

SPATIAL DISTRIBUTION OF TELEHEALTH NETWORK AND ITS PROSPECT IN THE NEW NATIONAL BROADBAND NETWORK

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SUMMARY

Given the increasing demand for health care in Australia, there are insufficient health workers to take care of the population particularly in rural and remote areas. As a result, various initiatives and strategies are being developed to support health care in regional areas.

Telehealth, which adopts various telecommunications solutions to link up clinicians with patients or patient related information held elsewhere, is recognised as a means to improve the quality and efficiency of health services delivery at a distance.

Recently, the Australian Government has announced that Tasmania will be the launch state for the Commonwealth's new super fast National Broadband Network, connecting Tasmanian households and businesses including hospitals and schools. It is expected that health service provision in Tasmania, especially the Telehealth network, will change in view of these specific circumstances.

This paper examines the implications for strategies to improve telehealth service in rural Tasmania. The crux of the matter lies in both hard and soft infrastructure. The rollout of the National Broadband Network is the first step to address the hard infrastructure issue. However, a system is as good as how the people use it. Relevant trainings to upskill the health workforce and patient education are as crucial.

INTRODUCTION

Australia is experiencing health workforce shortages and the shortages are more acute in rural and remote areas.¹ According to Tasmania's Health Plan,² the health system is facing many challenges such as an increase in chronic diseases, increasing costs of health care and difficulties in recruiting staff. As a result, various initiatives and strategies are being developed to support health care in regional areas. Telehealth, which adopts telecommunications solutions to link up clinicians with patients or patient related information held elsewhere, is recognised as a means to improve the quality and efficiency of health services delivery at a distance.³

The rate of adoption of telehealth services is influenced by factors such as adequacy and cost of existing health services in meeting patient needs; medicare policies with respect to coverage and payment for telehealth services; medical licensing restrictions; liability, privacy and security concerns.^{4,5} However, the principle reason preventing many rural and remote areas in Tasmania from receiving telehealth services lies in both hard and soft infrastructure. Hard infrastructure concerns mainly internet access with stable and high-speed connections. Soft infrastructure deals with people who are equipped with the skills and knowledge in delivering (as in the case of health professionals) and receiving (as in the case of patients) telehealth information.

Tasmania has the lowest broadband coverage in Australia at 32%.⁶ Recently, the Australian Government has announced that Tasmania will be the launch state for the new super fast National Broadband Network which will deliver speeds of up to 100 megabits per second (Mbps), connecting over 200,000 Tasmanian households and businesses including hospitals and schools. The new network will use wireless and satellite technologies that will be able to transmit information at 12 Mbps or more to people living in rural and remote areas.⁷ It also

provides fibre optic links connecting cities, major regional centres and rural towns. It is expected that health service provision in Tasmania, especially the Telehealth network, will change in view of these circumstances.

Geographical Information Systems (GIS) is a computer-based system for mapping, storing, retrieving and manipulating spatially referenced data.⁸ It allows users to display a variety of data on multiple maps to determine possible spatial relationships. Research employing GIS that looks into the location, planning and utilization of health care facilities, as well as the identification of the features influencing the efficiency and effectiveness of health care delivery systems, is not new. However, literature review did not reveal a similar study on the use of GIS in analysing the variability, availability and accessibility of Telehealth network and broadband coverage in Tasmania. This paper examines the spatial distribution of Telehealth network availability and broadband coverage in Tasmania and investigates their relationships with Tasmanian population data and socio-economic status using GIS.

