Submission

Family and Community Development Committee

Inquiry into Perinatal Services in Victoria

14 July 2017
# Table of Contents

Letter from the Vice-Chancellor ................................................................. 4

Terms of Reference .................................................................................. 6

1. Recommendations ............................................................................. 7
   1.1 The availability, quality and safety of health services delivering services to women and their babies during the perinatal period ........................................ 7
   1.2 The impact that the loss of commonwealth funding (in particular, the National Perinatal Depression Initiative) will have on Victorian hospitals and medical facilities as well as on the health and wellbeing of Victorian families ................. 7
   1.3 The adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high-risk and premature births in Victoria .......... 7
   1.4 The quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births ........................................... 8
   1.5 Access to and provision of an appropriately qualified workforce, including midwives, paediatricians, obstetricians, general practitioners, anaesthetists, maternal and child health nurses, mental health practitioners and lactation consultants across Victoria ............................................................................................................................. 8
   1.6 Disparity in outcomes between rural and regional and metropolitan locations ...... 8
   1.7 Identification of best practice ........................................................ 9

2. Introduction .......................................................................................... 10

3. Charles Sturt University ..................................................................... 11

4. Submission to Inquiry ....................................................................... 13
   4.1 Availability, quality and safety of health services delivering services to women and their babies during the perinatal period ........................................ 13
   4.2 Impact that the loss of Commonwealth funding for the National Perinatal Depression Initiative will have on hospitals, medical facilities and families. .............. 15
   4.3 Adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high-risk and premature births in Victoria .......... 15
   4.4 Quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births ........................................... 16
   4.5 Access to and provision of an appropriately qualified workforce ............. 16
   4.6 Disparity in outcomes between rural and regional and metropolitan locations ..... 18
   4.7 Identification of best practice ........................................................ 19

5. Conclusion ........................................................................................... 21
Appendix I - References

Appendix II - Letter from Chair, Family and Community Development Committee to Professor Andy Vann, Vice-Chancellor, Charles Sturt University - 24 May 2017

Appendix III - Why birthplace still matters for infants born before 32 weeks: Infant mortality associated with birth at 22–31 weeks’ gestation in non-tertiary hospitals in Victoria over two decades
14 July 2017

Ms Maree Edwards MP
Chair
Family and Community Development Committee
Parliament House
Spring Street
EAST MELBOURNE VIC 3002

Dear Ms Edwards

INQUIRY INTO PERINATAL SERVICES

Thank you for your letter of 24 May 2017 regarding the Victorian Parliament’s Family and Community Development Committee’s Inquiry into Perinatal Services in Victoria (Appendix I). On behalf of Charles Sturt University, I am pleased to provide this submission to the Committee as part the Inquiry process.

Charles Sturt University believes that perinatal services in Victoria could be strengthened in the following ways for the benefit of all residents of the State:

- Availability, quality and safety of health professionals delivering services to women and their babies during the perinatal period would be enhanced through improved collection, analysis and dissemination of birthing data that would enable more informed, evidenced-based, decision making.

- The Victorian Government should advocate for reinstatement and full funding of the National Perinatal Depression Initiative by the Commonwealth, and as part of reinstating the Initiative, the State Government; boost availability of staff trained by strengthening perinatal depression training resources and delivery and more effectively communicate perinatal depression screening protocols amongst professionals.

- Adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high-risk and premature births in Victoria and that the quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births can only be addressed with improved collection, analysis and dissemination of birthing data for informed, evidenced-based, decision making.

- Access to and provision of an appropriately qualified workforce, including midwives, paediatricians, obstetricians, general practitioners, anaesthetists, maternal and child health nurses, mental health practitioners and lactation consultants across Victoria be delivered by the Victorian Government making funding available to substantially grow the perinatal services workforce in Victoria, ensure that the State’s perinatal service workforce is appropriately qualified and operates at world’s-best standard. This would include, amongst program elements, the following:

This is just a sample of the content, the entire document can be found in the PDF attachment provided.
establishment of a centre for regional, rural and remote midwifery practice in collaboration with Charles Sturt University’s and La Trobe University’s Murray Darling Medical School delivering teaching and learning for the development of the midwifery profession and providing an industry research function, thereby providing the evidence base for governments to make policy decisions and develop and implement programs to enhance perinatal services in regional Australia; and,

- engaging Charles Sturt University to design, develop and deliver a “midwife practitioner” course at Master’s degree level and a bachelor level “child health nurse” qualification, that would provide highly specialised midwives to work as independent midwives, particularly in regional, rural and remote areas of Victoria.

- That understanding and addressing disparity in perinatal outcomes between rural and regional and metropolitan locations in Victoria be achieved by firstly making access to the State’s birthing statistical data bases open to the public with no charge; and secondly, by the State Government providing greater resources and effort into understanding regional, rural and remote Victoria’s perinatal service requirements, including collection and analysis of birthing data for informed, evidenced-based decision making. I note that, Charles Sturt University, in collaboration with the Murray Darling Medical School, could provide the Victorian Government with the capability and capacity to collect and analyse such data on perinatal services in regional, rural and remote Victoria.

- Finally, we believe that the Victorian Government should invest in a through and detailed analysis of perinatal best practice that draws on Victorian, Australian and international experience, and that such an investment includes comparison of perinatal service best practice across metropolitan, regional, rural and remote communities that would underwrite evidence based decision making. Again, Charles Sturt University, through the Murray Darling Medical School, could provide the Victorian Government with the capability and capacity to collect and analyse perinatal best practice services across Victorian, Australian and international regional, rural and remote communities.

Our submission provides a range of recommendations aimed at enhancing perinatal services in Victoria for the benefit of regional, rural and remote communities throughout Victoria and southern New South Wales.

I would be delighted to provide further information to the Committee and would be available to provide evidence at any proposed hearings that that Committee may undertake in relation to the improvement of perinatal services in Victoria.

