Obstetric care in rural Australia: the evidence is right under our noses—but what direction are we heading?

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Background

Despite one-third of Australia’s population residing in rural areas the current trend in Australian health care has been to downsize rural/regional health care facilities. At the same time there has been a significant loss of essential procedural services such as obstetric services in rural areas. Much has been written about this loss which has also been attributed to increases in litigation, an aging workforce and changing work-life expectations of younger health professionals.1

The Rural Doctors Association of Australia (RDAA) reports that in the last 10 years, 130 maternity units have been closed down nationally.2 This trend has also been mirrored in the US and Canada.3 In terms of obstetric care 29% of all babies born in Australia are born in rural and remote areas with two-thirds of Australia’s hospitals based in small rural towns.4 Rural GP Proceduralists in conjunction with rural midwives have to date provided obstetric care with support in large regional centres from specialist Obstetricians. GP Proceduralists however, are rapidly decreasing in number and the new cohort of GP registrars willing to undertake deliveries is far below replacement level. Two-thirds of procedural GPs will leave rural practice when the local acute/maternity service is closed by health authorities.4 Interestingly, this has occurred largely without reference to evidence based outcomes or assessment of the clinical, social and community costs. Further, the impact of small rural hospital closures on rural patients has not been well documented. This paper attempts to critically appraise some of the available evidence for maintaining and developing local rural maternity services by measuring health outcomes in rural obstetrics.

Methods

The authors conducted a literature review of Australian and international databases on rural health looking at health outcomes in obstetric care in rural environs. Databases searched included AustHealth, Medline and Cochrane. Only published literature was searched with search parameters including: obstetrics, maternity care, clinical outcomes and rural. Inclusion criteria related to publication in the last 10 years, measurable clinical outcomes, and reference to procedural services and rural demography. The rationale for concentrating on more recent articles was in response to the rapidly changing nature of rural obstetrics and the often long lead time to publication. By concentrating the search on clinical outcomes the authors looked for evidence of risk. Articles were excluded if they did not have measurable clinical outcomes and if no outcome factors were measured.

