

# Understanding patient access patterns for primary health-care services for Aboriginal and Islander people in Queensland: a geospatial mapping approach

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**Abstract.** This paper explores the patterns of patients' accessing six Aboriginal and Islander Community Controlled Health Services (AICCHSs) in Queensland. Between August 2011 and February 2014, 26 199 patients made at least one visit over a 2-year period prior to at least one of six Queensland AICCHS – one urban service (RA 1) in south-east Queensland, and five services in regional towns (RA 3) in Far North Queensland. Geospatial mapping of addresses for these registered patients was undertaken. The outcomes analysed included travel times to, the proportion of catchment populations using each AICCHS and an assessment of alternative mainstream general practice availability to these patients was made. In brief, the use of AICCHS was higher than Australian Bureau of Statistics census data would suggest. Approximately 20% of clients travel more than 30 min to seek Aboriginal Health services, but only 8% of patients travelled longer than 60 min. In the major city site, many other general practitioner (GP) services were bypassed. The data suggest Aboriginal and Islander patients in Queensland appear to value community-controlled primary care services. The number of Indigenous clients in regional locations in the Far North Queensland registered with services is often higher than the estimated resident population numbers.

**Additional keywords:** community-controlled primary health care, Indigenous, travel times.

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## Introduction

Primary health-care services are a significant component of the effort to 'close the gap' in Australia, namely, the disparity in health between the Aboriginal and Torres Strait Islander population and the broader population (Department of Health and Ageing 2009). Globally, primary health care is a core component of national health systems. Adequate primary health care is considered essential for good health, with primary care

providing accessible, continuous, comprehensive, patient-focussed coordinated health care (WHO 1986; Starfield 1994). Evidence also shows that primary health care improves health outcome and reduces disparity for Indigenous peoples (Hefford *et al.* 2005; Freemantle *et al.* 2007; Lavoie *et al.* 2010). However, application of these principles, the availability and the range of primary health care in Australia and elsewhere, is affected by geographic location and often does not match need

**What is known about the topic?**

- Access to primary health-care services is determined by an interplay of factors, including acceptability, perceived effectiveness, availability, affordability, travel dynamics, and social and cultural considerations.

**What does this paper add?**

- Use of specialised Aboriginal health services is high in regional and remote areas in Queensland with numbers of patients using services approaching or exceeding resident numbers; 20% of patients travel longer than 30 min to access these services.

(Bamford *et al.* 1999; Australian Institute of Health and Welfare 2014a).

The Aboriginal and Islander Community Controlled Health Services (AICCHS) were established in Australia to improve access to comprehensive primary health care delivered within a cultural framework specific to the Aboriginal and Torres Strait Islander community (Hunter *et al.* 2005). This policy was in part founded on evidence outlined above and also to counter perceived discrimination Aboriginal and Torres Strait Islander people experience in the broader health system (Kowal and Paradies 2010; Aspin *et al.* 2012). The issue of how many Aboriginal and Torres Strait Islander people use their local AICCHS and market share has been debated since a national report in 2005 suggested that only 30% of Aboriginal and Torres Strait Islander people used an AICCHS if they had a problem with their health. In 2009, as part of the background work for the Closing the Gap (CtG) reform, a review of Medicare Australia data suggested a 50–50 split between general practices and AICCHSs (Deeble 2009). The AICCHS sector would contest both these figures, with the former figure persisting in the couching of CtG initiatives and ongoing work (Couzos and Delaney Thiele 2009; Australian Institute of Health and Welfare 2013). Defining service user populations is also important in establishing denominators for the national key-performance indicator reporting program for AICCHS and critical to interpretation of data (Australian Institute of Health and Welfare 2014b).

Access to health services has been examined previously in research settings in the tertiary and primary health-care sectors, both in Australia and overseas. Australia is a highly urbanised country; in Queensland, 82% of the population live in major cities and inner regional areas, namely Remoteness areas (RA) 1 and 2 (Australian Bureau of Statistics 2011a), predominantly along the eastern coast, with the rest of the population (18%) spread across a remote interior comprising 93% of the total state area, at a density of less than one person per square kilometre (Australian Bureau of Statistics 2014). This leads to inequalities in access to health-care services in remoter areas, where services are sparsely distributed (Bamford *et al.* 1999; Australian Institute of Health and Welfare 2014a). In this context and with a desire to improve the business aspects of their service planning and delivery, using aggregated service-level data, the Queensland Aboriginal and Islander Health Council (QAIHC) has been

providing a Practice Health Atlas (PHA, Health First, Adelaide, South Australia) to most member services annually since 2011. Although it provides a useful overview of patient access, demography and ‘market share’, the PHA has limitations in that postcode is the only measure of locality. In remote areas, postcode is a coarse tool to use in assessing geographical location of patients and their proximity to comprehensive primary health care.

