* Accessed 10 October 2019: https://budget.qld.gov.au/

QUEENSLAND GOVERNMENT, 2017. *Queensland Health Burden of Disease and Injury Summary results for Queensland November 2017.* Accessed 11 October 2019: https://www.health.qld.gov.au/__data/assets/pdf_file/0025/684214/burden-of-disease-report-2017.pdf

QUEENSLAND PRODUCTIVITY COMMISSION (QPC), 2017. *2017 Final Report Service delivery in remote and discrete Aboriginal and Torres Strait Islander communities.* Accessed 10 October 2019: https://qpc.blob.core.windows.net/wordpress/2018/06/Service-delivery-Final-Report.pdf

TORRES AND CAPE HOSPITAL AND HEALTH SERVICE, 2019. *Torres and Cape Hospital and Health Service Strategic Plan 2019-2023.* Accessed 10 October 2019: https://www.health.qld.gov.au/__data/assets/pdf_file/0021/154173/tchhs-strategic-plan.pdf

TOWNSVILLE HOSPITAL AND HEALTH SERVICE, 2018. *Townsville Hospital and Health Service Health Service Plan 2018-2028.* Accessed 10 October 2019: https://issuu.com/townsvillehospitalandhealthservice/docs/thhs_health_service_plan

Northern Territory

ABORIGINAL MEDICAL SERVICES ALLIANCE NORTHERN TERRITORY (AMSANT), 2019. *Strategic Plan 2019-2023.* Accessed 10 October 2019: http://www.amsant.org.au/wp-content/uploads/2019/08/AMSANT-Strategic-Plan-

[2019-23.pdf](#)

AMSANT, 2018. *Annual Report 2017-2018.* Accessed: 10 October 2019.
[https://www.territorystories.nt.gov.au/jspui/bitstream/10070/305677/1/AMSANT-Annual-Report-2017-18.pdf](#)

AMSANT, 2016. *Priorities for Aboriginal Primary Health Care in the Northern Territory.* Accessed 10 October 2019:
[http://www.amsant.org.au/wp-content/uploads/2018/09/AMSANT-Priorities-for-Aboriginal-PHC-2016_Final-Draft.pdf](#)

AUSTRALIAN INSTITUTE OF HEALTH AND WELFARE (AIHW), 2017. *Aboriginal and Torres Strait Islander Health Performance Framework (HPF) report 2017.* Accessed 8 August 2019:
[https://www.aihw.gov.au/reports/indigenous-health-welfare/health-performance-framework/contents/summary](#)

BISSET, H. 2015. *Aboriginal Remote Housing Forum: 12-13 March 2015.* Aboriginal Peak Organisations of the Northern Territory, Darwin.

BURGESS P, 2016. *Psychologist Integration in Aboriginal Primary Health Care.* Top End Health Service. Accessed 6 September 2019: [https://ahha.asn.au/sites/default/files/docs/policy-issue/paul_burgess_-_psychologist_integration_in_aboriginal_primary_health_care_.pdf](#)

CENTRE FOR REMOTE HEALTH, 2017. *CARPA Standard Treatment Manual 7ᵗʰ Edition.* Accessed 31 August 2019:
[https://www.crh.org.au/the-manuals/carpa-standard-treatment-manual-7th-edition](#)

CENTRAL AUSTRALIAN ABORIGINAL CONGRESS, 2017. *Submission to the Northern Territory Alcohol Policies and Legislation Review.* Accessed 10 October 2019: [https://www.caac.org.au/uploads/pdfs/Congress-Submission-to-the-Northern-Territory-Alcohol-Policies-and-Legislation-Review.pdf](#)

NORTHERN TERRITORY GOVERNMENT, 2009. *Northern Territory Chronic Conditions Prevention and Management Strategy 2010-2020.* Accessed 10 October 2019: [https://digitallibrary.health.nt.gov.au/prodjspui/handle/10137/535](#)

DEVITT J, DWYER J, MARTINI A, TILTON E, 2015. *The Northern Territory Aboriginal Health Forum: A Historical Review - Prepared for the Northern Territory Aboriginal Health Forum and the Lowitja Institute.* Accessed 10 October 2019: [https://www.lowitja.org.au/content/Document/Lowitja-Publishing/FAR-NTAHF.pdf](#)

GORHAM G, CASS A, HOWARD K, EVANS K, 2016. *Central Australia Renal Study Technical Report Update.* Menzies School of Health Research. Accessed 10 October 2019:
[https://www.menzies.edu.au/icms_docs/248898_Central_Australia_Renal_Study_Technical_Report_Update.pdf](#)

MENZIES SCHOOL OF HEALTH RESEARCH. *Chronic Illness Care for Indigenous Australians: Implications for Policy from the ABCD Project.* Accessed 13 August 2019:
[https://www.health.qld.gov.au/__data/assets/pdf_file/0025/369034/chcillcare.pdf](#)

NORTHERN TERRITORY ABORIGINAL HEALTH FORUM (NTAHF), 2016. *What are the key core services needed to improve Aboriginal childhood outcomes in the NT? Progress and Possibilities.* Accessed 10 October 2019:
[http://www.amsant.org.au/wp-content/uploads/2017/08/What-Are-the-Key-Core-Services-Needed-to-Improve-Aboriginal-Childhood-Outcomes-in-the-NT-Report-FINAL.pdf](#)

NTAHF, 2009. *Pathways to Community Control: An agenda to further promote Aboriginal community control in the provision of Primary Health Care Services.* Northern Territory Aboriginal Health Forum, Darwin.

NORTHERN TERRITORY GOVERNMENT, 2019. *Public Health Unit (PHU).* Accessed 13 August 2019:
[https://health.nt.gov.au/professionals/public-health-unit](#)

NORTHERN TERRITORY GOVERNMENT, 2019. *Northern Territory Tobacco Action Plan 2019 – 2023.* Accessed 10 October 2019:
[https://digitallibrary.health.nt.gov.au/prodjspui/bitstream/10137/7581/3/Tobacco%20action%20plan.pdf](#)

NORTHERN TERRITORY GOVERNMENT, 2018. *Agency Budget Statements.* Accessed 10 October 2019:
[https://budget.nt.gov.au/__data/assets/pdf_file/0010/499375/2018-19-BP3-book.pdf](#)

NORTHERN TERRITORY GOVERNMENT, 2018. *Northern Territory Health Strategic Plan 2018 – 2022.* Accessed 10 October 2019:
[https://digitallibrary.health.nt.gov.au/prodjspui/bitstream/10137/2729/3/Northern%20Territory%20Health%20Strategic%20Plan.pdf](#)

NORTHERN TERRITORY GOVERNMENT, 2018. *Northern Territory Top End Health Service Academic Campus Strategic Plan 2018 – 2021.* Top End Health Service, Darwin.

NORTHERN TERRITORY GOVERNMENT, 2018. *Northern Territory Alcohol Harm Minimisation Action Plan 2018-2019.* Accessed 10 October 2019:
[https://alcoholreform.nt.gov.au/__data/assets/pdf_file/0008/485315/AHMPlan_2018.pdf](#)

NORTHERN TERRITORY GOVERNMENT, 2017. *Renal Services Strategy 2017-2022.* Accessed 10 October 2019:
[https://digitallibrary.health.nt.gov.au/prodjspui/bitstream/10137/1438/3/DoH_RenalServices_Strategy.pdf](#)

NORTHERN TERRITORY GOVERNMENT, 2016. *Northern Territory Aboriginal Cultural Security Framework 2016-2026.* Northern Territory Health, Northern Territory Government. Accessed 10 October 2019:
[https://digitallibrary.health.nt.gov.au/prodjspui/bitstream/10137/730/8/Northern%20Territory%20Health%20Aboriginal%20Cultural%20Security%20Framework%202016-2026.pdf](#)

NORTHERN TERRITORY GOVERNMENT, 2016. *Aboriginal Cultural Security Policy.* Accessed 10 October 2019:
[https://digitallibrary.health.nt.gov.au/prodjspui/bitstream/10137/729/7/Northern%20Territory%20Health%20Aborigi](#)

nal%20Cultural%20Security%20Policy.pdf

NORTHERN TERRITORY GOVERNMENT, 2016. *Indigenous Employment and Career Development Strategy 2015-2020 Progress Report.* The Office of The Commissioner of Public Employment. Accessed 10 October 2019: https://ocpe.nt.gov.au/__data/assets/pdf_file/0003/283800/IECDS-Annual-Progress-Report-April-2016.pdf

NORTHERN TERRITORY PRIMARY HEALTH NETWORK (NTPHN), 2019. *Annual Report 2018-2019.* Accessed 10 October 2019: https://www.ntphn.org.au/annual-report

NTPHN, 2018. *Northern Territory PHN Program Needs Assessment Comprehensive Review 2018.* Accessed 10 October 2019: https://www.ntphn.org.au/web_images/2018%20Program%20Needs%20Assessment.pdf

NTPHN, 2018. *Strategic Plan 2018 – 2023*. Accessed 10 October 2019: https://www.ntphn.org.au/strategic-plan

NTPHN, 2018. *Annual Report 2017-2018.* Accessed 10 October 2019: https://www.ntphn.org.au/web_images/NT_PHN_Annual_Report_2017-18.pdf

NTPHN, 2018. *Northern Territory Primary Health Care Workforce Needs Analysis: Priority Areas.* Accessed 10 October 2019: https://www.ntphn.org.au/files/NT%20PHN%20HWNA%20Priority%20areas%2015022018.pdf

NTPHN, 2018. *Annual Report 2017-2018.* Accessed 10 October 2019: https://www.ntphn.org.au/web_images/NT_PHN_Annual_Report_2017-18.pdf

NTPHN, 2017. *Innovate Reconciliation Action Plan December 2017 – December 2019.* Accessed 10 October 2019: https://www.ntphn.org.au/files/Reconciliation Action Plan.pdf

QUILTY S, WOOD L, & GAZEY A. 2019. *Katherine Individual Support Program (KISP): First Evaluation Report.* School of Population and Global Health, The University of Western Australia.