Yours sincerely

Professor Andrew Vann
Vice-Chancellor
Terms of Reference

On 16 September 2015, the Legislative Council of the Victorian Parliament agreed:

That the House, pursuant to section 33 of the Parliamentary Committees Act 2003, required the Family and Community Development Committee to inquire into, consider and report no later than 30 June 2016* on the current situation relating to the health, care and wellbeing of mothers and babies in Victoria during the perinatal period, including:

1. the availability, quality and safety of health services delivering services to women and their babies during the perinatal period;

2. the impact that the loss of commonwealth funding (in particular, the National Perinatal Depression Initiative) will have on Victorian hospitals and medical facilities as well as on the health and wellbeing of Victorian families;

3. the adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high-risk and premature births in Victoria;

4. the quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births;

5. access to and provision of an appropriately qualified workforce, including midwives, paediatricians, obstetricians, general practitioners, anaesthetists, maternal and child health nurses, mental health practitioners and lactation consultants across Victoria;

6. disparity in outcomes between rural and regional and metropolitan locations; and,

7. identification of best practice.

* The reporting date was extended to 8 December 2017 by resolution of the Legislative Council on 12 April 2016.

The terms of reference for the Inquiry, together with an invitation to provide a submission, were provided to Charles Sturt University on 24 May 2017 by the Chair of the Committee (Appendix I).
1. **Recommendations**

Charles Sturt University recommends the following with regards the improvement of perinatal services in Victoria:

1.1 **The availability, quality and safety of health services delivering services to women and their babies during the perinatal period**

*Charles Sturt University recommends, as a first step to enhancing perinatal services in Victoria, that the State Government:*

- make access to the State’s birthing statistical data bases open to the public with no charge; and,

- that the State Government put greater resources and effort into understanding Victoria’s perinatal service requirements, including collection and analysis of birthing data for informed, evidenced-based decision making.

1.2 **The impact that the loss of commonwealth funding (in particular, the National Perinatal Depression Initiative) will have on Victorian hospitals and medical facilities as well as on the health and wellbeing of Victorian families**

*Charles Sturt University recommends that the Victorian Government advocate for reinstatement and full funding of the National Perinatal Depression Initiative by the Commonwealth.*

Furthermore, as part of reinstating the Initiative, Charles Sturt University recommends that the State Government, whether in conjunction with the Commonwealth and/or in its own right make further resources available to:

- boost availability of staff trained in perinatal depression identification and management;

- enhance perinatal depression training resources and the delivery of perinatal depression training with public vocational and higher education providers and in health institutions; and,

- clarify and effectively communicate perinatal depression screening protocols.

1.3 **The adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high-risk and premature births in Victoria**

*Refer recommendation at Section 4.1(b) as a first step in addressing the adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high-risk and premature births in Victoria.*
1.4 The quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births

Refer recommendation at Section 4.1(b) as a first step in addressing the quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births in Victoria.

1.5 Access to and provision of an appropriately qualified workforce, including midwives, paediatricians, obstetricians, general practitioners, anaesthetists, maternal and child health nurses, mental health practitioners and lactation consultants across Victoria

Charles Sturt University recommends that the Victorian Government make funding available to substantially grow the perinatal services workforce in Victoria to ensure that the State’s perinatal service workforce is appropriately qualified and operates at world’s-best standards. This would include, amongst program elements, the following:

- establishment of a centre for regional, rural and remote midwifery practice in collaboration with Charles Sturt University’s and La Trobe University’s Murray Darling Medical School to deliver teaching and learning for the development of the midwifery profession and provide an industry research function, thereby providing the evidence base for governments to make policy decisions and develop and implement programs to enhance perinatal services in regional Australia;

- engaging Charles Sturt University to design, develop and deliver a “midwife practitioner” course at Master’s degree level, that would provide highly specialised midwives to work as independent midwives, particularly in regional, rural and remote areas of Victoria; and,

- engaging Charles Sturt University to design, develop and deliver a “child health nurse” course, that would provide highly specialised child health nurses, particularly in regional, rural and remote areas of Victoria.

1.6 Disparity in outcomes between rural and regional and metropolitan locations; and,

Charles Sturt University recommends, as a first step to enhancing perinatal services in regional, rural and remote Victoria, that the State Government:

- make access to the State’s perinatal statistical data bases open to the public with no charge; and,

- that the State Government put greater resources and effort into understanding regional, rural and remote Victoria’s perinatal service requirements, including collection and analysis of birthing data for informed, evidenced-based decision making.
Furthermore, by adopting our recommendation at Section 4.5(b), Charles Sturt University, through the Murray Darling Medical School, could provide the Victorian Government with the capability and capacity to collect and analyse data on perinatal services in regional, rural and remote Victoria which would provide an evidence base from which governments can make sound policy decisions and design effective programs for service enhancement.

1.7 Identification of best practice.

Charles Sturt University recommends that the Victorian Government invest in a through and detailed analysis of perinatal best practice that draws on Victorian, Australian and international experience, and that such an investment include comparison of perinatal service best practice across metropolitan, regional, rural and remote communities to underwrite evidence based decision making.

Furthermore, by adopting our recommendation at Section 4.5(b), Charles Sturt University, through the Murray Darling Medical School, could provide the Victorian Government with the capability and capacity to collect and analyse perinatal best practice services across Victorian, Australian and international regional, rural and remote communities.
2. Introduction

The Family and Community Development Committee of the Victorian Parliament is considering and reporting on the current situation relating to the health, care and wellbeing of mothers and babies in Victoria during the perinatal period, including:

1. the availability, quality and safety of health services delivering services to women and their babies during the perinatal period;

2. the impact that the loss of commonwealth funding (in particular, the National Perinatal Depression Initiative) will have on Victorian hospitals and medical facilities as well as on the health and wellbeing of Victorian families;

3. the adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high-risk and premature births in Victoria;

4. the quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births;

5. access to and provision of an appropriately qualified workforce, including midwives, paediatricians, obstetricians, general practitioners, anaesthetists, maternal and child health nurses, mental health practitioners and lactation consultants across Victoria;

6. disparity in outcomes between rural and regional and metropolitan locations; and

7. identification of best practice.

