TOOLS TO INFORM
ON
FUTURE PLANNING
FOR
MATERNITY SERVICES
August 2013
## Acronyms and abbreviations

<table>
<thead>
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<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ABS</td>
<td>Australian Bureau of Statistics</td>
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<tr>
<td>GIS</td>
<td>Geographic Information Systems</td>
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<tr>
<td>GP</td>
<td>General Practitioner</td>
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<tr>
<td>NMSCF</td>
<td>The National Maternity Services Capability Framework</td>
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<td>NMSP</td>
<td>The National Maternity Services Plan 2010</td>
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<td>MSIJC</td>
<td>Maternity Services Inter-Jurisdictional Committee</td>
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<td>RA</td>
<td>Remote Area score</td>
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<td>RBI</td>
<td>(Canadian) Rural Birth Index</td>
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<td>UCL</td>
<td>Urban Centre and Locality</td>
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Executive Summary

The provision of maternity services in rural and remote Australia has been the subject of much debate. The increasing urbanisation of Australia leaves small communities without the resources required to sustain such services. This has led to hospitals closing, women travelling vast distances to have their babies in communities that are foreign to them and even birthing on the roadside. The National Maternity Services Plan called for evidence based, equitable and women centred maternity care. It is in the bush that it is the hardest to provide this service.

A first step in the provision of such maternity services is to ascertain the existing services and the tools used to plan them. The first aim of this report was to review the literature for tools to guide or inform health service planning in rural and remote areas. We found no specific tools currently in use in Australia. However, systematic review of the literature did identify four tools to assist rural service planning. Just one tool related to maternity services - the Rural Birth Index from rural British Columbia in Canada. The Rural Birth Index uses social need, physical isolation and number of births to guide the level of service, understanding the current level of service has a place in the community and there may be other factors at play. This tool may be generalizable to the Australian setting and this is currently being tested.

The second aim of this report is to provide a snapshot of the extent of maternity services currently provided in the public sector in rural and remote communities of 1,000 to 25,000 people. Using publically obtainable data where ever possible, public hospitals were identified, located spatially and their level of services ascertained, then codified to the National Maternity Services Capability Framework. No two jurisdictions keep or record their data in the same manner. Data was collected from Perinatal Data Collection reports, the websites and publications of Departments of Health and from individual hospitals. These data varied in the range of data published, the time scale and time period. The inter-jurisdictional differences between data sources complicated the data for this report. In some cases we relied on local data or expert opinion to fill these gaps. We also found disparities between government websites such as MyHospitals and our other sources. No one source identified all public hospitals with maternity services, or with birthing services.
Introduction

The last half a century has shown a trend towards the closure, regionalisation and centralisation of rural and remote health services both in Australia and internationally.\(^1\)\(^-\)\(^5\) Regardless of the reason for closure, access to health services has become progressively constrained for rural and remote populations independent of the country, health system or system differences between countries.\(^6\)

The reduction in rural and remote services has created barriers for all women accessing maternity care but particularly for disadvantaged vulnerable populations in Australia and internationally.\(^7\)\(^-\)\(^9\)

The challenge is to plan services that meet the needs of rural and remote communities and reduce travel where possible by providing maternity services close to where people live.

Sustainable provision of maternity services is required to ensure continued access to antenatal, birthing and postnatal services even if they are provided in different locations. To achieve this, governments need a rigorous methodology to inform policy development health service planning and the subsequent delivery of services.

In response to the community’s reaction to the closure of maternity services, the Australian Government has demonstrated a commitment to reverse the trend of closure for rural and remote women.\(^10\) This however has little weight unless the jurisdictions also demonstrate a commitment to reversing this process. The National Maternity Services Plan (NMSP)\(^10\) provides a strategic national framework for maternity services for 2010-2015 and offers three principles for service delivery:

2.1 Ensure Australian maternity services provide high-quality, evidence-based maternity care
2.2 Develop and expand culturally competent maternity care for Aboriginal and Torres Strait Islander people.
2.3 Develop and expand appropriate maternity care for women who may be vulnerable due to medical, socioeconomic and other risk factors.