Results

The database search located 49 articles, of which 9 articles best fitted the inclusion criteria. These articles were critically appraised according to the JAMA guide to articles dealing with prognosis.5 More specifically, three articles discussed the Australian context, two were Canadian studies, two were on the US experience, and two studies were from Norway and Germany respectively. A summary of the articles is shown in Table 1.
<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Design</th>
<th>Study Population</th>
<th>Outcomes</th>
<th>Limitation</th>
<th>Findings</th>
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<tbody>
<tr>
<td>Leeman et al</td>
<td>2002</td>
<td>Retrospective cohort study</td>
<td>All pregnant women over 20 weeks over 5 years in a rural location</td>
<td>Perinatal and neonatal mortality Transfers, LSCS delivery rate</td>
<td>Small sample size Potential confounders</td>
<td>Perinatal mortality rate at or below national averages Higher risk population Lower LSCS rate</td>
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<tr>
<td>Larimore et al</td>
<td>1995</td>
<td>Cross sectional study</td>
<td>Mathematical model comparing physician availability with infant mortality whilst controlling for socioeconomic variables</td>
<td>Cannot say cause and effect Likely multiple confounders other than those measured</td>
<td>Negative correlation between availability of maternity services and infant mortality however the statistical basis of this appears severely confounded</td>
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<tr>
<td>Lynch et al.</td>
<td>2005</td>
<td>Population based retrospective study</td>
<td>All women over 20 weeks gestation in 2 rural communities</td>
<td>Perinatal mortality, adverse perinatal outcomes, premature delivery, LSCS and forceps delivery</td>
<td>Small size. No information about age and risk factors–no idea of compatibility</td>
<td>20% more women were able to deliver locally where LSCS facilities were offered Similar perinatal mortality</td>
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<tr>
<td>Abdul-Latif, M.Z.E. et al</td>
<td>2006</td>
<td>Retrospective cross sectional study</td>
<td>All infants&lt; 32 weeks born between 1999–2002 admitted to neonatal intensive care</td>
<td>Stillbirth rates, rural maternal residence, neonatal mortality</td>
<td>No measure of prenatal care, stillbirth data may be incomplete Were other outcomes assessed?</td>
<td>Despite the majority of NICU rural babies being born in tertiary centres rural infants have a higher mortality and higher still birth rates. Comparison between teenage mothers in rural and IVF advanced maternal age in city</td>
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<tr>
<td>Cameron, B.</td>
<td>1998</td>
<td>Retrospective audit</td>
<td>All women delivering in a rural Hospital 1981–1990</td>
<td>Perinatal mortality rate, LSCS rate, antenatal referral rate</td>
<td>Small size</td>
<td>Low intervention rates (LSCS) and referral rates. Comparable/favourable perinatal mortality even when corrected to include those transferred because of intrapartum complications</td>
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<tr>
<td>Tracey, S.</td>
<td>2006</td>
<td>Population based</td>
<td>All women on National Perinatal Data Collection aggregated into various size hospitals</td>
<td>Rates of intervention at birth, neonatal mortality</td>
<td>Neonatal death rate lower in hospitals &lt;2000 births per annum. For low risk women hospitals with less than 100 births per year had lower rates induction of about, intrathecal analgesia, instrumental birth, LSCS after birth and admission to a neonatal unit</td>
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<tr>
<td>Heller et al 2002</td>
<td></td>
<td>Population Based</td>
<td>95% of births in German region</td>
<td>Early neonatal death rates (within 7 days of birth)</td>
<td>Low risk defined as &gt;2500gm&lt;br&gt; All units regional or bigger all with obstetrician present&lt;br&gt; Definition of neonatal death different to other study&lt;br&gt; 5% births missing</td>
<td>Gradient of increasing neonatal risk with decreasing unit size</td>
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<tr>
<td>Moster et al 1999</td>
<td></td>
<td>Population based</td>
<td>Birth registry country wide</td>
<td>Neonatal death rate</td>
<td>Definition of low risk &gt;2500gm&lt;br&gt; Reporting of risk factors changed&lt;br&gt; Small units midwifery only,(no procedural capacity) county hospitals, university hospitals</td>
<td>Gradient of increasing mortality with smaller units</td>
</tr>
<tr>
<td>Roberts C &amp; Algert C 2000</td>
<td>Midwives Data Collection (Population Based)</td>
<td>All women delivering in NSW 1990–7</td>
<td>Stillbirth, Low APGAR scores, Small for gestational age (SGA)</td>
<td>Some leakage of rural patients over state borders, Stillbirth rate may reflect lack of diagnostic access SGA rates may reflect socioeconomic or other disadvantage</td>
<td>Higher rates of stillbirth and low APGAR scores in infants born to mothers in remote communities. Increased rate of SGA in Indigenous mothers Births declining in more remote areas</td>
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A number of themes emerged from the reviewed literature with some published studies challenging the previous notion that bigger units had better outcomes. Resource implications in terms of transportation and the availability of timely retrieval services were also prominent.

The review included three major epidemiological studies utilising data from birth registries across large population groups. All compared low risk women in maternity units of varying size. A large Australian population-based study, based on the National Perinatal Data Collection found that for women in hospitals with less than 100 births per annum there were lower rates of induction of labour, intrathecal analgesia/anaesthesia, instrumental birth, caesarean section after labour and admission to a neonatal unit. Neonatal death was less likely in hospitals with less than 2000 births. For low risk multiparous women the adjusted odds ratio reached statistical significance in units between 100–500 births. This Australian study suggests that for low risk women neonatal mortality was not increased in smaller units. Furthermore, this study used identified comparison groups and a clear and conservative estimate of low risk patients. According to their classification, 40% of primiparous women were low risk and nearly 60% of multiparae women, combining to a total of 47% of women who could be defined as low risk.