Charles Sturt University is honoured to that the Chair of the Committee has invited the University to provide a submission to the Inquiry. A copy of the Chair’s invitation is provided at Appendix I for reference.
3. **Charles Sturt University**

Charles Sturt University is Australia’s largest regional university, with more than 39,000 students and approximately 2,100 FTE staff. Established in 1989, the University traces its origins to the formation of the Bathurst Experimental Farm and Wagga Wagga Experimental Farm in the 1890s. In one form or another, research, innovation and education has been integral to the University’s character and mission for more than a century.

Charles Sturt University is a unique multi-campus institution with campuses at Albury-Wodonga, Bathurst, Canberra, Dubbo, Goulburn, Manly, Orange, Parramatta, Port Macquarie and Wagga Wagga, as well as various study centres located throughout regional and rural south-eastern Australia.

The University’s commitment to the development and sustainability of rural and regional Australia is informed by the unique research focus undertaken, and the partnerships it has formed with each of its campus’ local communities, local industry, and with the broader regions it serves.

CSU offers a comprehensive suite of research and academic training programs that focus on addressing rural and regional labour market needs, growing regional economies, and preparing students for the jobs of the new economy through rural and regional Australia.

Particularly in health and medical related disciplines, Charles Sturt University seeks to address key training and equality of access issues across our rural and regional footprint, ensuring the critical supply of health professionals into local markets.

As one of Australia’s largest online and distance education providers Charles Sturt University has been able to leverage its course profile and specialist expertise in education provision for the delivery of nationally available study programs. These programs support labour market skills development regardless of student location.

Our rural and regional focuses, as well as strength in online and distance education, position’s Charles Sturt University as a leading institution in providing higher education opportunities to first-in-family applicants, mature-aged students, as well as those from disadvantaged backgrounds.

Increasing participation of Indigenous Australians in higher education has been a key focus area of the University’s mission and ethos. Charles Sturt University consistently works in collaboration with Indigenous communities across our footprint to ensure access and develop links into the University. Our position as one of the top Australian universities for Indigenous participation is proof of our strong background in this regard.

The success of the University is demonstrated by its sector-leading performance in work-integrated learning, graduate employment and graduate incomes. Underpinning this success is the close links that the University has forged with industry, both regionally and nationally.

For example, the University is internationally recognised as a leader in work-integrated learning with students spending extended periods in employment with our industry partners as part of their degree learning and applying their knowledge in practice.

**CHARLES STURT UNIVERSITY**

Page 11 of 23
Research excellence, with a strong commitment to addressing the complex regional needs through innovation, has long been at the centre of Charles Sturt University’s mission.

As evidenced by the recent Excellence in Research for Australia results (ERA 2015), Charles Sturt University is recognised internationally for competitive research strengths in agricultural science, horticultural production, food and wine sciences, crop and pasture production, veterinary science, animal production, education, curriculum and pedagogy, environmental science, applied ethics, philosophy, religious studies, criminology, nursing and marketing.

Charles Sturt University has a proud tradition of delivering high-quality research that creates new knowledge, benefits people’s lives, enhances the profitability of regional industries and helps communities grow and flourish. Through its Higher Degree by Research programs, Charles Sturt University is training the next generation of researchers and professionals who use critical thinking and seek to influence the world for the better.

The recently announced AgriSciences Research and Business Park, to be located on the Wagga Wagga campus exemplifies our industry focus. The AgriSciences Research and Business Park will facilitate industry engagement and collaboration, economic growth, wealth creation, employment and skills development. Success will be evidenced by the recognition of Wagga Wagga as a world-standard centre for agricultural innovation, research and development, extension, education and training.

Today, Charles Sturt University continues a 100-year tradition of engagement and leadership with our local communities, of research and innovation in collaboration with industry, expansion in the educational opportunities offered to our diverse student body, and preparing students for employment markets emerging with the evolution of regional and the national economy.
4. Submission to Inquiry

Charles Sturt University is pleased to provide a submission to the Victorian Parliament’s Family and Community Development Committee on perinatal services in Victoria. We have prepared a comprehensive and detailed submission containing commentary of our view and position of perinatal service delivery in Victoria.

Building on our commentary, view and position, Charles Sturt University also proposes a range of recommendations, that we believe would strengthen perinatal services in Victoria. Adopting our recommendations would:

- strengthen the availability, quality and safety of health services delivering services to women and their babies during the perinatal period;
- mitigate the impact that the loss of Commonwealth funding for the National Perinatal Depression Initiative has had on hospitals, medical facilities and families;
- enhance the adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high-risk and premature births in Victoria;
- improve quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births;
- increase access to and provision of an appropriately qualified workforce;
- address disparity in outcomes between rural and regional and metropolitan locations; and,
- enable identification of best practice and implementation of best practice learnings.

Charles Sturt University’s submission has been prepared based on the terms of reference provided by the Victorian Parliament’s Family and Community Development Committee for their inquiry into perinatal services in Victoria, which was obtained from the Parliamentary website at https://www.parliament.vic.gov.au/images/stories/committees/fcdc/inquiries/58th/Perinatal/Terms_of_Reference_-_Inquiry_into_Perinatal_Services.docx.pdf.

4.1 Availability, quality and safety of health services delivering services to women and their babies during the perinatal period.

(a) Position of Charles Sturt University

In Victoria in 2014, 79.3% of women giving birth lived in major cities, with 17% in inner regional areas, 3.5% in outer regional areas and 0.1% in remote parts of the State. Total births outside metropolitan areas constituted 20.6% of all births in Victoria.
In Victoria, most women (73.7%) used public hospitals to birth while 25.4% of women birthed in private hospitals. A third (33.4%) of babies were born via Caesarean section, while almost half (51.6%) had a normal birth. This is in contrast to New South Wales and Queensland where 56.7% of women gave birth without any intervention, while Western Australia had the lowest percentage of normal births (49.9%).