This project sought to pilot a geospatial approach with a small group of Aboriginal and Islander community-controlled primary health-care services, using address data, catchment populations, travel times and the comparative availability of mainstream general practices to examine the use and aspects of access to these primary health-care services.

**Methods***Setting*

In 2011, Queensland had an Indigenous population of 188 954 Aboriginal and Torres Strait Islander persons. This represents 4.2% of total Queensland population and 28.2% of the national Aboriginal and Torres Strait Islander population (Australian Bureau of Statistics 2011b).

The QAIHC supports the 26 AICCHS in Queensland to deliver comprehensive primary health care to their communities. QAIHC has a small Health Information Unit which has established a data-management system to support a quality-improvement program (Panaretto *et al.* 2013), including work to better understand the client bases and catchment areas of the services. The AICCHSs have been integrally involved in and supported this health information system and use of data since 2009 in advisory, testing and participatory capacities.

*Study design, data collection and analysis*

Eight medical clinics from six AICCHS participated in this project, including one urban (RA1) service in south-eastern Queensland and five outer regional (RA3) services in far-northern Queensland. The urban service, Kalwun Health Service in Miami on the Gold Coast, is 80 km south of its nearest Queensland neighbour, Brisbane Aboriginal and Torres Strait Islander Health Services in Woolloongabba, and 106 km north of the nearest New South Wales service, Bullinah Aboriginal Health Service in Ballina. The five affiliated services (Northern Aboriginal and Torres Strait Islander Health Alliance, NATSIHA) in the far north are situated in Cairns and its surrounding region; these include two Wuchopperen Health Service clinics, namely their main clinic in Cairns and satellite clinic, Midin, in Atherton; clinics in Mossman Gorge (Apunipima Cape York Health Council), Mareeba (Mulungu Aboriginal Corporation Medical Centre); Gurriny Yealamucka in Yarrabah; and two Mamu Health Service clinics, namely their main clinic in Innisfail and satellite clinic in Ravenshoe. These five services are the only AICCHS in the far north; their next-nearest neighbouring AICCHS is in Townsville some 260 km south of Innisfail.

The AICCHSs catchment populations were tailored individually by 30-min drive time or statistical area, including local Government-area (LGA: Wuchopperen, Gurriny Yealamucka, Mamu – Innisfail), statistical local-area (SLA: Mulungu, Mamu – Ravenshoe) or statistical-area 2 (SA2: Apunipima – Mossman

Gorge) level derived from Australian Bureau of Statistics (ABS) census data (Australian Bureau of Statistics 2014). These derived catchment areas were discussed with the services to ensure that the boundaries were consistent with their service-delivery areas and perceived catchment areas. To assess proportions of the catchment populations using the AICCHSs, the number of Aboriginal and Torres Strait Islander patients who had made at least one visit in the preceding 2 years was then compared with the two derived catchment populations using the ABS data. This group is considered the 'all patients' group.

Datasets, i.e. the patient addresses, were extracted at the eight clinics between August 2013 and February 2014 from their electronic medical records (EMRs) using the Pen Computer Systems Clinical Audit Tool (PenCAT, PenCS, Melbourne, Vic., Australia). The data required cleaning; however, this was not a difficult task, with a small number of addresses requiring review for manual geocoding where the patient address was recorded as hotels, motels, camp sites, refuges, and community aged-care centres, for example. Post office box addresses were excluded. In total, 97% of all the patient addresses were successfully geocoded.