These recommendations identified actions for addressing improving access to maternity services.\(^10\)

Action 4.2 to “Ensure maternity service planning, design and implementation is women centred”.
Action 4.2.1 to develop a rigorous methodology to assist in women-centred maternity service planning.

The development of the National Maternity Services Capability Framework (NMSCF)\(^11\) addresses action 4.2.1 of the NMSP. The framework describes minimum requirements for each of six levels of maternity service, provides a consistent language, and guides maternity service provision and planning. A key purpose of the NMSCF is to support safe maternity services in Australia in as many locations as possible.

Another action specified is a strategy to promote sustainability and improve access by developing tools to inform planning regardless of geographic area. Currently there is limited evidence to inform decisions for service planning in rural and remote areas of Australia and internationally. As a result, decisions about the appropriate levels and types of services for rural and remote populations are challenging because of lack of evidence and strategy.

The challenge is to plan maternity services that are accessible, safe, quality, low volume and cost effective in rural and remote areas.\(^12\)\(^,\)\(^13\) Many of the decisions to close services were not based on the needs of the community but on meeting the policy challenges and planning agendas. Governments face fiscal constraints alongside persistent growth in the percentage of gross domestic product spent on health.\(^14\)\(^,\)\(^15\) This leads to decisions that are not evidence based and are often driven by budgetary constraints and use of historical models of care and staffing.
To examine the existing evidence base for informing such decisions, this report will detail the current use of evidence based tools to inform the planning of maternity services by jurisdictions. Next, the scientific literature was reviewed for any such tools to inform planning health services, including the Rural Birth Index developed in Canada. Thirdly, a mapping exercise was undertaken to provide a snapshot of existing maternity services in small communities in rural and remote Australia.
1 Tools to inform maternity services planning

1.1 Tools in current use in Australia

To identify possible tools that are currently used to inform maternity service planning in rural and remote communities, a systematic review of the literature was undertaken. The search criteria included tools (mathematical models, or methods using a group of variables identifying need in rural or remote communities) that were associated with a type and/or level of service. Articles were excluded if in a language other than English and if referring to countries without fully developed health care systems. An additional search of the grey literature including each jurisdiction’s website was also undertaken.

This search found no literature on tools to identify the optimal level of maternity service for rural and remote communities in Australia. However, there are service planning processes, clinical guidelines and capability frameworks that identify the minimum requirements for service delivery. Consultation with jurisdictions revealed one of the few tools used commonly in planning rural and remote maternity services are clinical services capability frameworks. Each jurisdiction has access to a capability framework for planning maternity services although there are variations in the descriptions of levels of service. The NMSFC has addressed some of the definitional differences between jurisdictions by providing a common descriptive language. However, despite providing a common language for planning maternity services, it does not identify the level of service required by a community, only the minimum requirements for service delivery at each level. The NMSFC is positioned as complimentary guideline for each jurisdiction rather than offering a framework that must be adopted by every jurisdiction.

1.2 Tools for maternity services planning – a review

To provide evidence for the provision of services the academic and grey literature were reviewed to find any tools or indexes that identify the optimal level of maternity or other health services. Of particular interest were indexes used in Australia or other geographically and culturally comparable countries where delivery of rural and remote services is an issue. Only indexes or tools that included mathematical models, used a group of variables identifying need in rural and remote communities and associated with a type and level of service were included. Literature was limited to English language studies from countries with a comparable health system including Australia, Canada, United Kingdom, United States and Europe. The search was not limited by year.

The literature was searched using the electronic search engines, OVID SP (includes Medline, CINAHL, Psychinfo), Embase and Informit. This yielded little in the way of information on indexes. The keywords used were: indexes or models, prioritization tools, maternity health service planning, health service planning, policy development, accessibility and access. The keyword ‘model’ was removed due to its multiple meanings and impact on search results. Of the 266 articles retrieved, only 79 were relevant. Articles were excluded based on their titles or abstracts and if the study was based in countries with emergent medical facilities or on clinical studies. A search of the geography literature was then conducted using another library search engine, GEOBASE with the keywords Geographic Information Systems (GIS), health service planning and accessibility. Again this was not limited by year as the historical view point was considered relevant to the evolution of the use of GIS and variables included in the composite indexes. The searches were also limited to English language and the same countries as above. Here, 135 articles were retrieved, with 29 relevant to this review.
1.2.1 Indexes

The extended review of the 128 studies identified by the literature review identified a total of four indexes (20-23). These indexes map access to health services and the impact of geographic and socioeconomic variables on that access.