The use of anaesthesia for birthing in Victoria was high (97% of births) but consistent with New South Wales, with the lowest rate of anaesthesia use in Australia being Tasmania (90.9%). However, it is not possible to extrapolate anaesthesia birthing statistics for regional, rural and remote areas of the State or for the rest of Australia.

In Victoria, 2% of mothers were <20 years of age, with the Australian rate being 3%; >40 years of age, Victoria 4.7% (Australia 4.3%), 1.2% of Victorian women were Indigenous (4.2% Australia) and 73% used public system (Australia 72.6%). Birthing rates across non-metropolitan Victoria included; inner regional 17% (Australia 16.3%), outer regional 3.5% (Australia 8.6%) and remote 0.1% (Australia 1.5%) with no births in very remote Victoria (Australia 1%).

Victoria had highest percentage of very low birthweight infant born in 2014 – 1.1% (Australia 0.8%). This statistic is a cause for concern.

It is not possible to provide a deeper analysis of perinatal services in Victoria as the State’s birthing statistical data base is not available to the public. See, file:///D:/Users/lshields/Downloads/Victorian%20Perinatal%20Data%20Collection%20Manual%20Section%201%20-%20Introduction%20-%20V5%20Jan%202017.pdf.

(b) Charles Sturt University’s Recommendations

Charles Sturt University recommends, as a first step to enhancing perinatal services in Victoria, that the State Government:

- make access to the State’s perinatal statistical data bases open to the public with no charge; and,

- that the State Government put greater resources and effort into understanding Victoria’s perinatal service requirements, including collection and analysis of data for informed, evidenced-based decision making.
4.2 Impact that the loss of Commonwealth funding for the National Perinatal Depression Initiative will have on hospitals, medical facilities and families.

(a) Position of Charles Sturt University

An early evaluation of the National Perinatal Depression Initiative indicated an increase in access to Medicare funding for women with perinatal depression (Chambers 2016), though States and Territories were not examined separately. The Initiative has been shown to be effectively used in some Australian maternity hospitals, while in others it has not been well supported.

Barriers found included lack of trained staff and training resources, insufficient time to spend with women to do the testing, and lack of clarity about screening protocols (Fisher 2012). Given this, recent cutbacks to funding of the Initiative can be only detrimental.

(b) Charles Sturt University’s Recommendations

Charles Sturt University recommends that the Victorian Government advocate for reinstatement and full funding of the National Perinatal Depression Initiative by the Commonwealth.

Furthermore, as part of reinstating the Initiative, Charles Sturt University recommends that the State Government, whether in conjunction with the Commonwealth and/or in its own right make further resources available to:

- boost availability of staff trained in perinatal depression identification and management;
- enhance perinatal depression training resources and the delivery of perinatal depression training with public vocational and higher education providers and in health institutions; and,
- clarify and effectively communicate perinatal depression screening protocols.

4.3 Adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high-risk and premature births in Victoria.

(a) Position of Charles Sturt University

Please refer general commentary with regards perinatal services in Section 4.1.
However, it is not possible to provide a thorough analysis of the adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high-risk and premature births in Victoria as the State’s birthing statistical data base is not available to the public. See, file:///D:/Users/lshields/Downloads/Victorian%20Perinatal%20Data%20Collection%20Manual%20Section%201%20-%20Introduction%20-%20V5%20Jan%202017.pdf.

(b) Charles Sturt University’s Recommendations

Refer recommendation at Section 4.1(b) as a first step in addressing the adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high-risk and premature births in Victoria.

4.4 Quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births.

(a) Position of Charles Sturt University

Please refer general commentary with regards perinatal services in Section 4.1.

However, as with Section 4.3, it is not possible to provide a thorough analysis of the quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births in Victoria as the State’s birthing statistical data base is not freely available to the public. See, file:///D:/Users/lshields/Downloads/Victorian%20Perinatal%20Data%20Collection%20Manual%20Section%201%20-%20Introduction%20-%20V5%20Jan%202017.pdf.

(b) Charles Sturt University’s Recommendations

Refer recommendation at Section 4.1(b) as a first step in addressing the quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births in Victoria.

4.5 Access to and provision of an appropriately qualified workforce.

Charles Sturt University has interpreted this element of the Committee’s Inquiry Terms or Reference to include midwives, paediatricians, obstetricians, general practitioners, anaesthetists, maternal and child health nurses, mental health practitioners and lactation consultants across Victoria.
(a) **Position of Charles Sturt University**

From the publicly available data it appears that Victoria has the highest numbers of registered midwives in Australia. In 2016, there were 1,165 midwives registered with Australian Health Practitioner Regulation Agency (AHPRA). In addition, there were 7,441 nurses who are also midwives, but it is not possible to determine which of these are working as midwives and which are working as nurses in the public or private health systems.

Only one state – New South Wales - has a midwife practitioner (which is the same as nurse practitioner). However, there is only one of these professionals in New South Wales. Midwife practitioners will provide highly specialised services to mothers and babies, especially in regions where there is shortage of obstetric-qualified doctors, and in specialist areas, see, [http://www.nursingmidwiferyboard.gov.au/](http://www.nursingmidwiferyboard.gov.au/). The potential effectiveness of midwife practitioners could be aligned with that of already-existing nurse practitioners. There is a large and growing body of evidence about how nurse practitioners have: improved access in rural and remote areas (Roots & MacDonald 2014), provided practitioners in areas of shortage of doctors, increased patient satisfaction (Stahlke et al 2017), saved costs (Donald et al 2014), increased continuity of care (Southern Health 2008 and enhanced patient care (Hill et al 2003).