In contrast to this study, a large population-based Norwegian study showed the opposite results with a gradient of increasing neonatal mortality as units became smaller. This Norwegian study however, identified low risk by size (2500gm), which they described as 56% of deliveries—a less conservative estimate compared with the Australian study. The context for this Norwegian study differs from the Australian health setting in that the smaller units described (<100 birth a year) were mainly midwife only units with no operative capacity. In addition to this, the study did not make a distinction between primiparous and multiparous women.
The third population-based study reviewed was from Germany and the authors concurred with the findings of the Norwegian study showing a gradient of increasing neonatal risk with smaller units.\(^8\) The services studied also differed from the Australian rural health context as each unit described care by Obstetricians who were present at all deliveries. This is much more applicable for comparison with large regional centres rather than rural hospitals, which in Australia are normally attended by a GP proceduralist with support from hospital midwives. Again, low risk births were assumed to be all births \(\geq 2500\) gm, excluding those with a lethal congenital abnormality. This is likely to be a raw test of low risk, and a much less conservative estimate of low risk than that employed in the Australian study.\(^6\)

The remainder of the studies examined were descriptive studies focused on small rural communities with limited statistical significance and generalisability. Of note was another Australian study based in Atherton, Queensland, which demonstrated lower perinatal mortality in the local unit even when corrected for women transferred to the nearest regional centre with intrapartum complications.\(^9\) This study, however, was limited by a small sample size and many confounders. On the other hand, a Canadian study showed an increased outflow of 20\% in a defined geographic region where there was no onsite access to Caesarean section but no differences in perinatal mortality, adverse perinatal outcomes or instrumental delivery.\(^10\) These remote communities however, were small hence limiting interpretations that can be made from the study. A retrospective cohort study of a small American rural community noted similar perinatal and neonatal mortality compared to national averages.\(^11\) Again the study was small and there were likely other confounders. It also detailed some of the possible risk factors in rural birthing populations.

A cross sectional study in the US attempted to mathematically model infant mortality with availability of procedural medical practitioners and reported an association after controlling for various socioeconomic variables. However, the study authors conceded that these results were likely to have been severely confounded by other variables.\(^12\)

Of note was an Australian study of premature birth outcomes based on maternal residence.\(^13\) This study looked at stillbirth rates and neonatal mortality in infants less than 32 weeks and concluded that despite the majority of rural babies being born at \(\leq 32\) weeks in large tertiary centres, they continue to have higher mortality and stillbirth rates compared with their urban counterparts. This has implications for antenatal care and careful selection of patients.

Finally the study by Roberts and Algert noted a marked decline in mothers giving birth in small rural and remote areas up to 1.7\% per annum in NSW.\(^14\) This was particularly evident in the mothers 20–34 years. It also noted higher rates of still birth and low APGAR scores in remote communities.

**Discussion**

For such an important issue there is surprisingly little evidence based on clinical outcomes in the accessible medical literature. Clinical outcomes most frequently measured are neonatal mortality and intervention rates. Consistent data on other clinical outcomes is difficult to obtain.

The Australian population-based study\(^6\) had sufficient power to conclusively indicate not only a comparable neonatal mortality but in smaller units with multiparous women, a statistically significant improvement in neonatal mortality in units of 100–500 births. Further, there were definitional issues, which reduced the comparability of the studies examined, particularly distinctions between neonatal and perinatal death. For example, a different cut off for gestational age (Australia defines this as 20 weeks whilst European studies use 28 weeks) and differing definitions of low risk. The Norwegian\(^7\) and German\(^8\) studies were not directly comparable with the Australian study\(^6\) as their definitions of low risk differed and the centres they were measuring were not comparable. The lack of clear definitions of low risk deliveries in the two European population based studies may partly explain the differing outcomes. On the other hand the conservative definition used by the Australian study points to the need for careful assessment of antenatal risk.
Some of the smaller studies reported rural and remote perinatal outcomes comparable with national benchmarks.9,10,11 Whilst these studies lack sufficient power to improve confidence intervals and deliver statistically significant results they do point to recent experience of good local outcomes.