RHEUMATIC HEART DISEASE (RHD) AUSTRALIA, 2019. *Champions4change Program.* Accessed 20 January 2020: https://www.rhdaustralia.org.au/champions4change-program

SCHMIDT, B. 2018. *Miwatj Health Social Determinants of Health Summit: Darwin 15-16 May 2018.* Darwin: Miwatj Health Aboriginal Corporation.

SPAETH B AND R OMOND, 2017. *Northern Territory Point-of-Care Testing Program.* Accessed 13 August 2019: http://www.amsant.org.au/wp-content/uploads/2016/03/1.-BROOKE-SPAETH-AND-ROD-OMOND.pdf

TILTON E & THOMAS D, 2011. *Core functions of primary health care: a framework for the Northern Territory.* Northern Territory Aboriginal Health Forum, AMSANT, NT Government. Accessed 10 October 2019: http://www.amsant.org.au/wp-content/uploads/2014/10/111001-NTAHF-ET-External-Core_PHC_Functions_Framework_FINAL.pdf

Western Australia

ABORIGINAL HEALTH COUNCIL OF WESTERN AUSTRALIA, 2018. *Strategic Plan 2018-2020.* Accessed 10 October 2019: https://c18e0eb7-fe2e-4a7e-a2e8-bb027c600d8d.filesusr.com/ugd/e6fc28_2643418585c7404b8a7fcb90bc6eb882.pdf

KIMBERLEY ABORIGINAL HEALTH PLANNING FORUM (KAHPF). 2019. *KAHPF Resources.* Broome: Kimberley Aboriginal Health Planning Forum. Access 20 January 2020: http://kahpf.org.au/resources

KAHPF, 2018. *Strategic Plan 2018-2028.* Accessed 10 October 2019: https://static1.squarespace.com/static/5b5fbd5b9772ae6ed988525c/t/5bd91a9a40ec9a47ec9ddb81/1540954787024/kahpf_stratplan.pdf

KAHPF, 2018. *KAHPF Strategic Plan 2018-2028 Regional Indicators.* Accessed 10 October 2019: https://static1.squarespace.com/static/5b5fbd5b9772ae6ed988525c/t/5ccfdb9a104c7b981c3ac0c2/1557126055084/KAHPF+Regional+Indicators+2018-2020.pdf

KAPHF ENVIRONMENTAL HEALTH SUBCOMMITTEE, 2018. *Hospitalisations in 2016 of Aboriginal People Due to Their Environment: Demand, Costs and Kimberley Solutions.* Kimberley Public Health Planning Report, Western Australia.

KIMBERLEY ABORIGINAL MEDICAL SERVICES LTD (KAMS), 2019. "Welcome to KAMS". Accessed 8 August 2019: https://kams.org.au/

KAMS, 2019. *Kimberley Renal Services.* Accessed 6 September 2019: https://kams.org.au/kamsc-services/kimberley-renal-services/

WESTERN AUSTRALIA COUNTRY HEALTH SERVICE (WACHS), 2019. *WA Country Health Service Digital Innovation Strategy 2019–2022.* Western Australia Government. Accessed 10 October 2019: http://www.wacountry.health.wa.gov.au/fileadmin/sections/publications/Publications_by_topic_type/Service_Strategies/ED-CO-18-84303__eDoc_-_CO_-_2019-05-13_Digital_Innovation_Strategy_Final_Version_13_May_2019.pdf

WACHS, 2018. *Annual Report 2017-18*. Accessed 11 October 2019: http://www.wacountry.health.wa.gov.au/fileadmin/sections/publications/Publications_by_topic_type/Corporate_documents/WACHS_Annual_Report_2017-18.pdf

WACHS, 2018. *Kimberley Health Profile,* Planning and Evaluation Unit, November 2018. Accessed 10 October 2019: http://www.wacountry.health.wa.gov.au/fileadmin/sections/publications/Publications_by_topic_type/Reports_and_Profiles/Kimberley_Health_Profile_2018.pdf

WACHS, 2018. *Pilbara Health Profile.* Accessed 10 October 2019:
http://www.wacountry.health.wa.gov.au/fileadmin/sections/publications/Publications_by_topic_type/Reports_and_Profiles/Pilbara_Health_Profile_2018.pdf

WACHS, 2018. *Midwest Health Profile.* Accessed 10 October 2019:
http://www.wacountry.health.wa.gov.au/fileadmin/sections/publications/Publications_by_topic_type/Reports_and_Profiles/Midwest_Health_Profile_2018.pdf

WACHS, 2017. *Increasing referrals to environmental services in the Kimberley: current position and strategies for change.* Accessed 8 August 2019:
https://static1.squarespace.com/static/5b5fbd5b9772ae6ed988525c/t/5cd0d3666e9a7f74f179c4e8/1557189485525/Increasing+Referrals+to+Environmental+Services+in+the+Kimberley+baseline+April+2017.pdf

WACHS, 2015. *Strategic Directions 2015–2018: Healthier Country Communities through Partnerships and Innovation*. Western Australia Government. Accessed 10 October 2019:
http://www.wacountry.health.wa.gov.au/fileadmin/sections/purpose_and_strategy/Documents/Strategic_Plan_3_August.pdf

WA PRIMARY HEALTH ALLIANCE (WAPHA), 2016. *Population Health Needs Assessment Country WA PHN*. Accessed 10 October 2019: https://www.wapha.org.au/wp-content/uploads/2016/08/WAPHA_Population_Health_Needs_Assessment_PHN_Country_WA-1.1.pdf

WAPHA, 2019. *Commissioning for Better Health*. Accessed 11 October 2019: https://www.wapha.org.au/wp-content/uploads/2019/04/Commissioning-for-Better-Health.pdf

WAPHA 2017. *Lessons of location: Potentially Preventable Hospitalisation hotspots in Western Australia 2017*. Perth: Government of Western Australia.

SUSTAINABLE HEALTH REVIEW, 2019. *Sustainable Health Review: Final Report to the Western Australian Government*. Department of Health, Western Australia. Accessed 10 October 2019:
https://ww2.health.wa.gov.au/~/media/Files/Corporate/general%20documents/Sustainable%20Health%20Review/Final%20report/sustainable-health-review-final-report.pdf

WESTERN AUSTRALIA GOVERNMENT, 2019. *2019-20 Budget Agency Details*. Accessed 10 October 2019:
https://www.ourstatebudget.wa.gov.au/agency-details.html

WESTERN AUSTRALIA GOVERNMENT, 2018. *Annual Report 2017-2018.* Accessed 10 October 2019:
https://ww2.health.wa.gov.au/~/media/Files/Corporate/Reports%20and%20publications/Annual%20reports/2018/DOH-Annual-Report.pdf

WESTERN AUSTRALIA GOVERNMENT, 2015. *WA Health Strategic Intent 2015 – 2020*. Accessed 10 October 2019:
https://ww2.health.wa.gov.au/~/media/Files/Corporate/general%20documents/About%20WA%20Health/wa_health_strategic_intent14052015.pdf

Cross Jurisdictional

AUSTRALIAN GOVERNMENT, 2018. *Corporate Plan 2018-2019: Strong Rural Health Strategy*. Commonwealth of Australia. Access 20 Janurary 2020: https://www.health.gov.au/resources/corporate-plan-2018-2019/our-performance/stronger-rural-health-strategy [Accessed].