Addresses were mapped and 10-, 30- and 60-min travel times were calculated using GIS software (MapInfo Professional ver. 12.0, MapInfo Drivetime Queensland ver. 7.1 and Spectrum on Demand geocoding service, Pitney Bowes Pty Ltd, Sydney, NSW, Australia). Calculation of travel time used a velocity of  $60 \text{ km h}^{-1}$ , assuming direct travel to the service at a constant speed. On all the maps, one dot represents one patient address; where more than one patient resided at one address there was an equal number of dots, namely, one dot for each patient. Layered mapping of patient information with population, the relative accessibility of mainstream general practices, allied health, pharmacies, hospitals and public transport was undertaken using the *CheckUp Directory*, from which data were extracted in February 2014. Simple descriptive statistics were used, namely, proportions.

This work, as an element of a QAIHC health-information program, is iterative. Attendance at regional meetings and site visits by QAIHC staff keep participants informed of progress and plan further analysis. Participation is voluntary. All participating services have Australian General Practice Accreditation and patients are advised of ongoing quality-assurance activity in the services. QAIHC has data-management agreements with all participating member services and its partners. All data are held securely at QAIHC in a password-protected data repository. A copy of the data extraction is retained by the service, and a list of cleaned addresses and copies of any maps have been prepared. An advisory group with QAIHC and representatives from participating services oversee the project.

#### Ethics approval

The project has been approved by the Human Research Ethics Committee, James Cook University, Townsville, Queensland, with support from QAIHC and member services (Approval number 62014).

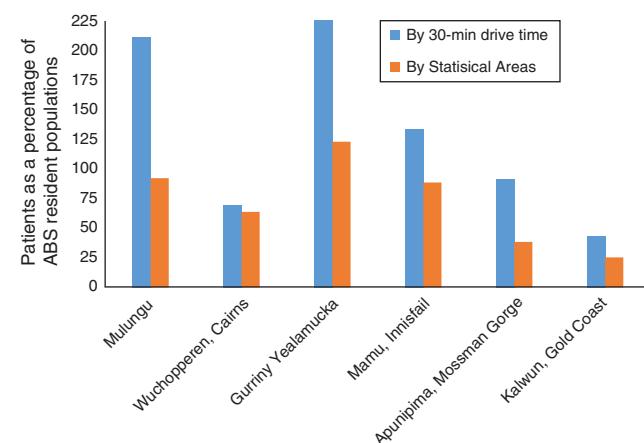
#### Results

A total of 26 199 patients had made one or more visits to the six participating services in the 2 years before data extraction, of

whom 22 178 (84.7%) were of Aboriginal and Torres Strait Islander descent. The proportion of the Aboriginal and Torres Strait Islander population in the catchment area that may be using each service varied (Fig. 1). For the five AICCHS services around Cairns (RA 3), the number of Aboriginal and Torres Strait Islander patients registered with a visit in their EMR databases as a proportion of the total number of Indigenous residents comprising the ABS resident population in their catchment areas (Australian Bureau of Statistics 2011b) varied between 40 and 123%, with the proportion being above 50% for four of the five sites. Using travel-time boundaries, the number of Aboriginal and Torres Strait Islander patients in the EMR databases who had used these services in the far north, in the preceding 2 years, as a proportion of the ABS resident populations living within a 30-min drive time (Australian Bureau of Statistics 2011b) varied from 70 to 331%, with the proportion being above 100% for three of the five sites. For Kalwun Health Services, the south-eastern corner service, which is a major metropolitan area (RA 1), the number of Indigenous patients using the service, as a proportion of the resident Aboriginal and Torres Strait Islander population, was much lower.

The proportion of all patients accessing each of the eight clinics and identifying as Aboriginal and Torres Strait Islander ranged from 70 to 94% (Table 1). The proportions of patients attending each clinic, broken down by travel time to their respective clinic, are shown in Table 1. Overall, 20% of patients travelled longer than 30 min to their respective primary-care clinics, with the range varying from 6 to 43%. Six clinics had less than 20% of patients travelling over 30 min, and the two Mamu clinics in Innisfail and Ravenshoe had ~40% of patients travelling over 30 min.