An index is a mathematical construct that integrates a group of variables relevant to the purpose for which it is created. It is important that the variables used to construct the index are appropriate for measuring the intended association, such as a level of maternity service. In addition the index should be simple to use and constructed with variables using current and easy to access data. Indexes are usually constructed around a single or combined group of geographic or socioeconomic variables. Measures of socioeconomic deprivation or poverty (24-27) can be used or the relationship of distance, time and cost to a service (28-31). An index combining both socioeconomic and geographic variables is a statistically appropriate and broadly accepted method of combining a range of variables into a single measure (21, 22).

For an index to inform planning or sustainability of health service the variables used must also demonstrate a relationship to the service being described, for example birth number or distance to a caesarean section service. Despite the volume of literature on both geographic and socioeconomic variables only four indexes were identified that measured a relationship to a level and type of service. Of these, only one index was associated with maternity services (21).

1.2.1.1 The Trauma Model

The Trauma Model is a Canadian tool incorporating a range of variables including a measure of isolation, two measures of social vulnerability, population and a risk of trauma measure (23). The Canadian Rural Birth Index (RBI) (21) and the Trauma Model share common authors and are both associated with health service access in British Columbia, Canada.

1.2.1.2 The Index of Rural Access

The Index of Rural Access was developed in Australia and uses Victoria as the population base to map access to general practitioner (GP) services (22). It combines four key elements of access including availability of, and proximity to, services, health needs and mobility. This is done through the identification of catchments and related distance to GP services for rural populations in Victoria.

1.2.1.3 The Cardiac Aria Index

This is an index which used GIS to map 20,387 urban, rural and remote population locations to availability of local health services including non-cardiac specific ambulances and pharmacies (20). The difference with this index is that although it is recognised that socio economic disadvantage and distance impact on outcomes of a cardiac event, no socioeconomic variables were integrated in the index. The aim of the project was to identify access to response to a cardiac emergency in an objective geographic way.
1.3 The Canadian Rural Birth Index

The RBI is a Canadian tool incorporating three variables that relate to distance and access to services. The extensive qualitative work on which the RBI is based, identified that population birth numbers within a 60 minute travel time catchment, social vulnerability of the local population and the degree of isolation of the community (travel time to a caesarean section service) were the dominant characteristics predicting service stability. The RBI links the number of births with the degree of social vulnerability, level of geographic isolation and access to services with caesarean section capability (Figure 1). These variables are closely connected to the criteria for planning maternity services in the NMSP.

The RBI investigators’ in depth knowledge of the local British Columbia service environment evolved from experience and in-depth qualitative research. The process of index development enabled manipulation of cut-off points for each variable ensuring the scores matched the levels of services to which they were applied. The resultant score assigned, indicated whether a location was under, over or appropriately serviced for maternity services. The cut off points for an Australian index would need to be assigned with an understanding of the Australian service environment and the associated levels of maternity service. An expert panel was used to provide additional professional insight and overview. When the index was applied to the 42 nominated communities in British Columbia it was found to have an accuracy rate of 80 per cent.

Figure 1: The Canadian Rural Birth Index and its composite variables.

![Diagram of Rural Birth Index](image)

1.3.1 Catchment

One of the key variables incorporated into the RBI is the number of births that occur within a designated 60 minute drive time catchment for a maternity service. By defining a catchment and measuring birth numbers there is a realistic measure of how much demand there may be in a community for maternity including birthing services. The RBI uses the average number of births over the last five years to account for changes in numbers over time. That average number of births was divided by 10, to create a usable score for inclusion in the RBI. While accounting for birth numbers is relatively simple due to the development of national perinatal databases, the identification of the catchment is more complex.