AUSTRALIAN BUREAU OF STATISTICS (ABS), 2019. *Population Estimates by Statistical Area Level 2 2017 to 2018.* Accessed 8 August 2019: https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3218.02017-18?OpenDocument

AUSTRALIAN INSTITUTE OF HEALTH AND WELFARE (AIHW), 2019a. *Health Expenditure Australia 2017-18.* Accessed 5 October 2019: https://apo.org.au/sites/default/files/resource-files/2019/09/apo-nid260681-1388711.pdf

AIHW, 2019b. *Potentially Preventable Hospitalisations in Australia by age groups and small geographic areas 2017-18.* Accessed 25 August 2019: https://www.aihw.gov.au/reports/primary-health-care/potentially-preventable-hospitalisations/contents/overview

AIHW, 2019c. *Diabetes hospital care for diabetes.* Accessed 25 August 2019:
https://www.aihw.gov.au/reports/diabetes/diabetes-snapshot/contents/hospital-care-for-diabetes

AIHW, 2019d. *AIHW data by geography.* Accessed 10 October 2019: https://www.aihw.gov.au/about-our-data/aihw-data-by-geography

AIHW, 2018a. *Percentage of adults(a) who are obese(b), by PHN area, age-standardised, 2016.* Accessed 10 October 2019: https://www.aihw.gov.au/reports-data/indicators/healthy-community-indicators/national/all-australia/overweight/overweight-obesity

AIHW, 2018b. *Australia's Health 2018*. Accessed 8 August 2019: https://www.aihw.gov.au/reports/australias-health/australias-health-2018/contents/table-of-contents

AIHW, 2017a. *Aboriginal and Torres Strait Islander Health Performance Framework Report 2017.* Accessed 8 August 2019: https://www.aihw.gov.au/reports/indigenous-health-welfare/health-performance-framework/contents/overview

AIHW, 2017b. *Dialysis hospitalisations.* Accessed 25 August 2019:

https://aihw.maps.arcgis.com/apps/MapJournal/index.html?appid=891550f5edb44184b8abeb43f7824bbb#

AIHW, 2017c. *Risk factors to health Risk factors and disease burden.* Accessed 25 August 2019: https://www.aihw.gov.au/reports/risk-factors/risk-factors-to-health/contents/risk-factors-and-disease-burden

AIHW, 2017d. *Geographic variation in chronic kidney disease*. Accessed 10 October 2019: https://www.aihw.gov.au/reports/chronic-kidney-disease/geographical-variation-ckd/contents/contents

AIHW, 2017e. Trends in Indigenous mortality and life expectancy 2001–2015. Accessed 10 October 2019. https://www.aihw.gov.au/reports/indigenous-australians/trends-in-indigenous-mortality-and-life-expectancy/contents/table-of-contents

AIHW, 2008. *Disability in Australia: trends in prevalence, education, employment and community living*. Accessed 10 October 2019: https://www.aihw.gov.au/reports/disability/trends-prevalence-education-employment-community/contents/table-of-contents

AUSTRALIAN HEALTHCARE AND HOSPITALS ASSOCIATION (AHHA), 2017. *Healthy People, Healthy Systems*. Accessed 10 October 2019: https://ahha.asn.au/sites/default/files/docs/policy-issue/ahha_blueprint_2017_0.pdf

AUSTRALIAN HEALTH MINISTERS ADVISORY COUNCIL, 2017. *National Aboriginal and Torres Strait Islander Health Workforce Strategic Framework 2016–2023.* Accessed 2 August 2019: https://www1.health.gov.au/internet/main/publishing.nsf/Content/4A716747859075FFCA257BF0001C9608/$File/National-Aboriginal-and-Torres-Strait-Islander-Health-Workforce-Strategic-Framework.pdf

AUSTRALIAN PREVENTION PARTNERSHIPS CENTRE, 2019. *AUSPOPS 2016–2018 Second national report*. Accessed 10 October 2019: https://preventioncentre.org.au/wp-content/uploads/2019/09/AUSPOPS2_TAPPC_NationalReport_140519-FINAL.pdf

AUSTRALIAN PRIMARY HEALTH CARE RESEARCH INSTITUTE, 2006. *A Systematic Review of Primary Health Care Delivery Models in Rural and Remote Australia 1993-2006*.

BATTYE, K., ROUFEIL, L., EDWARDS, M., HARDAKER, L., JANSSEN, T., WILKINS, R, 2019. *Strategies for increasing allied health recruitment and retention in rural Australia: A Rapid Review*. Accessed 25 August 2019: https://sarrah.org.au/system/files/members/rapid_review_-_recruitment_and_retention_strategies_-_final_web_ready.pdf

COMMONWEALTH OF AUSTRALIA, 2017. "*My Life My Lead*": Opportunities for Strengthening Approaches to the Social Determinants and Cultural Determinants of Indigenous Health – Report on the National Consultations.* Accessed 10 October 2019: https://www1.health.gov.au/internet/main/publishing.nsf/Content/D2F6B905F3F667DACA2580D400014BF1/$File/My%20Life%20My%20Lead%20Consultation%20Report.pdf

COMMONWEALTH OF AUSTRALIA, 2015. *Our North, Our Future: White Paper on Developing Northern Australia*. Accessed 28 August 2019: https://www.industry.gov.au/sites/g/files/net3906/f/June%202018/document/pdf/nawp-fullreport.pdf

COMMONWEALTH OF AUSTRALIA, 2013. *National Aboriginal and Torres Strait Islander Health Plan 2013–2023*. Accessed 25 August 2019: https://www1.health.gov.au/internet/main/publishing.nsf/content/B92E980680486C3BCA257BF0001BAF01/$File/health-plan.pdf

COMMONWEALTH OF AUSTRALIA, 2009. *Improving Maternity Services in Australia The Report of the Maternity Services Review.* Accessed 10 October 2019: https://www1.health.gov.au/internet/main/publishing.nsf/Content/624EF4BED503DB5BCA257BF0001DC83C/$File/Improving%20Maternity%20Services%20in%20Australia%20-%20The%20Report%20of%20the%20Maternity%20Services%20Review.pdf

COMMONWEALTH OF AUSTRALIA, 2016. *Medical Training Review Panel: Nineteenth Report*. Accessed 10 October 2019: https://www1.health.gov.au/internet/main/publishing.nsf/Content/work-pubs-mtrp-19

FERDINAND ET AL, 2019. *Understanding Disability through the Lens of Aboriginal and Torres Strait Islander People – Challenges and Opportunities.* Accessed 11 October 2019: https://www.lowitja.org.au/content/Document/PDF/NDIS_Evaluation_M_Kelaher_v2.pdf

GLOBAL HEALTH ALLIANCE INSTITUTE, 2019. *Health and Climate Change in Australia and the Asia Pacific Region from Townsville to Tuvalu.* Accessed 10 October 2019: http://glham.org/from-townsville-to-tuvalu/

GREATER NORTHERN AUSTRALIAN REGIONAL HEALTH NETWORK (GNARTN), 2014. *Submission to the Joint Select Committee on Northern Australia By Greater Northern Australia Regional Training Network (GNARTN) & The Remote Health Project (RPH)*. GNARTN & Health Workforce Australia.

GNARTN, 2017. *Increasing the Aboriginal and Torres Strait Islander health workforce in Northern Australia.* GNARTN.

GNARTN, 2013. *Rural and Remote Generalist: Allied Health Project December 2013*. Accessed 25 August 2019: https://www.health.qld.gov.au/__data/assets/pdf_file/0025/656035/GNARTN-project-report.pdf

HEALTH WORKFORCE AUSTRALIA (HWA), 2014a. *Australia's Future Health Workforce – Nurses Overview Report*. Accessed 25 August 2019:

https://www1.health.gov.au/internet/main/publishing.nsf/Content/34AA7E6FDB8C16AACA257D9500112F25/$File/AFHW%20-%20Nurses%20overview%20report.pdf

HWA, 2014b. *Nursing Workforce Sustainability: Improving Nurse Retention and Productivity*. Accessed 25 August 2019: https://www1.health.gov.au/internet/main/publishing.nsf/Content/29418BA17E67ABC0CA257D9B00757D08/$File/Nursing%20Workforce%20Sustainability%20-%20Improving%20Nurse%20Retention%20and%20Productivity%20report.pdf

JACKSON H & SHIELL A, 2017. *Preventive Health: How Much Does Australia Spend and is it Enough?* Accessed 11 October 2019: http://fare.org.au/wp-content/uploads/Preventive-health-How-much-does-Australia-spend-and-is-it-enough_FINAL.pdf

NATIONAL ABORIGINAL COMMUNITY CONTROLLED HEALTH ORGANISATION (NACCHO), 2019. *Quality use of Medicines Maximised for Aboriginal and Torres Strait Islander People (QUMAX)*. Accessed 11 October 2019: https://www.naccho.org.au/programmes/medicines/qumax-program/

NATIONAL ABORIGINAL AND TORRES STRAIT ISLANDER HEALTH WORKERS ASSOCIATION (NATSIHWA), 2016. *Cultural Safety Framework*. Accessed 30 November 2019: https://www.natsihwa.org.au/sites/default/files/natsihwa-cultural_safety_framework_summary.pdf

SERVICES FOR AUSTRALIAN RURAL AND REMOTE ALLIED HEALTH (SARRAH), 2015. *The impact of allied health professionals in improving outcomes and reducing the cost of treating diabetes, osteoarthritis and stroke: a report developed for services for Australian rural and remote allied health*. Accessed 11 October 2019: https://sarrah.org.au/sites/default/files/docs/sarrah_report_on_the_economic_impact_of_allied_health_interventions_-_final_-_091015.pdf

Export and demand sources

ADELMAN, MA; IVASCHENKO, O; PACKARD, TG.; SURI, V. 2015. *Hardship and vulnerability in the Pacific island countries*. Washington DC; World Bank Group. http://documents.worldbank.org/curated/en/649891468098658407/Hardship-and-vulnerability-in-the-Pacific-island-countries

AUSTRADE, 2019. *Export Markets Indonesia; AusTrade Export Markets Myanmar*, Commonwealth of Australia.

AUSTRADE, 2019. "Tropical Medicine Northern Australia" Accessed 1 October 2019: https://www.austrade.gov.au/International/Invest/Opportunities/tropical-medicine

AUSTRALIAN INSTITUTE OF TROPICAL HEALTH AND MEDICINE (AITHM), 2019. *Aims of the Tropical Partnership Project*. Accessed 10 October 2019: https://www.aithm.jcu.edu.au/research/research-projects-and-groups/tropical-partners/aims-of-the-tropical-partners-project/

CHONGSUVIVATWONG V, PHUA KH, TENG YAP M, POCOCK NS, HASHIM JH, CHHEM R, WILOPO SA, LOPEZ AD, 2011. Health and health-care systems in southeast Asia: diversity and transitions. *Lancet*, 377:429-37.