Higher risk pregnancies and in particular women with premature labour and delivery were more safely managed in a larger institution with access to neonatal intensive care facilities.13 Comparable studies have shown this and currently 83% of deliveries do occur in large units in Australia. This is the basis of neonatal transport systems that prioritise the transport of high risk women to deliver in tertiary centres.

A number of studies articulated differences in the birthing rural population compared to their urban counterparts, noting higher socioeconomic disadvantage, higher rates of Indigenous mothers and potentially poorer antenatal access. Roberts and Algert14 noted higher stillbirth rates and low APGAR scores in remote areas and suggested reasons for this such as poorer access to antenatal care and diagnostic services. This highlights the importance of accessible, available antenatal care and robust assessment of risk so that appropriate decisions can be made about safe birthing locations.

This paper discusses these outcomes at a time when the numbers of rural and regional hospitals providing procedural services such as obstetrics continues to diminish and those remaining appear vulnerable. As well as the loss of obstetric services this is likely to mean the further loss of anaesthetic and surgical procedural capacity as many operating theatres have also closed. The lack of retention of not only procedural medical practitioners but experienced theatre staff, midwives and other associated hospital staff is likely to have an outsized detrimental effect on the range of services being offered to rural and remote communities.

While this paper makes no attempt to detail the economic and social costs of health care away from home, it is fair to say that these costs are increasingly being directly born by rural patients and their families and currently these hidden costs do not reflect on hospital or health service balance sheets. The emotional and physical dislocation must be a factor of concern. The current movement to more distant, centralised, metropolitan-based services has major implications for provision of both regular and emergency transportation, particularly when the long distances between services is considered such as is the reality in Queensland, Western Australia and the Northern Territory.

**Conclusion**

The studies reviewed in this paper adopted a variety of approaches to evidence around rural obstetrics. The Australian population-based study, which used a conservative definition of low risk, demonstrated a positive gradient towards neonatal mortality in small units, although this has not been born out in large European studies. There were a number of differences in study design, populations and models of service delivery, which may partly explain the lack of comparability across studies. Also notable is the reality that rural communities contain significant numbers of higher risk women for whom transfer to larger centres may well be required to produce optimal birth outcomes. Yet, rural hospitals continue to be closed and downsized, despite good outcomes in low risk obstetrics and a crucial role in initial stabilisation in trauma and treatment of chronic and complex conditions. Equity for rural patients is about access and availability locally, not just rhetoric about specialised standard of care available in central locations. Health bureaucrats and planners must move urgently to preserve and support rural obstetric units before the tide goes out and leaves them above the high water mark line.

**References**


**Presenter**

Jenny May has over 20 years’ experience as a GP in rural and remote Australia. She is currently the Rural Doctors Association representative and Deputy Chair of the National Rural Health Alliance. In this capacity she has been involved in numerous committees and working parties around rural health issues. Currently she represents the NRHA on the Mental Health Council of Australia. Within RDAA she is involved in the Female Doctors Group, and has represented RDAA in forums around cervical screening. She represents RDAA Women’s Group on the National Rural Women’s Coalition. She is an examiner for RACGP and currently works in a new practice set up by North-West Slopes Division of General Practice. Through this model she is exploring usage and upskilling of practice nurses. Her job funded by PHCREDS encompasses support of research and evaluation activities in primary health care particularly involving Divisions of General Practice, regional GP training providers and CPD delivery. She is currently involved in an evaluation of the GP workforce in Tamworth as part of the wider evaluation the UDRH is doing for the new Division Managed Practice. She is also studying for a Masters of Health (Social Science) and has a research interest in looking at the economic, clinical and social viability of rural health facilities. Her interests include women’s health, mental health and the development of rural general practice models.