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1 The Canadian RBI tool is currently being tested and verified in Australia under a National Health and Medical Research Council Maternity Services Research Grant funded under a Memorandum of Understanding between the National Health and Medical Research Council and the Department of Health and Ageing.
Catchment size and data is place dependent and informs us about spatial accessibility of health services. The catchment itself will usually vary in size, related to the way distance and time is measured (e.g. road speed) within a given catchment. It is also well recognized that the population within the catchment will have unequal access to services dependent on their circumstances and exactly where they reside within the catchment. The size and perimeter of the catchment may change over time, dependent on the service being planned. Where there are many services and higher population density there will be overlap in catchment perimeters and more choice. With closure of services the population catchments of facilities grow larger, there is less choice and travel times are greater. The 60 minute catchments in British Columbia appear to almost join up. This would not be the case in Australia particularly for remote services and it is likely that a longer travel time may be required in Australia to define catchments or categories of isolation.

However, there is evidence that 60 minutes travel times or the ‘golden hour’ impacts on outcomes or decisions to access services. All of the indexes identified used a 60 minute travel time for their access to service calculations. The Trauma model excluded populations that were within 60 minutes’ drive time as they were considered to have good access to high level trauma care. The Index of Rural Access mapped the access Victorians had to GP services within a 60 minute timeframe. However, rural Victoria is more densely populated than the rest of Australia and there is a much higher ratio of primary health care services to population and the 60 minute catchments overlap. Overlap of catchments is unlikely to be the case for most hospital services in rural and remote Australia as there is generally only one hospital per catchment in rural and remote areas. Therefore, longer travel times than 60 minutes may be necessary when defining catchments in the Australian context.

1.3.2 Isolation

The greater the distance, the greater the isolation, the fewer services a community is likely to have. People from isolated communities must then travel further to access services when required. The concept of accessibility has both socioeconomic and mobility components which contribute to the view that it is the ‘ability of people to reach and engage in opportunities and activities’ p2. The Institute of Medicine (United States) defines access to healthcare as ‘... the timely use of personal services to achieve the best possible outcomes’ p412. The implication is that if people do not have the ability to transcend barriers related to distance, they have a high mobility disadvantage and poor access to health services. The combined social and geographic barriers preventing access to services, result in isolation from services and contribute to poor health outcomes.

The isolation factor in the RBI was based on the distance to the next maternity service with caesarean section capability, even if there was a service in town. The isolation factor used seven epochs of time weighted in a stepwise fashion from less than 30 minutes to more than four hours. While this measure of time may be applicable for Canada it is necessary to consider its usefulness in the Australian setting. Many small rural and remote communities in Australia are serviced by primary health care services and may be 12 hours or more road travel time to a higher level service. In some instances it may not be possible to drive at all and may require multiple forms of transport including road, plane, helicopter and boat. While these are extreme and in the minority, this is a problem some communities deal with on a regular basis. These travel times in an Australian Index will require some degree of flexibility dependent on the area in question. The Cardiac Aria Index used eight categories of time to different categories of hospital including those with cardiac catheterisation laboratories. Considering various options such as in the Cardiac Aria Index may also be appropriate for maternity services. Using time to a birthing service with and without caesarean section capability may be required to account for access to services in isolated
communities. Low risk, low volume birthing should be provided close to where women live as poor health outcomes because of travel result in higher rates of intervention.

1.3.3 Vulnerability

Accurate measurement of health need is the first step in addressing the barriers to health care access and identifying levels of vulnerability in the community. The choice of variables used in an index needs to describe the vulnerability of the catchment and be relevant to the socioeconomic characteristics of the designated population.

The Canadian RBI used previously validated British Columbia Statistics Socioeconomic Indices which measure the social vulnerability of a local health area ranging from socially disadvantaged to advantaged. It was recognized that measures of socio-disadvantage more accurately correlated to poor health outcomes than measures of advantage. Although the Trauma Model uses a similar methodology to the RBI, it used two types of socioeconomic disadvantage and an additional measure of trauma risk, which correlates the likelihood of increased rates of trauma in different populations.