Nurse practitioners are well established in Australia, with Charles Sturt University delivering a successful Master's degree course for nurse practitioners. Students must be registered nurses with a Bachelor’s degree in nursing, who have completed a substantial amount of clinical practice in a speciality. Charles Sturt University could build upon this and create a “midwife practitioner” course at Master’s degree level, to provide highly specialised midwives who could work as independent midwives, particularly in rural and regional areas.

There are no midwife practitioners in Victoria. We highly recommended that Victoria’s maternity care is supported by the development of a highly specialised and autonomous workforce. Universities, including Charles Sturt University, including through our Murray Darling Medical School, must be provided with and allocated funding to develop suitable courses, that include intensive clinical placement opportunities.

The MDMS will be part of the suite of health-related professions taught at CSU, including midwifery and nursing. It will provide ideal opportunities for interdisciplinary teaching and learning, research and clinical practice across all the health disciplines. We recognise that the design, development and delivery of midwife practitioner courses will require input from professional accreditation bodies.
Charles Sturt University, through our Murray Darling Medical School, could establish a centre of regional, rural and remote midwife practitioners. Such a centre would not only deliver teaching and learning for the development of the midwifery profession, but it would also provide an industry research function, thereby providing an evidence base for governments to make policy decisions and development and implement programs that would enhance perinatal services for the benefit of regional Australia. Such an initiative by Charles Sturt University would include the University becoming a global leader by expanding its existing nurse practitioner course to create a midwife practitioner course.

(b) **Charles Sturt University’s Recommendations**

Charles Sturt University recommends that the Victorian Government make funding available to substantial grow the perinatal services workforce in Victoria to ensure that the State’s perinatal service workforce is appropriately qualified and operates at world’s-best standards. This would include, amongst program elements, the following:

- establishment of a centre for regional, rural and remote midwifery practice in collaboration with Charles Sturt University’s and La Trobe University’s Murray Darling Medical School to deliver teaching and learning for the development of the midwifery profession and provide an industry research function, thereby providing the evidence base for governments to make policy decisions and develop and implement programs to enhance perinatal services in regional Australia;

- engaging Charles Sturt University to design, develop and deliver a “midwife practitioner” course at Master’s degree level, that would provide highly specialised midwives to work as independent midwives, particularly in regional, rural and remote areas of Victoria; and,

- engaging Charles Sturt University to design, develop and deliver a “child health nurse” course, that would provide highly specialised child health nurses, particularly in regional, rural and remote areas of Victoria.

4.6 **Disparity in outcomes between rural and regional and metropolitan locations.**

(a) **Position of Charles Sturt University**

Please refer general commentary with regards perinatal services in Section 4.1.
However, as with Sections 4.3 and 4.4, it is not possible to provide a thorough analysis of the disparity in outcomes between rural and regional metropolitan locations of Victoria as the State’s birthing statistical data base is not freely available to the public. See, file:///D:/Users/lshields/Downloads/Victorian%20Perinatal%20Data%20Collection%20Manual%20Section%201%20-%20Introduction%20-%20V5%20Jan%202017.pdf.

(b) Charles Sturt University’s Recommendations

Charles Sturt University recommends, as a first step to enhancing perinatal services in regional, rural and remote Victoria, that the State Government:

- make access to the State’s perinatal statistical data bases open to the public with no charge; and,

- that the State Government put greater resources and effort into understanding regional, rural and remote Victoria’s perinatal service requirements, including collection and analysis of data for informed, evidenced-based decision making.

Furthermore, by adopting our recommendation at Section 4.5(b), Charles Sturt University, through the Murray Darling Medical School, could provide the Victorian Government with the capability and capacity to collect and analyse data on perinatal services in regional, rural and remote Victoria which would provide an evidence base from which governments can make sound policy decisions and design effective programs for service enhancement.

4.7 Identification of best practice.

(a) Position of Charles Sturt University

Identification and analysis of perinatal service best practice in regional, rural and remote community perinatal services is at best, scant. Much work needs to be undertaken to correct this paucity of knowledge. Correcting this deficiency in our understanding of perinatal services will be essential to ensure a rigorous evidence base for governments to make policy decisions, develop and implement effective programs and allocate resources productively to enhance perinatal services in Victoria.

(b) Charles Sturt University’s Recommendations

Charles Sturt University recommends that the Victorian Government invest in a through and detailed analysis of perinatal best practice in rural and remote regions that draws on
Victorian, Australian and international experience, and that such an investment include comparison of perinatal service best practice across metropolitan, regional, rural and remote communities to underwrite evidence based decision making.

Furthermore, by adopting our recommendation at Section 4.5(b), Charles Sturt University, through the Murray Darling Medical School, could provide the Victorian Government with the capability and capacity to collect and analyse perinatal best practice services across Victorian, Australian and international regional, rural and remote communities.
5. Conclusion

In conclusion, Charles Sturt University believes that perinatal services in Victoria could be strengthened in the following ways for the benefit of all residents of the State:

- Availability, quality and safety of health professionals delivering services to women and their babies during the perinatal period would be enhanced through improved collection, analysis and dissemination of birthing data that would enable more informed, evidenced-based, decision making.

- The Victorian Government should advocate for reinstatement and full funding of the National Perinatal Depression Initiative by the Commonwealth, and as part of reinstating the Initiative, the State Government; boost availability of staff trained by strengthening perinatal depression training resources and delivery and more effectively communicate perinatal depression screening protocols amongst professionals.

- Adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high-risk and premature births in Victoria and that the quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births can only be addressed with improved collection, analysis and dissemination of birthing data for informed, evidenced-based, decision making.