METHODS

Datasets used in this study include:

1. Geographic and population data^{9,10} which contains Tasmanian digital boundaries and population for mapping purposes.
2. Accessibility and Remoteness Index of Australia (ARIA+) for classifying geographic variations in terms of accessibility and remoteness in Tasmania;^{11,12} ARIA+ defines remoteness and accessibility to service centres based on road distances. The accessibility to service is expressed as a continuous measure from 0 (high accessible) to 15 (high remoteness). Localities that are more remote have less access to service centres and vice versa.¹¹

3. Listing of 52 open-access Telehealth videoconferencing sites of the Tasmanian Department of Health and Human Services.¹³
4. Telstra reports which contain information about broadband plans and its coverage in Tasmania.¹⁴ The regions with broadband coverage as reported are converted to postcode regions using Australian Postcode finder.¹⁵

In this paper, different maps were generated at postcode levels using GIS software, graphically plotting the distribution of remoteness and accessibility to service centres, the availability of Telehealth facilities and coverage of fast broadband services.

Ethics application is exempted as data are available publicly and do not include sensitive information.

RESULTS

Figure 1 shows that all Tasmanian areas including Hobart are considered as regional and remote compared to other areas on mainland Australia, based on ARIA+ index.

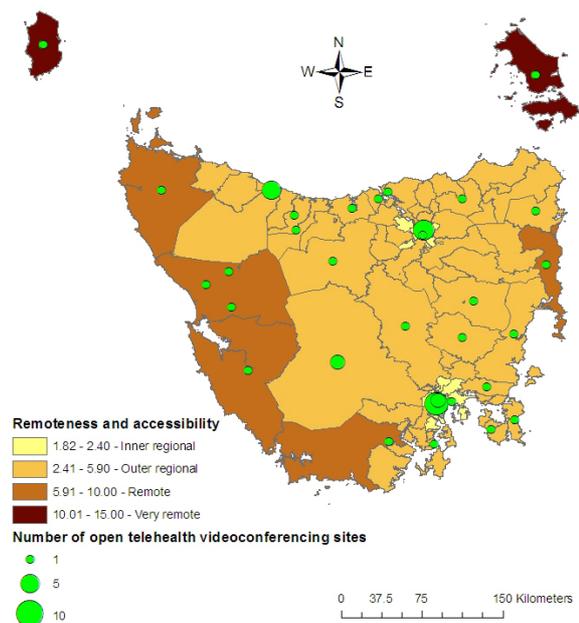


Figure 1: Distribution of open-access Tasmanian Telehealth sites and geographic variations of remoteness and accessibility.

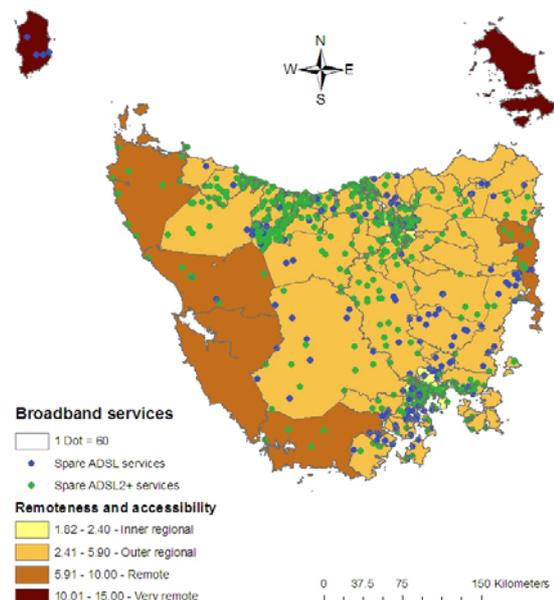


Figure 2: Distribution of broadband services (Telstra) and geographic variations of remoteness and accessibility.

Telehealth sites are concentrated in three main cities: Hobart in the south, Launceston in the north and Burnie in North West. These three cities are homes to two regional hospitals and a district hospital where the majority of specialists and health professionals work and live. Other outer and remote areas have limited number of open-access Telehealth sites.

Figure 2 indicates the distribution of fast broadband services (ADSL2+) in Tasmania. The provision of fast broadband services again concentrates in the three main cities namely Hobart, Launceston and Burnie and their immediate surrounds. Broadband services have limited reach in remote areas and are absent in very remote areas such as King Island and Flinders Island. Future mobile network services with reliable and stable bandwidth would be beneficial to the population living in these areas.