In the Index of Rural Access there are six final (from an initial 37) measures of socioeconomic disadvantage including a range of age and education variables and those related to Indigenous and Culturally and Linguistically Different, known as CALD categories. The Index of Rural Access also articulates that some age groups are more vulnerable than others including children under five, women of childbearing age and people over 65 as they are greater users of health care. However, whereas both the RBI and Trauma Model used available socioeconomic data, the Index of Rural Access modelled a range of measures of socioeconomic disadvantage and removed the repeated variables. Regardless of how the variables were chosen, using more than one separate measure of deprivation or socioeconomic disadvantage strengthens the measure of vulnerability.

The use of census data to quantify socioeconomic deprivation is well documented as an accepted method of identifying populations with poorer outcomes. It is considered the most accessible, is updated regularly, is place dependent and measures the vulnerability of the population with a range of variables. Census data is collected at five year intervals in Australia, with information collected on individual income, education and housing, demographic data, and address information. It is aggregated into scores by the Australian Bureau of Statistics and publicly available for analysis. These scores include Indigenous components and measure relative advantage or disadvantage.

1.4 Conclusion

A review of the literature found just four indexes of health provision. This report details the variables used to construct them and the common themes described in each index, despite the difference in intended services. The main groups of variables used were related to access to services in geographically rural and remote areas. The potential for application of the Canadian RBI in Australia is substantial, but requires inclusion of Australian variables and appropriate cut-off points that link to Australian levels of maternity service.
2 Maternity services in rural or remote Australia

To identify rural and remote maternity services the team used publicly available data sources when these were available. Data for each jurisdiction was sought in a systematic manner. Where possible, our results were verified with members of the Maternity Services Inter-Jurisdictional Committee (MSIJC). A database was then developed to house these data.

The services identified:

- were in public hospitals
- were in locations defined as rural or remote – Remoteness area level 2 to 5\(^{(44)}\)
- were in locations with a population of between 1,000 and 25,000
- met the criteria of maternity services Level One to Level Five of the NMSCF\(^{(11)}\)

2.1 Identifying rural and remote hospitals

Hospitals are generally listed on the website of their Department of Health. These websites were interrogated to identify those hospitals that were located in rural or remote Australia. Next, data from the MyHospitals website\(^{(45)}\) were added. This combined list of hospitals was then checked against the list of public hospitals included in the National Hospital Morbidity Database for 2009-10\(^{(46)}\) to ensure that all hospitals were identified.

Remoteness was defined using the Australian Bureau of Statistics (ABS) Australian Standard Geographical Classification (ASGC) Remoteness Area (RA), with rural and remote ranging from RA2 (inner regional) to RA5 (very remote).\(^{(44)}\) The location of each hospital was assessed using the Remoteness Area score attributed to the hospital in the National Hospital Morbidity Database report\(^{(46)}\) and then verified using the Department of Health’s website, DoctorConnect.\(^{(47)}\)

2.1.1 Rural and remote hospitals serving populations of 1,000-25,000

Catchments for hospitals are often difficult to define.\(^{(13)}\) To identify the catchment or number of people residing in the local area for each hospital, we used the Urban Centre and Locality (UCL) in which each hospital was located. This is an estimation of the town or community size developed by the ABS and was based on the 2006 census data (the most recent census data available). UCLs are groups of one or more contiguous whole census collection districts\(^{(48)}\). UCL was chosen because it was information that is publicly available for all jurisdictions, and offered a simple assessment of ‘town’ (usually where the hospital is located) population to provide an indication of populations 1,000 to 25,000.

We used the ‘Place of usual residence’ as identified by the ABS to estimate populations. An alternate measure, ABS ‘Estimated Resident Populations’, was only available at UCL level for Queensland and was used there. Hospitals with catchments of less than 1,000 people or more than 25,000 people were not included in the study. There are many communities in rural and remote Australia with populations outside those parameters, but the study was confined to those areas with equivocal service needs.
2.1.2 Maternity services in rural and remote hospitals, and births

Maternity services were defined for this report as those services in public sector hospitals that were government resourced and had a main focus related to antenatal, birthing and post natal care of women and their babies from the onset of pregnancy to one week after birth. This included antenatal, birthing and post natal services and excluded specialist services for In Vitro Fertilisation, foetal monitoring and prolonged care of the baby. Only hospitals with maternity services that met the criteria for a NMSCF Level 1 service as a minimum were included.