COMMONWEALTH OF AUSTRALIA, 2015. *Our North, Our Future: White Paper on Developing Northern Australia*. Accessed 28 August 2019: https://www.industry.gov.au/sites/g/files/net3906/f/June%202018/document/pdf/nawp-fullreport.pdf

DELOITTE ACCESS ECONOMICS, 2011. *Medical Tourism in Australia: A Scoping Study.* Report produced for the Department of Resources, Energy and Tourism. Accessed 1 October 2019: https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloite-au-economics-medical-tourism-australia-150811.pdf

DEPARTMENT OF FOREIGN AFFAIRS AND TRADE (DFAT), 2019. "Overview of Australia's Assistance for Health". Accessed 20 September 2019: https://dfat.gov.au/aid/topics/investment-priorities/education-health/health/Pages/health.aspx

DEPARTMENT OF FOREIGN AFFAIRS AND TRADE, 2015. *Health for Development Strategy.* Accessed 21 October 2019: https://dfat.gov.au/about-us/publications/Pages/health-for-development-strategy-2015-2020.aspx

JAMES COOK UNIVERSITY, 2015. *Concept Note: Export Opportunities in Tropical Health and Medicine*. James Cook University, Townsville.

LEE K, 2014. Health policy in Asia and the Pacific: Navigating local needs and global challenges. *Asia Pacific Policy Studies*. 1(1): 45–57.

LIN V, LEUNG G, CARTER B, 2019. Asia-Pacific countries moving toward universal health coverage. *Health Systems & Reform*, 5(1): 1-6.

MENZIES SCHOOL OF HEALTH RESEARCH, 2019. "Global and Tropical Health". Accessed 11 October 2019: https://www.menzies.edu.au/page/Research/Global_and_Tropical_Health/

NORTHERN TERRITORY GOVERNMENT, 2019. "National Critical Care and Trauma Response Centre". Accessed 1 October 2019: https://www.nationaltraumacentre.nt.gov.au/what-we-do/disaster-management

STATE OF THE TROPICS, 2014. *State of the Tropics: Full Report.* James Cook University. Accessed 10 October 2019: https://www.jcu.edu.au/state-of-the-tropics/publications/2014

STATE OF THE TROPICS, 2019. Accessed 11 November 2019: *Health in the Tropics: A State of the Tropics Report.* James Cook University. https://www.jcu.edu.au/state-of-the-tropics

VOIGT C. 2010. *Health tourism in Australia: supply, demand and opportunities*. CRC for Sustainable Tourism, Gold Coast.

WHO, 2010. Tuberculosis in the WHO South-East Asia Region. *Bulletin of the World Health Organization*, 88:164-164.

Research investment sources

DELOITTE ACCESS ECONOMICS, 2015. *The social and economic contribution of the Menzies School of Health Research in 2015.* Deloitte Access Economics. Accessed 21 January 2020: https://www2.deloitte.com/au/en/pages/economics/articles/economics-social-economic-contribution-menzies-school-health-research-2015.html

HOT NORTH, 2019. "Resources". Menzies School of Health Research. Accessed 25 September 2019: https://www.hotnorth.org.au/resources/

KPMG, *Economic Impact of Medical Research in Australia: A Report Prepared for the Association of Australian Medical Research Institutes.* 2018. KPMG International. Accessed 21 January 2020: https://aamri.org.au/wp-content/uploads/2018/10/Economic-Impact-of-Medical-Research-full-report.pdf

SWOT sources

VAN WIJNGAARDEN JDH, SCHOLTEN GRM, VAN WIJK KP, 2012. Strategic analysis for health care organisations: the suitability of the SWOT-analysis. *International journal of health planning and management,* 27: 34-49.

Costing study sources

AUSTRALIAN HEALTH MINISTERS' ADVISORY COUNCIL (AHMAC) 2017. *Aboriginal and Torres Strait Islander health performance framework 2017 report.* Canberra: AHMAC; 2017. Accessed 15 September 2019: https://www1.health.gov.au/internet/main/publishing.nsf/Content/oatsih_heath-performanceframework

AUSTRALIAN INSTITUTE OF HEALTH AND WELFARE (AIHW) 2018, *Health expenditure Australia 2016–17*, AIHW, Canberra. Accessed 07 October 2019: https://www.aihw.gov.au/reports/health-welfare-expenditure/health-expenditure-australia-2016-17/contents/data-visualisation

AUSTRALIAN INSTITUTE OF HEALTH AND WELFARE (AIHW) 2019, *Potentially preventable hospitalisations in Australia by small geographic areas.* Accessed 10 September 2019. https://www.aihw.gov.au/reports/primary-health-care/potentially-preventable-hospitalisations

AUSTRALIAN INSTITUTE OF HEALTH AND WELFARE (AIHW) 2016. *National Healthcare Agreement: PI 18- Selected potentially preventable hospitalisations, 2016.* Accessed September 2019. http://meteor.aihw.gov.au/content/index.phtml/itemId/598746.

AUSTRALIAN INSTITUTE OF HEALTH AND WELFARE (AIHW) 2015, *National healthcare agreement: PI 18-selected potentially preventable hospitalisations*, 2015. Accessed 10 September 2019. http://meteor.aihw.gov.au/content/index.phtml/itemId/559032

CLINICAL EPIDEMIOLOGY AND HEALTH SERVICE EVALUATION UNIT (CEHSEU), 2009. *Potentially Preventable Hospitalisations: A Review of the Literature and Australian Policies (Final Report).* Melbourne Health. Accessed 20 January 2020: https://www.safetyandquality.gov.au/sites/default/files/migrated/Potentially-preventable-hospitalisations-A-review-of-the-literature-and-Australian-policies-Final-Report.pdf

COUNCIL OF AUSTRALIAN GOVERNMENTS (COAG). *Intergovernmental Agreement (IGA) on Federal Financial Relations: Schedule F National Healthcare Agreement.* 2008. Accessed September 2019. http://www.federalfinancialrelations.gov.au/content/national_agreements.aspx.

DUCKETT, S., GRIFFITHS, K. 2016. *Perils of Place: Identifying Hotspots of Health Inequalities.* The Grattan Institute; 2016. Accessed 03 October 2019: https://ssrn.com/abstract=2821308

FALSTER, MO., LEYLAND AH., JORM LR. 2019. *Do hospitals influence geographic variation in admission for preventable hospitalisation? A data linkage study in New South Wales, Australia. BMJ Open* 2019;**9:**e027639.

FALSTER, M AND JORM, L. *A guide to the potentially preventable hospitalisations indicator in Australia. 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: Sydney; 2017. Accessed 04 October 2019: https://www.safetyandquality.gov.au/sites/default/files/migrated/A-guide-to-the-potentially-preventable-hospitalisations-indicator-in-Australia.pdf

HARRISS, LR., THOMPSON F., LAWSON, K., LOUGHLIN, MO & MCDERMOTT, R. 2018. Preventable hospitalisations in regional Queensland: potential for primary health? *Aust Health Rev*, 43, 371-81.

KATTERL R., ANIKEEVA O., BUTLER C., BROWN L., SMITH B., BYWOOD P. 2012. *Potentially avoidable hospitalisations in Australia: causes for hospitalisations and primary health care interventions.* Primary Health Care Research & Information Service Policy Issue Review. Adelaide: Primary Health Care Research & Information Service; 2012. Accessed 16 September 2019: https://dspace.flinders.edu.au/xmlui/handle/2328/26600

PAGE A, AMBROSE S, GLOVER J, HETZEL D. (2007) *Atlas of Avoidable Hospitalisations in Australia: ambulatory care-sensitive conditions*. Adelaide: University of Adelaide. Accessed 15 September 2019: https://www.aihw.gov.au/getmedia/c4d175cd-f22f-4834-a96b-546a0595613f/10459.pdf.aspx?inline=true

WEISSMAN JS, GATSONIS C AND EPSTEIN AM. 1992. Rates of avoidable hospitalization by insurance status in Massachusetts and Maryland. *JAMA*, 268(17): 2388- 2394.

ZHAO Y., THOMAS SL., GUTHRIDGE SL., WAKERMAN J.2014. 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*, 14: 463.

Additional evidence supporting priority actions sources

ABEL, J., KINGSTON, H., SCALLY, A., HARTNOLL, J., HANNAM, G., THOMSON-MOORE, A. & KELLEHEAR, A. 2018. Reducing emergency hospital admissions: a population health complex intervention of an enhanced model of

primary care and compassionate communities. *British Journal of General Practice*, 68, e803-e810.

ALFORD, K. 2014. *Investing in Aboriginal Community Controlled Health Makes Economic Sense.* Canberra: National Aboriginal Community Controlled Health Organisation. Accessed 15 January 2020: https://nacchocommunique.files.wordpress.com/2014/04/naccho_14_econimic-value-exec-summary_020414.pdf

BAILIE, R. 2007. Chapter 10: Housing. In Carson B, Dunbar T, Chenhall RD and Bailie R. *Social Determinants of Indigenous Health*. Allen & Unwin, NSW.