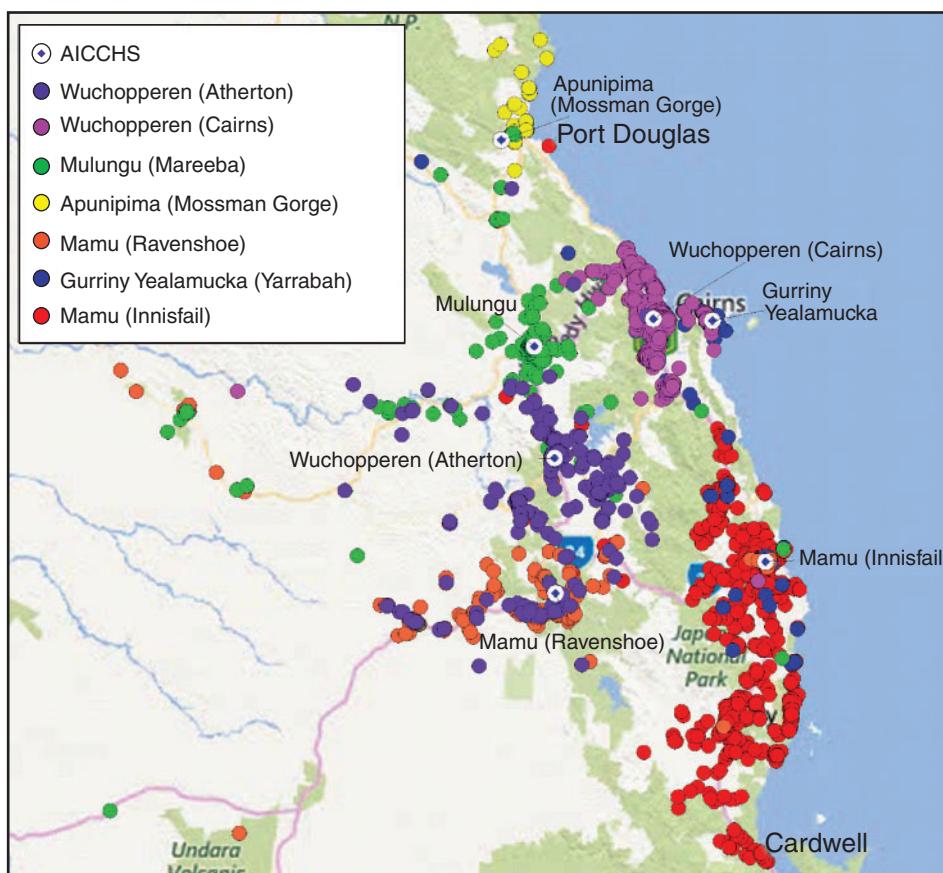
In Fig. 2, colour coding shows the clustering of the patients using each of the seven health clinics around Cairns. Fig. 3 shows the clustering of the patients using Gurriny Yealamucka at Yarrabah by the two distinct areas in which they live; ~80%



**Fig. 1.** Aboriginal and Torres Strait Islander patients as a proportion of resident Aboriginal and Torres Strait Islander people by drive time or the service catchment areas, September 2014. The denominator for the drive time or the service catchment areas used Australian Bureau of Statistics Aboriginal and Torres Strait Islander population data 2011. Note the y-axis has been truncated for clarity, with Gurriny Yealmucka value being 331%.

**Table 1.** Travel time for all patients and the proportion of Aboriginal and Torres Strait Islander patients using eight medical clinics at five Aboriginal and Islander health services in Queensland 2013–14  
The percentage of Indigenous patients is as a proportion of all patients, September 2014