- Access to and provision of an appropriately qualified workforce, including midwives, paediatricians, obstetricians, general practitioners, anaesthetists, maternal and child health nurses, mental health practitioners and lactation consultants across Victoria be delivered by the Victorian Government making funding available to substantially grow the perinatal services workforce in Victoria, ensure that the State’s perinatal service workforce is appropriately qualified and operates at world’s-best standard. This would include, amongst program elements, the following:
  - establishment of a centre for regional, rural and remote midwifery practice in collaboration with Charles Sturt University’s Murray Darling Medical School delivering teaching and learning for the development of the midwifery profession and providing an industry research function, thereby providing the evidence base for governments to make policy decisions and develop and implement programs to enhance perinatal services in regional Australia; and,
  - engaging Charles Sturt University to design, develop and deliver a “midwife practitioner” course at Master’s degree level and a bachelor level “child health nurse” qualification, that would provide highly specialised midwives to work as independent midwives, particularly in regional, rural and remote areas of Victoria.

- That understanding and addressing disparity in perinatal outcomes between rural and regional and metropolitan locations in Victoria be achieved by firstly making access to the State’s birthing statistical data bases open to the public with no charge; and secondly, by the State Government providing greater resources and effort into understanding regional, rural and remote Victoria’s perinatal service requirements, including collection and analysis of birthing data for informed, evidenced-based decision making. I note that, Charles Sturt University, through the...
Murray Darling Medical School, could provide the Victorian Government with the capability and capacity to collect and analyse such data on perinatal services in regional, rural and remote Victoria.

- Finally, we believe that the Victorian Government should invest in a thorough and detailed analysis of perinatal best practice that draws on Victorian, Australian and international experience, and that such an investment includes comparison of perinatal service best practice across metropolitan, regional, rural and remote communities that would underwrite evidence based decision making. Again, Charles Sturt University, through the Murray Darling Medical School, could provide the Victorian Government with the capability and capacity to collect and analyse perinatal best practice services across Victorian, Australian and international regional, rural and remote communities.

Charles Sturt University’s submission to the Committee’s inquiry provides a range of recommendations aimed at enhancing perinatal services in Victoria for the benefit of regional, rural and remote communities throughout Victoria and southern New South Wales.
Appendix I - References


24 May 2017

Professor Andrew Vann
Vice- Chancellor and President
Charles Sturt University
The Grange Chancellory
Panorama Avenue
BATHURST NSW 2795

Dear Professor Vann

Inquiry into perinatal services: Call for submissions

I am writing on behalf of the Family and Community Development Committee to advise that the Committee is now seeking submissions for its Inquiry into perinatal services. The terms of reference for this Inquiry are enclosed and I invite you to make a submission to this important Inquiry. Your submission should address at least one of the issues identified in the terms of reference.

To make a submission, you can send it:

- Via email to fcdc@parliament.vic.gov.au
- In hardcopy; send to:

  The Executive Officer
  Family and Community Development Committee
  Parliament House, Spring Street
  EAST MELBOURNE VIC 3002

All submissions should include:

- Your full name
- Contact details (either a postal address or phone number)
- The text of your submission or an attachment containing your submission
- A clear indication if you are seeking confidentiality

All submissions are public documents (and may be published on the Committee’s website) unless confidentiality is requested and granted by the Committee. Your name will be published with your submission, but your contact details will be removed.

Information about how to make a submission can also be found on our website at: http://www.parliament.vic.gov.au/committees/get-involved/making-a-submission.
I would appreciate it if you could circulate information about the Inquiry to anyone with an interest in this Inquiry, and encourage their participation. Please find the enclosed materials in relation to the Inquiry.

The Committee will receive submissions until Friday 14 July 2017.

If you require any further information, please contact the Committee’s Executive Officer, Dr Greg Gardiner, on [redacted].

Yours sincerely

[redacted]

Maree Edwards, MP
Chair, Family and Community Development Committee
FAMILY AND COMMUNITY DEVELOPMENT COMMITTEE

Terms of Reference

58th Parliament
Received from the Legislative Council on 16 September 2015

Inquiry into perinatal services

That this House, pursuant to section 33 of the Parliamentary Committees Act 2003, requires the Family and Community Development Committee to inquire into, consider and report no later than 30 June 2016* on the current situation relating to the health, care and wellbeing of mothers and babies in Victoria during the perinatal period, including —

(1) the availability, quality and safety of health services delivering services to women and their babies during the perinatal period;

(2) the impact that the loss of Commonwealth funding (in particular, the National Perinatal Depression Initiative) will have on Victorian hospitals and medical facilities as well as on the health and wellbeing of Victorian families;

(3) the adequacy of the number, location, distribution, quality and safety of health services capable of dealing with high risk and premature births in Victoria;

(4) the quality, safety and effectiveness of current methods to reduce the incidence of maternal and infant mortality and premature births;

(5) access to and provision of an appropriately qualified workforce, including midwives, paediatricians, obstetricians, general practitioners, anaesthetists, maternal and child health nurses, mental health practitioners and lactation consultants across Victoria;

(6) disparity in outcomes between rural and regional and metropolitan locations; and

(7) identification of best practice.

*The reporting date was extended to 8 December 2017 by resolution of the Legislative Council on 12 April 2016.
Original Article

Why birthplace still matters for infants born before 32 weeks: Infant mortality associated with birth at 22–31 weeks’ gestation in non-tertiary hospitals in Victoria over two decades

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Background: Very preterm infants born in non-tertiary hospitals (‘outborn’) are known to have higher mortality rates compared with infants ‘inborn’ in tertiary centres.

Aim: The aim of this study was to report changes over time in the incidence of outborn livebirths, 22–31 weeks and infant mortality rates for outborn compared with inborn births.

Methods: We conducted a population-based cohort study of consecutive livebirths, 22–31 weeks’ gestation in Victoria from 1990 to 2009. The relationship between birthplace, gestational age, birthweight, sex and infant mortality were analysed by logistic regression.