To identify facilities with maternity services, our list of rural and remote hospitals was checked against two main sources. Firstly, against the newsletter of the Australasian Maternity Outcomes Surveillance System (AMOSS). This organisation collects data from hospitals with more than 50 births annually. Secondly, we checked against the MyHospitals website which documents hospital services, including ‘Obstetric Services’ (defined as “whether or not a specialised facility dedicated to the care of obstetric/maternity patients is provided within an establishment, as represented by a code” p314). Individual hospital websites were also checked along with health services sites as further checks to establish if hospitals had a current maternity service.

To establish numbers of births at each hospital, perinatal reports for each jurisdiction were consulted. These offered varying levels of detail related to numbers of births. For example the NSW Mothers and Babies reports hospitals with 200 or more births, whereas South Australia reports facilities with more than 10 births.

2.1.3 Level of maternity services in rural or remote hospitals

No jurisdiction was using the NMSCF. It was necessary to map the published framework used in each jurisdiction to the national framework. First, the jurisdictional level of each maternity service was required; however there was a large variation between jurisdictions in the availability of information on these levels. Where information was publicly available such as in the New South Wales Mothers and Babies publications, levels of service were ‘translated’ into the NMSCF levels. In many cases this translation was not an ideal ‘fit’ as jurisdictional frameworks use different language and degree of detail to the national framework. There were also some differences in the structure of frameworks, for example level one on the New South Wales Role Delineation (which delineates facilities rather than services) describes post-natal care only, whereas, in the NMSCF level 1 describes a service providing antenatal and postnatal care but no births. Hence, no hospital denoted as level 1 in NSW matched the criteria for level 1 in the NMSCF.

In most cases information on levels of maternity services had to be sourced through MSJC contacts. Where this was not possible, information was gathered through individual hospitals’ websites and directly from Directors of Nursing or Clinical Services at individual hospitals by telephone or email. Where a maternity service was not designated as NMSCF level 1-6, it was not included.

The level of a maternity service may be sensitive to changes in workforce or local circumstances, particularly in rural and remote hospitals. Where there were internal variations in level of service, the lower level of service reported was recorded. It should be noted that it is difficult to access accurate information on level of services and that information may become out-dated very quickly. In addition, NMSCF level 1 services such as antenatal care are often provided in non-hospital settings such as general practice, primary healthcare centres, and community health and therefore are not included. This has particularly affected the data from New South Wales and the Northern Territory.
Our work on identifying maternity services has highlighted the importance of the NMSCF as there is variation between jurisdictions including no common language to describe services. Jurisdictions will need support and encouragement to identify levels of services using the NMSCF and in adopting a common language.

2.2 Maps of services

Maps of all Australia (for example Figure 2), and for each jurisdiction show the current location and level of maternity services in public hospitals in rural and remote communities of between 1,000 and 25,000. The maps place each hospital on the Australian Standard Geographical Classification remoteness areas (major cities, inner regional, outer regional, remote and very remote).

Hospitals with maternity services were located by their latitude and longitude and geocoded with the corresponding level of maternity service using the NMSCF. For example, hospitals with level 3 capability or those providing surgical service, are shown as a purple dot. Services in towns of more than 25,000 people are not shown.

Figure 2: This map of Australia demonstrates the location of maternity services in small communities in rural and remote areas in 2012. Level of remoteness is depicted by background colour indicated in the index of each map using the Remoteness Area ratings of the Australian Standard Geographical Classification. Here, very remote areas are in ochre and inner regional are beige.
Figure 3: Public hospital maternity services and levels in rural and remote New South Wales – 2012
Figure 4: Public hospital maternity services and levels in rural and remote Victoria – 2012
Figure 5: Public hospital maternity services and levels in rural and remote Queensland – 2012
Figure 6: Public hospital maternity services and levels in rural and remote South Australia – 2012
Figure 7: Public hospital maternity services and levels in rural and remote Western Australia – 2012
Figure 8: Public hospital maternity services and levels in rural and remote Tasmania 2012
Figure 9: Public hospital maternity services and levels in rural and remote Northern Territory 2012
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