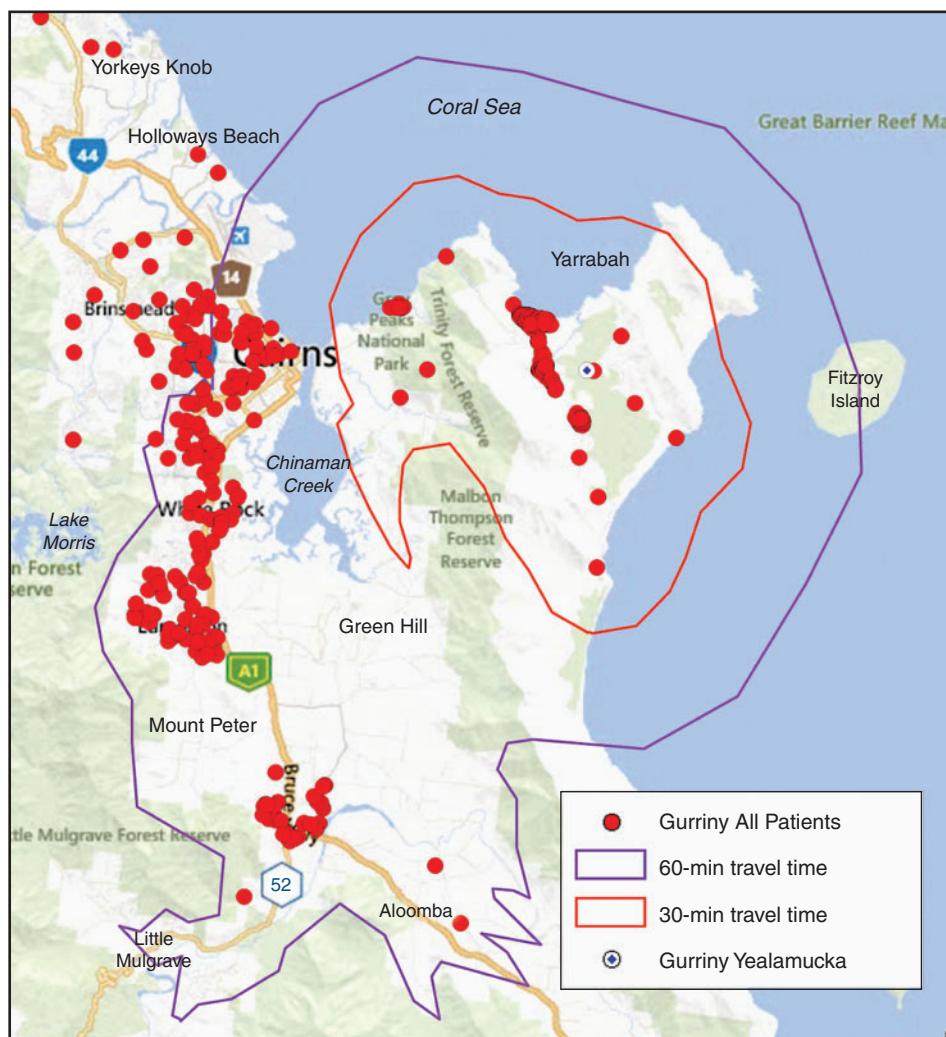
Service	2011 remoteness area (RA)	All patients	0–10 min		10–30 min		30–60 min		60+ min		Indigenous patients %
			n	%	n	%	n	%	n	%	
Mulungu, Mareeba	RA3	2290	1782	80	120	5	177	8	158	7	91
Mamu, Ravenshoe	RA3	1134	426	38	210	19	278	25	202	18	78
Mamu, Innisfail	RA3	5195	2547	51	455	9	1183	24	815	16	70
Wuchopperen, Cairns	RA3	8581	5835	71	1980	24	331	4	125	2	91
Midin, Wuchopperen Atherton	RA3	1896	1178	63	435	23	146	8	115	6	91
Gurriny Yealamucka, Yarrabah	RA3	3955	3165	81	51	1	323	8	383	10	94
Mossman Gorge, Apunipima	RA3	343	212	63	72	21	5	1	50	15	96
Kalwun, Miami	RA1	2805	963	35	1274	46	328	12	213	8	71
Total		26 199	16 108	63	4597	18	2771	11	2061	8	85



**Fig. 2.** Clustering of all patients by health-service use for the seven clinics of the five affiliated services around Cairns, far-northern Queensland. One dot represents one patient address.

of patients live in the Yarrabah community, with 20% driving out to Yarrabah from the southern suburbs of Cairns. In the south-eastern corner of Queensland, several patients travel from New South Wales to visit Kalwun; Kalwun patients pass many other general practice clinics on their journey to the AICCHS clinic in Miami (Fig. 4). Fig. 5 shows the patient distribution for the Mamu clinic in Innisfail, with 40% of the patients living more than 30 min from the service; however, most (92%) of these patients live within a 2-h drive of the service (Fig. 5).

Access to other primary health-care providers varied widely with remoteness. For example, for patients living in and around the Mamu Ravenshoe clinic, there is one mainstream general practitioner (GP) clinic, one hospital and one pharmacy in the catchment area. In contrast, in Cairns, there are 32 mainstream general practices, two hospitals and five pharmacies in the Wuchopperen clinic catchment area; in the south-eastern corner, there are 162 mainstream GP clinics, 11 hospitals and 61 pharmacies in the Kalwun catchment area (Fig. 4).