BATH, J. & WAKERMAN, J. 2015. Impact of community participation in primary health care: what is the evidence? *Australian Journal of Primary Health*, 21, 2-8.

BEAVER, C. & ZHAO, Y. 2004. *Aboriginal and Torres Strait Islander Primary Health Care Review: Consultant Report No 2 - Investment Analysis of the Aboriginal and Torres Strait Islander Primary Health Care Program in the Northern Territory*. Canberra: Commonwealth of Australia. Accessed 19 January 2020: https://www1.health.gov.au/internet/main/publishing.nsf/Content/B3CB608ECEF4658FCA257BF0001DAC93/$File/2investment.pdf

BEHRENDT, L. LARKIN, S., GRIEW, R., KELLY, P. 2012. *Review of Higher Education Access and Outcomes for Aboriginal and Torres Strait Islander People: Final Report*. Canberra: Australian Government. Accessed 15 January 2020: https://docs.education.gov.au/system/files/doc/other/heaccessandoutcomesforaboriginalandtorresstraitislanderfinalreport.pdf

BLACK, R. E., TAYLOR, C. E., AROLE, S., BANG, A., BHUTTA, Z. A., CHOWDHURY, A. M. R., KIRKWOOD, B. R., KURESHY, N., LANATA, C. F., PHILLIPS, J. F., TAYLOR, M., VICTORA, C. G., ZHU, Z. & PERRY, H. B. 2017. Comprehensive review of the evidence regarding the effectiveness of community-based primary health care in improving maternal, neonatal and child health: 8. summary and recommendations of the Expert Panel. *Journal of Global Health*, 7, 010908.

BLOOM DE, CANNING D, SEVILLA J, 2004. The effect of health on economic growth: a production function approach. *World Development*, 32 (1):1-13.

BOYCE, T. & BROWN, C. 2019. *Economic and social impacts and benefits of health systems*. Copenhagen, Denmark: World Health Organization: Regional Office for Europe. Accessed 2 February 2020: http://www.euro.who.int/en/publications/abstracts/economic-and-social-impacts-and-benefits-of-health-systems-2019

BUYKX, P., HUMPHREYS, J., WAKERMAN, J. & PASHEN, D. 2010. Systematic review of effective retention incentives for health workers in rural and remote areas: towards evidence-based policy. *Australian Journal of Rural Health*, 18, 102-9.

CHALMERS, I & GLASZIOU, P. 2009. Avoidable waste in the production and reporting of research evidence. *Lancet*, 374(9683), 86-89.

CONEJO-CERON, S., MORENO-PERAL, P., RODRIGUEZ-MOREJON, A., MOTRICO, E., NAVAS-CAMPANA, D., RIGABERT, A., MARTIN-PEREZ, C., RODRIGUEZ-BAYON, A., BALLESTA-RODRIGUEZ, M. I., LUNA, J. D., GARCIA-CAMPAYO, J., ROCA, M. & BELLON, J. A. 2017. Effectiveness of Psychological and Educational Interventions to Prevent Depression in Primary Care: A Systematic Review and Meta-Analysis. *Annals of Family Medicine*, 15, 262-271.

CRISTOBAL, F. & WORLEY, P. 2011. Transforming health professionals' education. Lancet, 377, 1235-6; author reply 1238-9.

CRISTOBAL, F. & WORLEY, P. 2012. Can medical education in poor rural areas be cost-effective and sustainable: the case of the Ateneo de Zamboanga University School of Medicine. *Rural Remote Health*, 12, 1835.

DEPARTMENT OF HEALTH. 2019. "Rural Health Multidisciplinary Training (RHMT) program". Australian Government. Accessed 19 January 2020: http://www.health.gov.au/internet/main/publishing.nsf/content/rural-health-multidisciplinary-training

DIELEMAN, M. K., S; ZWANIKKEN, P; GERRETSEN, B. 2011. *Realist review and synthesis of retention studies for health workers in rural and remote areas*. World Health Organization. Accessed 19 January 2020: https://apps.who.int/iris/bitstream/handle/10665/44548/9789241501262_eng.pdf;jsessionid=1D609B8AD01127246B54A2A732738487?sequence=1

DOLEA, C. & WORLD HEALTH ORGANIZATION. 2010. *Increasing access to health workers in remote and rural areas through improved retention: global policy recommendations*. World Health Organization. Accessed 19 January 2020: https://www.who.int/hrh/retention/guidelines/en/

DUNBAR, T., BOURKE, L. & MURAKAMI-GOLD, L. 2019. More than just numbers! Perceptions of remote area nurse staffing in Northern Territory Government health clinics. *Aust J Rural Health*, 27, 245-250.

ERNST & YOUNG, E. 2013. *Evaluation and Investigative Study of the Queensland Rural Generalist Program*. Queensland Health Office of Rural and Remote Health. Accessed 27 January 2020: http://ruralgeneralist.qld.gov.au/wp-content/uploads/2017/07/qrgpeval_rpt_feb13..pdf

FARMER, J., KENNY, A., MCKINSTRY, C. & HUYSMANS, R. D. 2015. A scoping review of the association between rural medical education and rural practice location. *Human Resources for Health*, 13, 27.

FERNANDEZ, A., MORENO-PERAL, P., ZABALETA-DEL-OLMO, E., BELLON, J. A., ARANDA-REGULES, J. M., LUCIANO, J. V., SERRANO-BLANCO, A. & RUBIO-VALERA, M. 2015. Is there a case for mental health promotion in the primary care setting? A systematic review. *Preventive Medicine*, 76 Suppl, S5-11.

FERRER, R. L. 2007. Pursuing equity: contact with primary care and specialist clinicians by demographics, insurance,

and health status. *Annals of Family Medicine*, 5, 492-502.

FRIEDMAN CP, ALLEE NJ, DELANEY BC, FLYNN AJ, SILVERSTEIN JC, SULLIVAN K & YOUNG KA. 2016. The science of Learning Health Systems: Foundations for a new journal. *Learning Health Systems*, 1(1), e10020.

GARDINER, M., KEARNS, H. & TIGGEMANN, M. 2013. Effectiveness of cognitive behavioural coaching in improving the well-being and retention of rural general practitioners. *Australian Journal of Rural Health*, 21, 183-9.

GILES-CORTI, B., VERNEZ-MOUDON, A., REIS, R., TURRELL, G., DANNENBERG, A. L., BADLAND, H., FOSTER, S., LOWE, M., SALLIS, J. F., STEVENSON, M. & OWEN, N. 2016. City planning and population health: a global challenge. *Lancet*, 388, 2912-2924.

HOGENBIRK, J. C., TIMONY, P. E., FRENCH, M. G., STRASSER, R., PONG, R. W., CERVIN, C. & GRAVES, L. 2016. Milestones on the social accountability journey: Family medicine practice locations of Northern Ontario School of Medicine graduates. *Canadian Family Physician*, 62, e138-45.

JOHNSON, G., FOSTER, K., BLINKHORN, A. & WRIGHT, F. C. 2019. Exploration of the factors that influence new Australian dental graduates to work rurally and their perspectives of rural versus metropolitan employment. *European Journal of Dental Education*, 23, 437-447.

KAPHF ENVIRONMENTAL HEALTH SUBCOMMITTEE, 2018. *Hospitalisations in 2016 of Aboriginal People Due to Their Environment: Demand, Costs and Kimberley Solutions*. Kimberley Public Health Planning Report, Western Australia.

KONDALSAMY-CHENNAKESAVAN, S., ELEY, D. S., RANMUTHUGALA, G., CHATER, A. B., TOOMBS, M. R., DARSHAN, D. & NICHOLSON, G. C. 2015. Determinants of rural practice: positive interaction between rural background and rural undergraduate training. *Medical Journal of Australia*, 202, 41-5.

KRINGOS, D. S., BOERMA, W., VAN DER ZEE, J. & GROENEWEGEN, P. 2013. Europe's strong primary care systems are linked to better population health but also to higher health spending. *Health Affairs*, 32, 686-94.

KWAN, M. M. S., KONDALSAMY-CHENNAKESAVAN, S., RANMUTHUGALA, G., TOOMBS, M. R. & NICHOLSON, G. C. 2017. The rural pipeline to longer-term rural practice: General practitioners and specialists. *PLoS One*, 12, e0180394.

LARKINS S., CARLISE K., TURNER N., TAYLOR J., COPLEY K., COONEY S., WRIGHT R., MATTHEWS V., THOMPSON S. & BAILIE R. 2019. 'At the grass roots level it's about sitting down and talking': exploring quality improvement through case studies with high-improving Aboriginal and Torres Strait Islander primary healthcare services. *BMJ Open*, 9(5).

LARTEY, S., CUMMINGS, G. & PROFETTO-MCGRATH, J. 2014. Interventions that promote retention of experienced registered nurses in health care settings: a systematic review. *Journal of Nursing Management*, 22, 1027-41.

LEBAN, K. 2011. *How Social Capital in Community Systems Strengthens Health Systems: People, Structures, Processes*. USAID, Core Group. Accessed 14 January 2020: https://coregroup.org/wp-content/uploads/2018/12/Components_of_a_Community_Health_System_final10-12-2011.pdf

LENTHALL, S., WAKERMAN, J., OPIE, T., DUNN, S., MACLEOD, M., DOLLARD, M., RICKARD, G. & KNIGHT, S. 2011. Nursing workforce in very remote Australia, characteristics and key issues. *Australian Journal of Rural Health*, 19, 32-7.