Figure 3 depicts the population distribution and areas of low Index of Relative Socioeconomic Disadvantage. The most disadvantaged areas with relatively higher concentration of population are the east coast, central Tasmania and the north western tip of Tasmania.

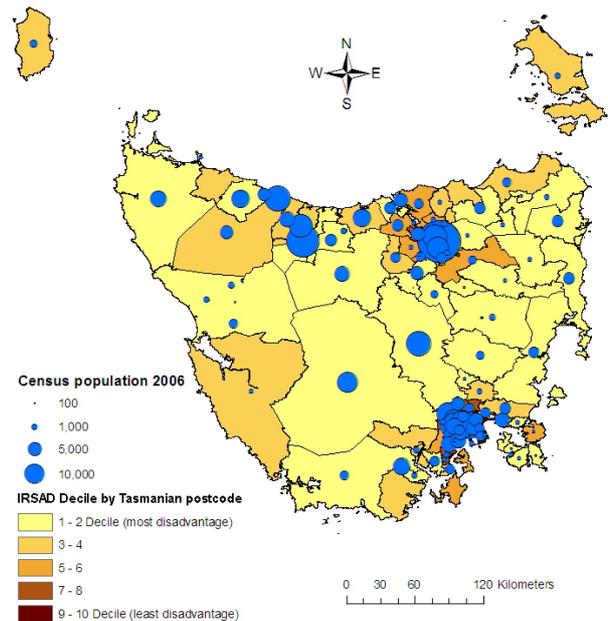


Figure 3: Population distribution and areas of different Indices of Relative Socioeconomic Disadvantage and Advantage (IRSDA).

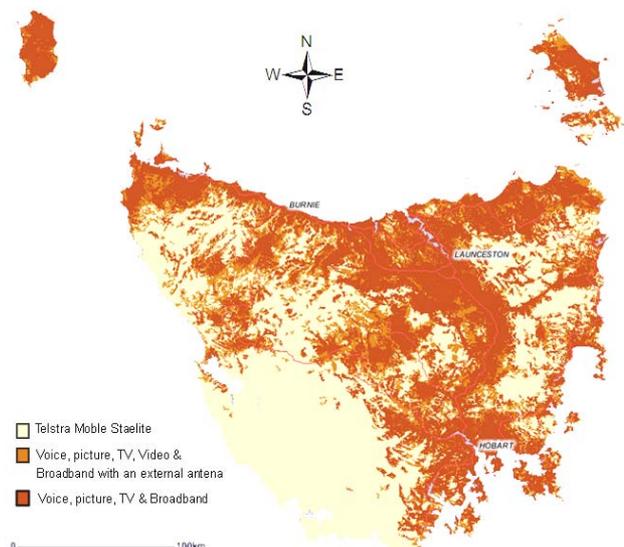


Figure 4: Distribution of broadband coverage areas including wireless broadband network.

Figure 4 displays the total broadband coverage in Tasmania including satellite services and Next-G network for mobile services.¹⁶ This paper mainly displays the areas with broadband coverage according to a report of Telstra, the dominant Internet Service Provider in Tasmania.

The wireless broadband coverage has taken into consideration areas that are socioeconomically disadvantaged.

Figure 5 shows the existing fibre optic backbone in Tasmania and the proposed fibre optic extensions.¹⁷ It is worth noting that the extensions when completed will greatly boost broadband accessibility on the east coast and the north western tip, the most disadvantaged areas in Tasmania.