**Fig. 3.** Patient clustering by travel time for all patients using the Gurriny Yealamucka clinic in Yarrabah, far-northern Queensland, February 2014. One dot represents one patient address.

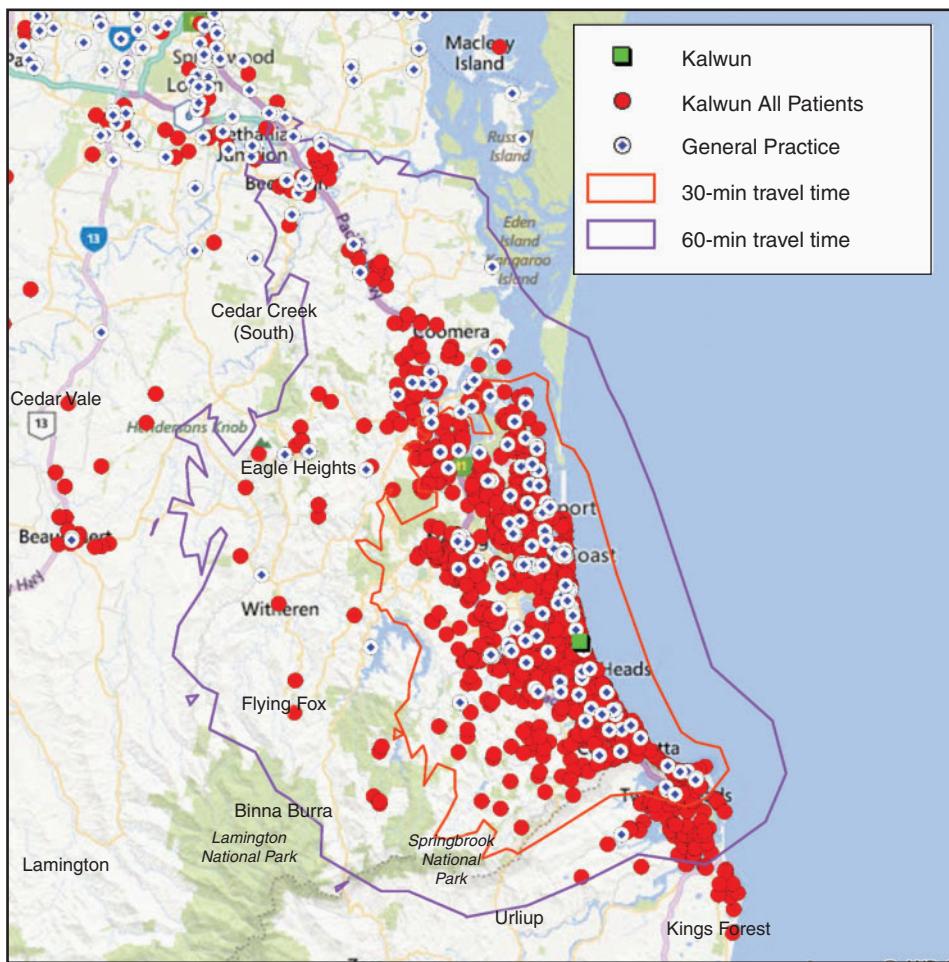
## Discussion

The findings of the present study suggest that AICCHS in remote and regional areas in Queensland see the majority of Aboriginal and Torres Strait Islander people living in their catchment areas and additional patients from outside their communities. A significant proportion, ~20% of clinic patients, travel in excess of 30 min to visit these primary health-care teams.

Access to primary health-care services is a complex concept and has been articulately discussed by other researchers. The definition has evolved from the original five dimensions of availability, accessibility, affordability, accommodation and acceptability, to include consideration of awareness, timeliness and perceived effectiveness (Penchansky and Thomas 1981; Levesque *et al.* 2013; Russell *et al.* 2013). All of these factors have overlying social and cultural components, with their interplay leading to the use or not of health clinics. The present study had no qualitative component and, therefore, could not address all the facets of access; however, the data derived

from real-world clinic databases constituted ‘realised access’ (Russell *et al.* 2013) and, as such, provided some further evidence on the use and access to AICCHSs. The high use of these clinics by the community suggests that the potential barriers of accessibility, affordability, accommodation and acceptability were being, at least partially, overcome. However, without further data, we cannot assess the timeliness and effectiveness of the visits made, which is crucial to improving health and wellbeing of the Aboriginal and Torres Strait Islander community.