MARMOT MG. 2017. Dignity, social investment and the Indigenous health gap. *Medical Journal of Australia*. 207(1), 20-21.

MBEMBA, G., GAGNON, M. P., PARE, G. & COTE, J. 2013. Interventions for supporting nurse retention in rural and remote areas: an umbrella review. *Human Resources for Health*, 11, 44.

MCGIRR, J., SEAL, A., BARNARD, A., CHEEK, C., GARNE, D., GREENHILL, J., KONDALSAMY CHENNAKESAVAN, S., LUSCOMBE, G. M., MAY, J., MC LEOD, J., O'SULLIVAN, B., PLAYFORD, D. & WRIGHT, J. 2019. The Australian Rural Clinical School (RCS) program supports rural medical workforce: evidence from a cross-sectional study of 12 RCSs. *Rural Remote Health*, 19, 4971.

MCGRAIL, M. R., RUSSELL, D. J. & CAMPBELL, D. G. 2016. Vocational training of general practitioners in rural locations is critical for the Australian rural medical workforce. *Medical Journal of Australia*, 205, 216-21.

NGUYEN, H. T. & GARDINER, A. 2008. Indigenous community members as teachers of Indigenous health. *Australian Family Physician*, 37, 1019-21.

NICHOLS, L. & TAYLOR, L.A. 2018. Social determinants as public goods: a new approach to financing key investments in healthy communities. *Health Affairs*, 37, 1223-1230.

PALSDOTTIR, B., BARRY, J., BRUNO, A., BARR, H., CLITHERO, A., COBB, N., DE MAESENEER, J., KIGULI-MALWADDE, E., NEUSY, A. J., REEVES, S., STRASSER, R. & WORLEY, P. 2016. Training for impact: the socio-economic impact of a fit for purpose health workforce on communities. *Human Resources for Health*, 14, 49.

PANARETTO, K. S., WENITONG, M., BUTTON, S. & RING, I. T. 2014. Aboriginal community controlled health services: leading the way in primary care. *Medical Journal of Australia*, 200, 649-52.

PANARETTO K, MITCHELL M, ANDERSON L, LARKINS S, MANESSIS V, BUETTNER P & WATSON D. 2007. Sustainable antenatal care services in an urban Indigenous community: the Townsville experience. *Medical Journal of Australia*. 187(1), 18-22.

PERRY, H. B., RASSEKH, B. M., GUPTA, S. & FREEMAN, P. A. 2017. Comprehensive review of the evidence regarding the effectiveness of community-based primary health care in improving maternal, neonatal and child health: 7. shared characteristics of projects with evidence of long-term mortality impact. *Journal of Global Health*, 7, 010907.

PLAYFORD, D. & PUDDEY, I. B. 2017. Interest in rural clinical school is not enough: Participation is necessary to predict an ultimate rural practice location. *Australian Journal of Rural Health*, 25, 210-218.

RUSSELL, L. 2017. *The economics of delivering primary health care in rural and underserved areas—what works?*. 14th National Rural Health Conference. Cairns. Accessed 19 January 2020: http://www.ruralhealth.org.au/14nrhc/sites/default/files/Russell%2C%20Kesley%2C%20KN.pdf

SALLIS, J. F., BULL, F., BURDETT, R., FRANK, L. D., GRIFFITHS, P., GILES-CORTI, B. & STEVENSON, M. 2016. Use of science to guide city planning policy and practice: how to achieve healthy and sustainable future cities. *Lancet*, 388, 2936-2947.

SALT, J., CUMMINGS, G. G. & PROFETTO-MCGRATH, J. 2008. Increasing retention of new graduate nurses: a systematic review of interventions by healthcare organizations. *J Nurs Adm*, 38, 287-96.

SANDEL, M. & DESMOND, M. 2017. Investing in Housing for Health Improves Both Mission and Margin. *JAMA*, 318, 2291-2292.

SCOTT, I. 2014. Ten clinician-driven strategies for maximising value of Australian health care. *Australian Health Review*, 38(2), 125-133.

SEN GUPTA, T., MANAHAN, D., LENNOX, D., TAYLOR, N., STEWART, R., BOND, D. 2015. *Queensland Rural Generalist Pathway: Impacts on Rural Medical Workforce*. 13th National Rural Health Conference. Darwin Convention Centre, Northern Territory. Accessed 18 January 2020: http://ruralgeneralist.qld.gov.au/wp-content/uploads/2017/07/paper_Sen-Gupta-Tarun.pdf

SERVICES FOR AUSTRALIAN RURAL AND REMOTE ALLIED HEALTH (SARRAH), 2015. *Resource 1: Allied health rural generalist training positions: an overview*. SARRAH. Accessed 20 January 2020: https://sarrah.org.au/sites/default/files/docs/resource_1_-_allied_health_rural_generalist_training_positions_-_an_overview.pdf

SHI, L. 2012. The impact of primary care: a focused review. *Scientifica*, 2012, 432892.

SMITH, S. M., WALLACE, E., O'DOWD, T. & FORTIN, M. 2016. Interventions for improving outcomes in patients with multimorbidity in primary care and community settings. *Cochrane Database Syst Rev*, 3, Cd006560.

STARFIELD B, SHI L & MACINKO J. 2005. Contribution of primary care to health systems and health. *Millbank Quarter*ly, 83(3, 457-502.

TAYLOR, E. V., LALOVIC, A. & THOMPSON, S. C. 2019. Beyond enrolments: a systematic review exploring the factors affecting the retention of Aboriginal and Torres Strait Islander health students in the tertiary education system. *International Journal of Equity in Health*, 18, 136.

THOMAS, S. L., ZHAO, Y., GUTHRIDGE, S. L. & WAKERMAN, J. 2014. The cost-effectiveness of primary care for Indigenous Australians with diabetes living in remote Northern Territory communities. *Medical Journal of Australia*, 200, 658-62.

TURNER, N. N., TAYLOR, J., LARKINS, S., CARLISLE, K., THOMPSON, S., CARTER, M., REDMAN-MACLAREN, M. & BAILIE, R. 2019. Conceptualizing the Association Between Community Participation and CQI in Aboriginal and Torres Strait Islander PHC Services. *Qualitative Health Research,* 29**,** 1904-1915.

VAN HAAREN, M. & WILLIAMS, G. 2000. Central Australian Nurse Management Model (CAN Model): a strategic approach to the recruitment and retention of remote-area nurses. *Australian Journal of Rural Health*, 8, 1-5.

VAN LOENEN, T., VAN DEN BERG, M. J., WESTERT, G. P. & FABER, M. J. 2014. Organizational aspects of primary care related to avoidable hospitalization: a systematic review. *Family Practice*, 31, 502-16.

VISWANATHAN, M., KRASCHNEWSKI, J. L., NISHIKAWA, B., MORGAN, L. C., HONEYCUTT, A. A., THIEDA, P., LOHR, K. N. & JONAS, D. E. 2010. Outcomes and costs of community health worker interventions: a systematic review. *Medical Care*, 48, 792-808.

VOS, T., CARTER, R.; BARENDREGT, J.; MIHALOPOULOS, C.; VEERMAN, J.L.; MAGNUS, A.; COBIAC, L.; BERTRAM, M.Y.; WALLACE, A.L. 2010. *Assessing Cost-Effectiveness in Prevention (ACE–Prevention): Final Report*. University of Queensland, Brisbane and Deakin University, Melbourne.

WAKERMAN, J., HUMPHREYS, J., RUSSELL, D., GUTHRIDGE, S., BOURKE, L., DUNBAR, T., ZHAO, Y., RAMJAN, M., MURAKAMI-GOLD, L. & JONES, M. P. 2019. Remote health workforce turnover and retention: what are the policy and practice priorities? *Human Resources for Health*, 17, 99.

WAKERMAN, J. & HUMPHREYS, J. S. 2013. Sustainable workforce and sustainable health systems for rural and remote Australia. *Medical Journal of Australia*, 199, S14-7.

WARE, V.-A. & MEREDITH, V. 2013. *Supporting healthy communities through sports and recreation programs*. Canberra, Australia: Australian Institute of Health and Welfare, Australian Government. Accessed 18 January 2020: https://www.aihw.gov.au/getmedia/61c83f53-3d74-40e4-8c99-554b5bce71cf/ctgc-rs26.pdf.aspx?inline=true

WEST, R., USHER, K. & FOSTER, K. 2010. Increased numbers of Australian Indigenous nurses would make a significant contribution to 'closing the gap' in Indigenous health: what is getting in the way? *Contemporary Nurse*, 36, 121-30.

WOLTERS, R. J., BRASPENNING, J. C. C. & WENSING, M. 2017. Impact of primary care on hospital admission rates for diabetes patients: A systematic review. *Diabetes Research and Clinical Practice*, 129, 182-196.

WOOD, L. F., P; ZARETSKY, K; FOSTER, S; VALLESI, S; MISCENKO, D. 2016. *What are the health, social and economic benefits of providing public housing and support to formerly homeless people?* AHURI Final Report No.265. Australian Housing and Urban Research Institute.

WOOLLEY, T., LARKINS, S. & SEN GUPTA, T. 2019. Career choices of the first seven cohorts of JCU MBBS graduates: producing generalists for regional, rural and remote northern Australia. *Rural Remote Health*, 19,

4438.