Results: There were 13,760 livebirths, 22–31 weeks: 14% were outborn. The proportion of outborn livebirths fell from 19% in 1991 to a nadir of 9% in 1997, but climbed to 17% by 2009. At all times, outborns had higher mortality rates compared with inborns. The overall infant mortality rate was 250.6 per 1000 outborn compared with 113.3 per 1000 inborn livebirths (adjusted odds ratio (aOR) 2.76 (95% CI 2.32, 3.27, \(P<0.001\)). There were no differences between outborn and inborn mortality risks for 22-week livebirths (OR 7.04, 95% CI 0.87, 56.8, \(P=0.067\)), but there were at 23–27 weeks (aOR 3.16, 95% CI 2.52, 3.96, \(P<0.001\)) and at 28–31 weeks (aOR 1.66, 95% CI 1.19, 2.31, \(P=0.003\)). Over time, mortality rates fell for inborn 23–27 week infants. Mortality rates fell for outborn 23–27 week infants in 1990–2005, but rose in 2006–2009.

Conclusions: Outborn livebirths at 22–31 weeks’ gestation occur too frequently and are associated with a significantly increased risk of mortality. Strategies to reduce outborn livebirths are required.

Key words: infant mortality, neonatal mortality, perinatal care, prematurity, very preterm infant.

Introduction

The fundamental aim of regionalised perinatal care is to identify women with high-risk pregnancies and to deliver these women in hospitals with appropriate obstetric and neonatal care facilities. Despite a highly organised system of regionalised perinatal care in Victoria, preterm infants 22–31 weeks’ gestation continue to be born in non-tertiary hospitals (‘outborn’). Outcome data from local and international population-based cohort studies have consistently demonstrated that birth in a non-tertiary hospital before 32 weeks’ gestation is associated with an increased risk of infant mortality.1–7

Outborn birth rates and mortality rates for extremely preterm births at 23–27 weeks’ gestation and for extremely low birthweight infants, 500–999 g have been reported at various time periods from 1979 to 2005 in Australia.4,8–10 However, no study has reported these risks for all births at 22–31 weeks over a consecutive period. Moreover, in recent years, few data have been published regarding infant mortality risk for outborn births at 28–31 weeks’ gestation. Knowing the mortality risk for all births before 32 weeks’ gestation is important as it informs perinatal guidelines recommending where these births should occur.

The aim of this study was to compare the birth and infant mortality rates of non-tertiary (outborn) and tertiary (inborn) births at 22–31 completed weeks’ gestation in...
Victoria over two decades from 1990 to 2009. It was hypothesised that the proportion of outborn livebirths would decrease over time. It was further hypothesised that infant mortality rates of extremely preterm outborn livebirths would decline, but remain higher than for inborn livebirths.

**Material and Methods**

Mandatory population-based surveillance data are collected for all pregnancies in Australia ending at 20 or more weeks' gestation (or at least 400 g birthweight if gestational age is unknown), irrespective of the outcome of the pregnancy. The Clinical Councils Unit at the Department of Health, Victoria, conducts and administers the Victorian Perinatal Data Collection on behalf of the Consultative Council on Obstetric and Paediatric Mortality and Morbidity (CCOPMM). CCOPMM enabled access to data for this study, following ethics approval.

Inclusion criteria were all livebirths at 22\textsuperscript{0}0 to 31\textsuperscript{6} weeks' gestation in Victoria between 1 January 1990 and 31 December 2009. Outborn births were defined as births other than in a tertiary centre, including in hospitals with non-tertiary obstetric or special care nursery services, non-obstetric hospitals, or births before arrival at a hospital. Inborn births were defined as births in a tertiary perinatal centre, including those in private hospitals co-located with a tertiary centre. Births occurring as a result of a late termination of pregnancy were excluded. Livebirths with congenital anomalies who died before 1 year of age were coded as having 'lethal anomalies' although it is acknowledged that the primary cause of death may have been due to another cause, such as prematurity. These infants were excluded in the analysis of risk factors for mortality.

Twenty data items were approved by CCOPMM for analysis. No individual or hospital could be identified. Maternal and infant demographics were provided by year of birth. Neonatal and infant mortality data were provided in epochs for de-identification purposes: 1990–1994 (epoch 1), 1995–1998 (epoch 2), 2001–2005 (epoch 3) and 2006–2009 (epoch 4). Complete neonatal and infant mortality data were available for all years with the exception of 1999–2000. In these 2 years, neonatal mortality data were available, but postneonatal infant mortality data (deaths between 28 and 364 days) were not. This occurred as a result of changes to the CCOPMM coding systems for hospitals in Victoria in 1999.

**Statistical analysis**

Data were analysed in STATA\textsuperscript{TM} (version 12.1 for Windows, StataCorp, College Station, TX, USA). Characteristics of outborn and inborn births were compared using the Student's $t$-test and univariable logistic regression. Changes in outborn birth rates and mortality rates over time were analysed using logistic regression. A multivariable logistic regression model was used to evaluate the relationship between infant mortality and outborn/inborn status, adjusted for gestational age, birthweight and sex. Odds ratios (OR) and 95% confidence intervals (CI) for each risk factor were calculated. Infant mortality data for livebirths, free of lethal anomalies, were analysed by gestational age subgroup (22, 23–27 and 28–31 weeks) and over four epochs: 1990–1994, 1995–1998, 2001–2005 and 2006–2009 to report changes over time.

**Results**

There were 13,760 livebirths, 22–31 weeks' gestation recorded in 1990–2009. Maternal and infant demographics were available for 13,757 births. Of these, 14.4% ($n=1,985$) were outborn. The number and proportion of outborn livebirths fluctuated over time. In 1990, 16% of all livebirths at 22–31 weeks' gestation were outborn. Between 1993 and 1997, the proportion of outborn births declined, reaching a nadir of 9% in 1997. Thereafter, the proportion of outborn births rose significantly ($P < 0.001$), reaching 17% in 2009 (Figure 1).