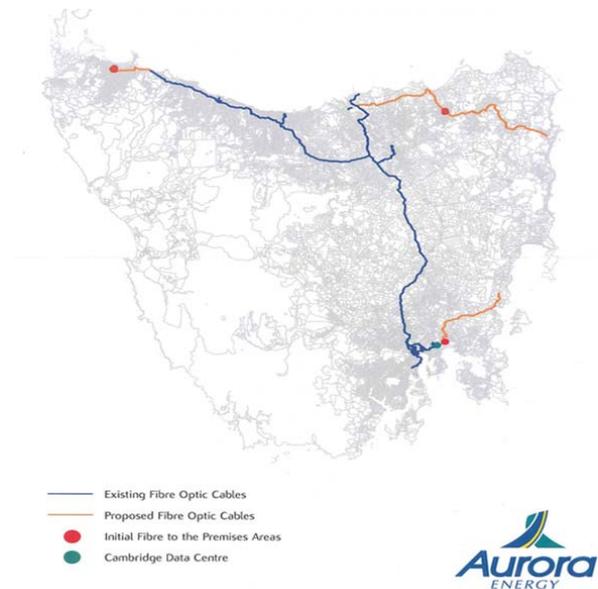


Figure 5: Initial national broadband network roll out.

Source: Adapted from DigitalTasmania.¹⁷

DISCUSSION

Improved efficiency and productivity

Fast broadband will enable the Telehealth network deliver health care services to patients anytime, anywhere in Tasmania. For instance, fast speed broadband service will allow high quality images to be transmitted in real time, enabling some diagnoses in particular urgent ones to be done remotely without compromising quality of care. In addition, fast broadband telehealth services via Next G and WiFi aeriels, as well as a Next G router will save both the patients and health care professionals unnecessary travel, thus unleashing productivity otherwise locked up.

Better patient management

Modern devices enabled by a fast broadband network will allow patients better control and management of their health. For instance, technology reduces the need of people not living in major cities to travel for specialist care. Broadband also enables a host of remote patient monitoring technologies. Innovative home health care monitoring systems now allow doctors to remotely monitor high-risk patients, e.g. their blood-pressure and pulse over broadband. These technologies can minimise expensive house calls, and help improve the quality of care and quality of life of those not living close to urban facilities.

Overcoming barriers of professional isolation

One of the challenges health professionals faced working in remote areas is professional isolation. The lack of support from peer and opportunities in professional development have been deterrent factors for health professionals settling in rural and remote areas. Improved broadband network will enable webinars and teleconsultations bringing health professionals at different locations together.

Addressing socioeconomic disadvantages

Though the whole Tasmania is treated as rural, the degree of rurality and remoteness varies. Fast broadband will play an essential role in delivering health services to remote areas at an affordable cost, addressing the disadvantages of people living in more rural and remote areas of Tasmania.

With the advent of information technology, more and more people are now working from home. A broader broadband coverage in Tasmania will encourage more economically active people desiring a better living environment to move to regional and remote townships. This will help improve the social fabrics of remote communities, thus alleviating the social inequality divide between urban and rural areas.

In conclusion, a universal fast speed broadband service will be a win for all, both the health care system and the patients. The physical presence of certain health service providers at a definitive location will become less crucial, providing a relief to local health workforce shortages. Patients will be required to travel less than before and get the same level of care, if not better. Productivity in the health care system can be improved and patients will be able to get more timely treatment preventing deterioration of their health problems, thus lowering health care costs. Numerous studies have found that broadband can dramatically cut health care costs such as reducing in-person nurse visits and the number of emergency room visits.

The crux of the matter lies in both hard and soft infrastructure. The rollout of the National Broadband Network addressing the hard infrastructure is the first step to improving health care service delivery to rural Tasmania. However, a system is as good as how the people use it. Relevant trainings to upskill the health workforce and patient education are as crucial. Educating patients in socioeconomically disadvantaged areas to embrace and make good use of the telehealth system will be the next big challenge.

Declarations:

Competing interests: None declared

Funding: None

Ethical approval: Not applicable

Guarantor: QL

Contributorship: QL was responsible for the design of this paper. QL and CC were responsible for the collection and the interpretation of the data. QL performed the distribution maps of telehealth services, ADSL exchange, IRSDA, ARIA+ and census population. CC was involved in revising this manuscript critically.