WOOLLEY, T., SEN GUPTA, T., MURRAY, R. & HAYS, R. 2014. Predictors of rural practice location for James Cook University MBBS graduates at postgraduate year 5. *Australian Journal of Rural Health*, 22, 165-71.

WORLD HEALTH ORGANIZATION. 2018a. Building the economic case for primary health care: a scoping review. Geneva, Switzerland: World Health Organization. Accessed 19 January 2020: https://www.who.int/publications-detail/building-the-economic-case-for-primary-health-care-a-scoping-review

WORLD HEALTH ORGANIZATION. 2018b. *WHO Housing and health guidelines. Licence: CC BY-NC-SA 3.0 IGO*. World Health Organization. Accessed 19 January 2020: https://apps.who.int/iris/bitstream/handle/10665/276001/9789241550376-eng.pdf

WORLD HEALTH ORGANIZATION. 2017. Shanghai declaration on promoting health in the 2030 Agenda for Sustainable Development. *Health Promotion International*, 32, 7-8.

WORLEY, P., MARTIN, A., PRIDEAUX, D., WOODMAN, R., WORLEY, E. & LOWE, M. 2008. Vocational career paths of graduate entry medical students at Flinders University: a comparison of rural, remote and tertiary tracks. *Med J Aust*, 188, 177-8.

ZHAO, Y., RUSSELL, D. J., GUTHRIDGE, S., RAMJAN, M., JONES, M. P., HUMPHREYS, J. S. & WAKERMAN, J. 2018. Cost impact of high staff turnover on primary care in remote Australia. *Australian Health Review*, 43, 689-695.

ZHAO, Y., THOMAS, S. L., GUTHRIDGE, S. L. & WAKERMAN, J. 2014. 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 Services Research*, 14, 463.

Appendix 1: Additional evidence supporting priority actions

This section provides examples of available evidence relating to the Priority Actions listed in the Situational Analysis. Overall, the critical role of health in underpinning economic growth is widely recognised: studies indicate that health has a positive and statistically significant effect on economic growth, with a one-year improvement in a population's life expectancy estimated to contribute to an increase of four percent in labour productivity (Bloom et al, 2004).

High health workforce turnover rates are costly and lead to poorer health outcomes:

- A study by Wakerman et al (2019) reports high annual turnover rates of NT remote area nurses and Aboriginal health practitioners of 148 percent and 80 percent respectively, and low rates of 12-month stability of 48 percent and 76 percent. Use of agency nurses has increased substantially in remote NT. The study reports potential savings of around $32 million per annum if staff turnover in remote clinics were halved. Ensuring a sustainable remote health workforce while preventing excessive turnover hinges on aligning government and health authority policies with the health service requirements and individual needs of the health professional and community (Wakerman et al., 2019).

- High staff turnover impacts on health outcomes for people living in remote areas with increased staff turnover associated with higher hospitalisation rates and higher average hospital costs (Zhao et al, 2019). High staff turnover aggravates the already high costs of primary health care provision in remote areas in the NT by approximately $50 per consultation. Annually, this translates to an additional $400,000 per clinic, or $21 million for the NT government (Zhao et al, 2018).

Targeted student selection, immersive rural clinical placement experiences and contextualised curricula improve rural workforce stability:

- Data from 14 rural clinical school programs in Australia showed that 16.6% of the 2011 graduating class were currently working in rural areas as determined by the Australian Health Practitioner Regulation Agency (AHPRA) register, with individual university cohorts ranging from 5.8% to 55.6% (McGirr et al., 2019). Educational strategies increasing the likelihood of Australian rural medical practice include rurally located internship positions, support for rural practice, and targeted selection of applicants with rural and Aboriginal and Torres Strait Islander and of individuals with a demonstrated interest in rural, remote, Indigenous and tropical health (Woolley et al., 2014).

- James Cook University (JCU), whose mandate is to produce medical graduates serving the region with a generalist focus, has maintained a strong rural intention among its graduates by reinforcing regional and generalist practice in its undergraduate and postgraduate teaching programs. Data from the first seven medical graduate cohorts of JCU (from

postgraduate year (PGY) 4 to PGY 10) showed preference in choice for careers as 'generalists' (general practitioners/rural generalists) or 'generalist specialists' in general surgery, general paediatrics, obstetrics and gynaecology and emergency medicine rather than 'specialist specialists' such as pathologists/radiologists or a physician subspecialty (Woolley et al., 2019).

- Prioritising applicants with rural, remote or priority population backgrounds is a widely used strategy to improve workforce in areas of workforce need (Behrendt, 2012; Dieleman, 2011; Mbemba et al, 2013; Kondalsamy-Chennakesavan et al, 2015; Kwan et al, 2017).

- Initial medical training in remote and rural areas has shown benefits in staff retention (Kwan et al., 2017) with longer periods of exposure yielding greater benefit (Kondalsamy-Chennakesavan et al, 2015; Farmer et al 2015; Playford and Puddey, 2017). Similarly, nursing training in rural and remote areas increases the chance of retention (Chenoweth et al., 2010). Vocational and post-graduate training in rural areas has shown value in retention, in addition to rural origins (McGrail et al., 2016, Hogenbirk et al., 2016).

- The Australian Government has addressed the disparity in health workforce distribution between rural and urban areas through the development of the Rural Health Multidisciplinary Training (RHMT) Program (Department of Health, 2019; Wakerman and Humphreys, 2013). The Program includes the delivery of effective rural training experiences for medical, dental, nursing, and allied health students, support of the existing local rural health workforce, and engagement and health promotion with the local community. The full evaluation is currently underway, but data thus far indicates a positive shift in intention to work rurally for students of both rural and urban background post-placement.

- Similar results have been found in other countries. For example, the Ateneo de Zamboanga School of Medicine (ADZU) in the Philippines designed a curriculum to meet priority health needs with a continuous community engagement theme throughout the program. Clinical learning is in small rural communities with the students living in the community in the 4th year (Palsdottir et al, 2016). Benefits included:

  - Student-initiated projects are solving major health issues in the community, drawing heavily on the social capital available;

  - Students have facilitated improvements in water, sanitation and transportation for pregnant women and school children;

  - Over 90 percent of ADZU graduates continue their training and clinical practice in the region; and

○ The regional infant mortality rate declined from the time that students started working clinically in communities – from 75/1000 in 1995 to 8.2/1000 in 2008 (Cristobal and Worley, 2012; Cristobal and Worley, 2011).

"Rural generalist" workforce models improve workforce retention, improve health outcomes and reduce costs in rural areas:

- The Queensland Rural Generalist Pathway provides a supported training and career pathway for junior physicians to train in rural and remote medicine, combined with financial and professional recognition. Key outcomes associated with this program include:

  ○ Employing rural generalists with advanced anaesthetic and obstetric skills allowed for local deliveries resulting in a 120 percent return on investment in terms of cost savings (Ernst & Young, 2013);

  ○ Increases in trainee numbers in rural areas have resulted in innovative models of service redesign in sites like Longreach, Cooktown, Emerald, Mt Isa, and Stanthorpe. The service redesign at the Central West Hospital and Health Service (Longreach) has attracted medical students, junior doctors and Rural Generalist trainees, enhancing local capacity and capability. The redesign has decreased dependence on locums, with significant budget savings – the $7 million locum budget is now around $1 million (Sen Gupta, 2015).

- The Allied Health Rural Generalist Pathway, under development in Australia since 2013, aims to improve health outcomes for rural and remote populations through increasing access to multi-disciplinary care in rural healthcare teams. Allied health rural generalists respond to the broad range of healthcare needs of a rural or remote community in a variety of clinical settings, with the aim of providing care as close to a patient's community as possible (SARRAH, 2015).

Creating opportunities for career development and providing safe and supportive work environments improve workforce retention:

- Adequate personal and professional support is necessary to reduce the sense of professional and social isolation. This can be achieved through education and preceptorship for those newly graduated (Salt et al., 2008).

- Access to supervision, professional support and continuing professional development are important factors influencing retention (West et al., 2010). Continued mentoring has been shown to positively impact nurse retention (Lartey et al., 2014).

- In remote communities, isolation, transport costs and high disease burden are significant drivers of service delivery costs. Underfunding has the consequence of inability to maintain

staffing quotas, thus resulting in stress, burnout and inevitable staff turnover (Lenthall et al., 2011).

- High quality and professional care demands adequate infrastructure, including clinics, housing for resident and visiting staff, information and communications technology, continuous upskilling for remote staff and workforce flexibilities, such as month on/month off and job-sharing (van Haaren and Williams, 2000).

- Interventions needed to support health practitioners include ensuring that financial incentives and retention bonuses are commensurate with the position. However, these are inadequate by themselves and need to be packaged with continuing professional development opportunities and psychological and family support (Dolea and World Health Organisation, 2010; Buykx et al, 2010; Gardiner et al, 2013).

- Dental graduates are motivated to work in rural locations by the financial incentives of better rural salaries, clinical experience, appreciation for the rural lifestyle and the promise of good mentorship (Johnson et al, 2019).

Aboriginal, and Torres Strait Islander, workforce retention and population health outcomes can be improved through community control and improved cultural responsiveness of health services and workforce:

- The cultural competence of healthcare services and professionals is associated with increased likelihood that Aboriginal people will access those services (Nguyen and Gardiner, 2008).