The demonstrated acceptability is consistent with and possibly explained by other work in Australia and abroad. Access has also been discussed by leading Aboriginal community researchers using the concepts of ‘*Kanyini*’ and ‘*candidacy*’ to explain why the Aboriginal community prefers to use AICCHSs (Dixon-Woods *et al.* 2005; Aspin *et al.* 2012; Peiris *et al.* 2012). *Kanyini* refers to the principle and primacy of caring for others, which is manifest in the way AICCHS and their clinical teams are seen as part of the community, with patients establishing long-term relationships with the primary health-care workers

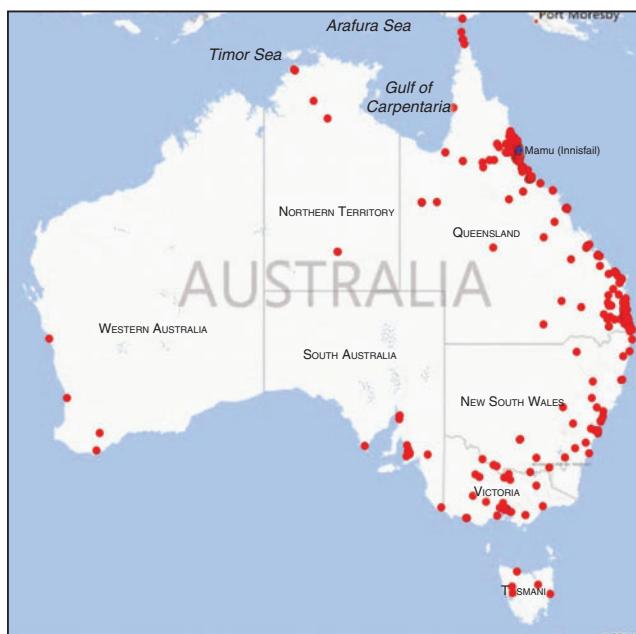


**Fig. 4.** Patient clustering by travel time for all patients using the Kalwun clinic in Miami and the available other general practices on the Gold Coast, south-eastern Queensland, September 2013. One dot represents one patient address.

(Aspin *et al.* 2012). The *candidacy* framework includes the concept of a ‘permeable service’, which is one that requires little negotiation to enter, and in which transport and distance are key components, along with welcoming buildings and no out-of-pocket expenses (Dixon-Woods *et al.* 2005). The multidisciplinary team characterises care delivery in AICCHSs and is a model that these patients may well be familiar with and value. Consistent with this work, seeing a doctor of their choice is important for the broader patient community in regional areas. People surveyed in rural Australia nominated preference for a GP as the most important factor in seeking routine care, ahead of travel time which ranked third (Ward *et al.* 2015). Similarly, work in London studying patient ethnicity and clinic registration patterns showed that patients will trade off slightly longer travel time to see a GP of a similar ethnic background (Lewis and Longley 2012). The data for the AICCHSs clinics in Cairns and the Gold Coast clearly showed that, for at least part of their health care, the patients are not using the closest GP but are travelling further to get to clinics whose outlook encompasses a similar social context, and whose focus is to provide high-quality care to the Aboriginal and Torres

Strait Islander community (Australian Institute of Health and Welfare 2014b).

Addressing the question of what proportion of the Aboriginal and Torres Strait Islander community uses AICCHS, Medicare data suggested that, overall, 50% of the population uses AICCHSs nationally (Deeble 2009; Australian Institute of Health and Welfare 2013). The present work showed, at the local level, how the method used to define boundaries or catchment areas yielded quite different denominator populations, namely, the catchment areas and, thus, populations derived using the statistical areas were consistently larger than those generated using drive times. Each service had quite definitive opinions on their service ‘boundaries’, which led us to tailor catchment areas for each service; this was consistent with an individualised approach recommended following work in Victoria (McGrail 2012). For the data analysed, the numerators, i.e. the patient numbers, derived over a 2-year time period from an EMR, will have a composition different from that of the resident ABS dataset, which is a cross-sectional snapshot obtained from the one time-point census data. The EMR will capture the visitors to the community, the ‘transient’ population (an arguably blunt