REFERENCES

1. Productivity Commission. *Australia's Health Workforce - Research Report*. Canberra; 2005 [updated 2005; cited 2009 25 August]; Available from: http://www.pc.gov.au/__data/assets/pdf_file/0003/9480/healthworkforce.pdf
2. DHHS. *Tasmania's Health Plan – Summary*. Hobart: Department of Health and Human Services; 2007 [updated 2007 May 2007; cited 2009 25 August]; 67]. Available from: http://www.dhhs.tas.gov.au/futurehealth/documents/HealthPlanSummary_nav.pdf
3. Telemedicine: An overview. *Health Devices*. 1999 Mar;28(3):88-103
4. Rheuban KS. The role of telemedicine in fostering health-care innovations to address problems of access, specialty shortages and changing patient care needs. *J Telemed Telecare*. 2006;12 Suppl 2:S45-50
5. Stanberry B. Telemedicine: barriers and opportunities in the 21st century. *J Intern Med*. 2000 Jun;247(6):615-28
6. Bingemann M. Tasmania on track as NBN testbed. *The Australian*. 2009 July 21, 2009
7. Warne D. BREAKING NEWS: Govt to build \$43bn fibre-to-the-home network Australia: *Australian Personal Computer Magazine*; 2009 [updated 2009; cited 2009 11 August]; Available from: <http://apcmag.com/Content.aspx?id=3730>
8. ESRI. *The guide to Geographic Information System*. Environmental Systems Research Institute; 1995 - 2009 [updated 1995 - 2009; cited 2009 12 August]; Available from: <http://www.gis.com/whatisgis/index.html>
9. ABS. *Australian Standard Geographical Classification (ASGC) Digital Boundaries* (Intercensal), Australia, cat 1259.0.30.001 - Canberra: Australian Bureau of Statistics; 2007 [updated 2007; cited 2007 25 July]; Available from: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/1259.0.30.001?OpenDocument>
10. ABS. *Regional Population Growth, Australia - Population Estimates by Local Government Area, 2001 to 2008*, cat 3218.0. Canberra: Australian Bureau of Statistics; 2009 [updated 2009 28 April 2009; cited]; 23 April 2009:[Available from: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3218.02007-08?OpenDocument>
11. ABS. *Remoteness Structure (RA) Digital Boundaries, Australia*, cat. 1259.0.30.004. Australian Bureau of Statistics; 2006 [updated 2006; cited 2008 20 June]; Available from: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1259.0.30.0042006?OpenDocument>

12. GISCA - *National Centre for Social Applications of GIS. ARIA Plus - National Data Product - CDROM*. [CD-ROM] Adelaide: The University of Adelaide; 2006 [updated 2006; cited 2008 15 November]; Version 2:[Available from:
http://www.gisca.adelaide.edu.au/products_services/ariav2.html
13. TasCOSS. *Resources and Links - Industry Development Tasmania Council of Social Services*; 2008 [updated 2008; cited 2009 1 August]; Available from:
<http://www.tascoss.org.au/IndustryDevelopment/InfoResourcesLinks/tabid/68/Default.aspx#Teleconf>
14. Telstra.com. *ADSL reports and plans*. [updated 2009; cited 2009 1 August]; Available from:
<http://www.telstrawholesale.com/products/data/adsl-reports-plans.htm>
15. Australian postcode finder. [cited 2009 1 August]; Available from: http://www.aus-emaps.com/postcode_finder.php
16. Telstra. *Next-G coverage map*. 2009 [updated 2009; cited 2009 11 August]; Available from:
<http://www.telstra.com.au/mobile/networks/coverage/maximise.html>
17. Digital Tasmania. *NBN Maps*. 2009 [updated July, 2009; cited 2009 25 August]; Available from: <http://www.digitaltasmania.org/nbn-maps>