- Aboriginal and Torres Strait Islander Community Controlled Health Services (ACCHS) offer a widely regarded model of community involvement in health care governance (Dunbar et al, 2019; Bath and Wakerman, 2015; Panaretto et al, 2014). ACCHSs are the largest employing industry of Aboriginal and Torres Strait Islander people within Australia – of approximately 5,829 workers, 3,215 are Aboriginal and/or Torres Strait Islander.

- A study by Turner et al (2019) found that two-way sharing, trusting relationships, safe spaces, and learning from each other might assist in forming genuine partnerships between non-Indigenous and Indigenous health professionals and their patients, so that community participation achieves the intended objectives. The study also found that health system personnel can learn firsthand about the factors affecting the community's health, including important social determinants, if community members participate openly from their community, cultural, and historical foundation. This then enables health personnel to make appropriate modifications to programs or even enable new ones.

- A project that explored how Continuous Quality Improvement was operationalised at six Indigenous primary health care services classified as 'high-improving' services found that

two-way relationships with community members ensured that improvement processes were embedded in culture and genuine engagement (Larkins et al, 2019).

- Retention of Aboriginal, and Torres Strait Islander, staff as university faculty is enhanced by culturally appropriate recruitment and selection processes, comprehensive orientation and pre-entry programs, appointment of Aboriginal and Torres Strait Islander academics, curricula rich in Aboriginal and Torres Strait Islander content and the provision of mentoring and tutoring programs (Taylor et al., 2019).

- Mutually beneficial partnerships between health and educational institutions and the communities they serve can strengthen impact and reduce costs through engagement of social, human and community resources (LeBan, 2011).

Improving social, cultural and environmental determinants of health improve health outcomes:

- Strong evidence exists to support that the social determinants of health, including access to adequate housing, nutrition, and transportation, can influence health outcomes and health care patterns of use for vulnerable populations (Nichols and Taylor, 2018). Health and wellbeing contribute to economic and social progress and, in turn, economic security and social cohesion are also key determinants of health (Boyce and Brown, 2019). Cities that support healthy lifestyles are integral to preventing chronic disease (Giles-Corti et al, 2016; Sallis et al, 2016; World Health Organization, 2017).

- Stable and affordable housing has long been identified as a critical social determinant of health (Sandel and Desmond, 2017). The benefits of improving housing conditions and standards are far reaching; ranging from saving lives and disease prevention to increasing the quality of life, alleviating poverty and mitigating the effects of climate change (World Health Organization, 2018b). An evaluation of an Australian initiative which involved improving access to public housing among homeless people found decreased frequency and duration of health service use in the preceding and subsequent year of entry into public housing tenancy, resulting in a combined potential health system cost saving in Western Australia of $16.4 million per year or $4,846 per person per year (Wood, 2016). Poor health outcomes related to housing result from overcrowding, deficiencies in housing infrastructure, housing insecurity, lack of proximity to services and facilities, and exposure to trauma (Bailie, 2007).

- A study on hospitalisations in 2016 of Aboriginal people due to their environment found that the costs of hospitalisations directly due to the environment was nearly $17 million across all age groups. This represented 26% of the entire budget spend on hospitalisations for Aboriginal people from the Kimberley. Among Aboriginal children 0-14 years, costs of hospitalisations directly due to the environment was over $3 million, representing 32% of

the entire budget spend on hospitalisations for Aboriginal children from the Kimberley (KAHPF, 2018).

- Sports and recreation programs improve health and wellbeing outcomes in Aboriginal and Torres Strait Islander communities, leading to improvements in school retention and attitudes towards learning, improved social and cognitive skills, physical and mental health and wellbeing, increased social inclusion and cohesion, increased validation of and connection to culture, and evidence of crime reduction (Ware & Meredith, 2013). Action to address the health gap between Indigenous and non-Indigenous Australians must start from pre-conception and the early years through school, and needs to recognise the importance of culture to strengthening communities (Marmot, 2017).

- A study of a population health complex intervention of an "enhanced model of primary care and compassionate communities" in the town of From in England (Abel et al, 2018) found that the intervention was associated with highly significant reductions in unplanned admissions to hospital – a decrease of 14 percent from the beginning of the study period, representing a 20.8 percent cost reduction. The intervention involved targeted identification of people at risk of an unplanned admission, systematic care planning for this group including referrals, and proactive community development using a "compassionate community social approach".

Comprehensive primary healthcare (PHC) service delivery models improve health outcomes and reduce costs:

- There is ample evidence of the health-promoting influence of PHC, including its role in preventing illness and death and in creating more equitable distribution of health in populations (Starfield et al, 2005). PHC provides continuity of care that has been shown to reduce total hospitalizations, avoidable admissions and emergency department use (Wolters et al., 2017, Carret et al., 2009, van Loenen et al., 2014, Abel et al., 2018).

- There is also substantial evidence linking PHC services to a range of economic benefits through its potential to improve health outcomes, health system efficiency and health equity (World Health Organization, 2018a).

- ACCHS offer a best practice PHC model in Australia. In contrast to many mainstream services, the ACCHS deliver culturally appropriate health care adopting a holistic approach focused on the presenting medical conditions as well as the underlying and interrelated issues (Beaver, 2004; Vos, 2010; Thomas et al, 2014; Zhao et al, 2014). The ACCHS workforce provide 2.5 million episodes of care to an estimated 342,000 Aboriginal and Torres Strait Islander people and other Australians annually (Alford, 2014). Higher attendance at ACCHSs results in a reduced likelihood of a hospital admission. In some cases, ACCHS care was found to provide both overall cost-savings from reduced

- hospitalisations as well as health gains (Beaver, 2004; Vos, 2010; Thomas et al, 2014; Zhao et al, 2014).

- Data analysed from a cohort of 14,184 Aboriginal residents in the NT between 2002 and 2011 (Zhao et al., 2014) showed that medium and high levels of PHC utilisation were associated with decreases in total and avoidable hospitalisations, deaths and years of life lost. Higher levels of PHC utilisation for renal disease reduced: avoidable hospitalisations by 82-85 percent, deaths by 72-75 percent, and years of life lost by 78-81 percent. For patients with ischaemic heart disease, the reduction in avoidable hospitalisations was 63-78 percent, deaths 63-66 percent and years of life lost 69-73 percent.

- Investing $1 in PHC in remote Aboriginal communities could realise a saving of between $3.95 and $11.75 in public hospital expenses, over and above the health and social benefits for patients (Zhao et al, 2014). Similarly, Thomas et al showed that an investment of $1 in medium-level primary care (2–11 visits per year) for people with diabetes in remote Aboriginal communities may save $12.90 in hospitalisation costs (2014).

- Overseas, PHC has been shown to improve access to health care services and mitigate the health implications of disparities in socioeconomic status in the United States (Ferrer, 2007; Shi, 2012). Data from Europe shows that stronger PHC systems are associated with lower inequity in self-rated health (Kringos et al., 2013).

- Under the Affordable Care Act (Obamacare) in the United States enacted in 2010, community health centres (CHCs) received an additional USD$11 billion in funding. The CHCs are the dominant model for provision of integrated PHC and public health services for low-income and uninsured Americans. In 2015, it was estimated that the CHCs were generating $54 billion in economic activity, which also translated into job retention and creation (over 457,000 jobs were generated), including 284,000 jobs as a direct result of the Affordable Care Act (Russell, 2017).

- PHC services are also useful for implementing interventions aimed at improving mental health outcomes related to depression, anxiety and suicide (Conejo-Ceron et al, 2017; Smith et al, 2016; Fernandez et al, 2015).

- Community health workers (CHWs) are a key workforce cadre in PHC models, and are known to reduce maternal, child and neonatal mortality in low-middle income countries (Perry et al, 2017; Black et al, 2017). CHWs have also been shown to improve health outcomes in high income countries (Viswanathan et al., 2010).

Waste and duplication in health systems can be reduced by investing in value-based care, including integrated care and learning health systems:

- "High value care", defined as care that offers clinically relevant and patient-important benefits at the lowest possible cost, can be strengthened by minimising errors in diagnosis, discontinuing practices that provide little benefit, deferring unproven interventions, selecting cost-effective care options, targeting interventions to those who derive the greatest benefit, adopting a more conservative approach nearing the end of life, actively involving patients in shared decision-making, minimising operational waste, creating learning organisations, and advocating for integrated patient care across all clinical settings (Scott, 2014). Enacting these strategies requires a shift away from volume-based care (often rewarded in activity-based funding schema) to value-based care.

- There are numerous studies providing evidence of the effectiveness of value-based service models. For example, a study evaluating an antenatal care service in Townsville, Queensland found that the community-based and integrated shared-care model used in the service, involving three formerly independent providers of antenatal care, improved perinatal outcomes among Indigenous women (Panaretto et al, 2007).

- A growing body of literature addresses the need to establish "learning health systems" to facilitate value-based health care, and to reduce "avoidable waste" in the production and reporting of research evidence (Friedman et al, 2016; Chalmers and Glasziou, 2009). It is hypothesised that more than 85 percent of research effort and investment is "lost" due to a combination of poor clinical relevance, scientific quality and communication of findings (Chalmers and Glasziou, 2009). Learning health systems can contribute to reducing waste by closely and systematically integrating the production of new knowledge with its application in practice (Friedman et al, 2017).