**Fig. 5.** Distribution of all patients visiting the Mamu clinic in Innisfail, far-northern Queensland, February 2014. One dot represents one patient address.

categorisation), who are potentially using the service in addition to the resident population. This service use by the visitors might explain our data, which showed that in remote services, the number of people on the EMR database was greater than the population included by statistical area or drive time. However, the data also suggested that those living further than a 60-min drive away are a small subset, i.e. 8%, of the clientele for most services; thus, the majority of the user patients might be considered local. These data, therefore, suggested that for the services located in the RA 3 regions, significant proportions of the local community made visits to their local AICCHSs, which is consistent with evidence that Aboriginal and Torres Strait Islanders value their community-controlled health services (Taylor *et al.* 2012).

The ‘transient’ population of Indigenous patients requires further exploration. Mamu Health Service has a high proportion of patients, nearly 20%, that travel more than 60 min to the clinic or that live outside the catchment area, being consistent with data from Townsville where 30% of patients were visitors (Panaretto *et al.* 2007). It is thought that these patients may be seasonal workers, such as fruit and agricultural workers. Mareeba, which is also an agricultural centre, does not have the same pattern, suggesting, possibly, that at the other participating services, transient patients are providing local addresses, such as maybe those of relatives, masking some of the movement; alternatively, the proportions of transient patients at AICCHS may vary considerably. This requires further exploration, and the large number of non-local patients has implications for these services both from a business perspective and from the provision of quality health care. Australia has used a fee-for-service model funded by the medical benefits schedule by legislated item numbers to fund much medical care since 1975.

In 2004, the enhanced primary-care items for Aboriginal health checks were introduced; in 2009, this system was revised to include chronic disease-management items (Department of Health 2015), including health assessments, care plans, team care and case conferencing, to provide higher remuneration for multidisciplinary team and preventative care. This system is restricted for use with ‘regular’ patients not ‘visitors’; however, these non-local resident Indigenous patients are likely to have a high burden of disease. Therefore, despite the need for both services to manage complex chronic diseases and provide preventative care, which is thought to be more time consuming than is providing acute care, one of these services will not have access to the highly rebated enhanced primary-care item numbers, which would help support the availability of allied health teams (Estabrooks and Glasgow 2006).

The present work has limitations; however, the intent was initially to explore feasibility of the methodology. In total, 97% of all patient addresses extracted from the EMR database were geocoded, which was an unexpectedly high percentage. The addresses apparently common to more than one service, as seen in Fig. 2, need further exploration. This may be explained by some patients having attended more than one service for primary care, or one service may provide access to specialists, or people in the same household may have used different services. In addition, we do not know which patients were regular users (3 visits in the preceding 2 years) of the services, which made single visits and which were visitors, nor do we have any other demographic and health indices, which makes interpretation difficult. Some of these questions could be answered as this work progresses, by linking health data to addresses while maintaining confidentiality, which technology now permits (Mazumdar *et al.* 2014), providing further insight into how patients use services. Another point of debate is the settings to use for the drive times. There was much discussion about the effect of built-up areas with limited speed, road works and the wet season in the north. Various speed options were used on map, and discussed with the services, and the  $60\text{ km h}^{-1}$  calculation seemed to best reflect what the local staff considered sensible drive times for these journeys.

This early work has been helpful in the planning of service delivery for Cairns region. Together, these services have been considering transfer of management of two of the clinics on the Atherton Tablelands between themselves and also opening new clinics in Cairns. The maps (Figs 2, 3) very graphically demonstrate where the users of the clinics reside in their clusters, assisting decision making and negotiations. Similarly, the visualisation of clinic users assists in advocacy with funding bodies, and in discussions about the need for new infrastructure.

In conclusion, this project has proven useful to participating services. It has provided confirmation of the service perceptions that their catchment communities, and additional people from outside these communities, use their clinics, with many choosing to travel more than 30 min to use clinics that have been designed to focus on their needs, i.e. needs of Aboriginal and Torres Strait Islander people. We can now further explore how patients use these services and how distance affects the quality of care received, by linking demographic, visit and clinical data. This pilot work has indicated that a geospatial approach to data analysis will assist primary health-care clinics and outreach

providers to better understand who accesses their clinics, and to improve service delivery and regional planning.

## Conflicts of interest

None declared.

## Acknowledgements

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