Over the 20-year period, there were 405 livebirths (66 outborn and 339 inborn) with lethal congenital anomalies. Of the 13,352 livebirths free of lethal anomalies, 1,919 (14.4%) were outborn and 11,433 (85.6%) were inborn. The proportions of livebirths who were outborn were 45.9% at 22 weeks, 22.6% at 23 weeks, 18.1% at 24 weeks, 8.1% at 25 weeks, 12.5% at 26 weeks, 10.9% at 27 weeks, 14.5% at 28 weeks, 11.2% at 29 weeks, 13.1% at 30 weeks and 15.0% at 31 weeks' gestation (Figure 2).

Perinatal characteristics of outborn compared with inborn livebirths, free of lethal anomalies are shown in Table 1. Mothers of outborn livebirths were more likely to be teenagers, multigravidas, have an antepartum haemorrhage, have spontaneous preterm labour and give birth vaginally compared with mothers of inborns. Outborn livebirths were less mature than inborn livebirths, but were heavier. A higher proportion of outborn livebirths were male compared with inborns.

**Mortality**

Over the 20 years, 1,777 (13.3%) livebirths free of lethal anomalies died before 1 year of age, with most deaths (92%) occurring before 28 days of age.

By 1 year of age, 25% ($n=481$) of outborn livebirths and 11% ($n=1,296$) of inborn livebirths had died, yielding an overall infant mortality rate of 250.6 per 1000 outborn livebirths compared with 113.3 per 1000 inborn livebirths (adjusted OR 2.76, 95% CI 2.32–3.27, $P < 0.001$) (Table 2). Post-neonatal infant mortality data were unavailable for 1,165 of 1,298 livebirths in 1999–2000, but based on an 18-year average, an estimated 10–15 additional infant deaths would have occurred.

Mortality fell with increasing gestational age (adjusted OR 0.60, 95% CI 0.57–0.62 for each week’s increase in gestational age, $P < 0.001$) and increasing birthweight.
(adjusted OR 0.84, 95% CI 0.81–0.87 for every 100 g increase in birthweight, $P < 0.001$). Mortality risk was higher for males than for females (adjusted OR 1.47, 95% CI 1.29–1.67, $P < 0.001$).

Of the 353 livebirths at 22 weeks’ gestation in 1990–2009, 344 (97%) died before 1 year of age. There was no significant difference in mortality risk for outborn (99%) compared with inborn (96%) infants (OR 7.04, 95% CI 0.87–56.9, $P = 0.067$).

Between 23 and 27 weeks, infant mortality rates decreased with each additional week of gestational age, however, outborn infants were at significantly higher risk of mortality compared with inborn peers (adjusted OR 3.16, 95% CI 2.52–3.96, $P < 0.001$; Figure 3).

The absolute differences in mortality for outborn compared with inborn infants born at 28–31 weeks’ gestation were narrower (3.8% vs 2.9%, unadjusted OR 1.32, 95% CI 0.96, 1.84, $P = 0.085$). However, when adjusted for gestational age, birthweight and sex, the odds ratio of infant mortality for outborn compared with inborn infants was 1.66 (95% CI 1.19–2.31, $P = 0.003$).

Changes in infant mortality rates over time

22-week livebirths

During epochs 1–4, the proportions of all infant deaths following livebirth at 22 weeks’ gestation were 95%, 100%, 93% and 99%, respectively. In 1990–2004, there were no outborn 22-week survivors from 107 livebirths and only 7 inborn survivors from 131 livebirths. In 2006–2009, 98% of outborn livebirths and 98% of inborn livebirths died. However, very few of the 60 livebirths were admitted to a special or intensive care nursery in 2006–2009.

23–27 week livebirths

Between 1990 and 2009, the proportion of infant deaths following livebirth in a tertiary centre declined: 32%, 25%,
25% and 21% in epochs 1–4, respectively. Outborn infant mortality rates did not follow the same pattern. In 1990–1994, 66% of the outborn infants died, 54% in 1995–1998 and 33% in 2001–2005. However, in 2006–2009, the proportion of outborn deaths rose to 46% (Table 3).

28–31 week livebirths

The proportion of infant deaths in the 28–31 week infants decreased over time for both inborn and outborn births. Over the four epochs, the proportion of inborn deaths was 5%, 2%, 2% and 3%, respectively, while the proportion of outborn deaths was 7%, 5%, 2% and 2%, respectively (Table 3).

Discussion

The major findings of this study are that incidence of outborn livebirths at 22–31 weeks’ gestation in Victoria is not declining: indeed, the problem is getting worse, not better. Since 1998, both the number and proportion of outborn livebirths have steadily increased, peaking at 18% in 2006 and marginally reducing to 17% in 2009. This is alarming, given the association between outborn birth and

Table 1 Perinatal characteristics of all 22+0 to 31+6 week livebirths, free of lethal anomalies in 1990–2009

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Outborn $n=1,919$</th>
<th>Inborn $n=11,433$</th>
<th>Univariable OR</th>
<th>95% CI</th>
<th>$P=$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age &lt;20 years</td>
<td>146 (8)</td>
<td>447 (4)</td>
<td>2.02</td>
<td>1.67 to 2.45</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Maternal age ≥40 years</td>
<td>55 (3)</td>
<td>519 (5)</td>
<td>0.62</td>
<td>0.47 to 0.82</td>
<td>0.001*</td>
</tr>
<tr>
<td>Multigravida</td>
<td>1,074 (56)</td>
<td>5,495 (48)†</td>
<td>1.37</td>
<td>1.24 to 1.51</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Multiple pregnancy</td>
<td>471 (25)</td>
<td>3,439 (30)</td>
<td>0.76</td>
<td>0.68 to 0.84</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Any antepartum haemorrhage</td>
<td>540 (28)</td>
<td>2,803 (25)</td>
<td>1.21</td>
<td>1.08 to 1.34</td>
<td>0.001*</td>
</tr>
<tr>
<td>Hypertensive disorders of pregnancy</td>
<td>88 (5)</td>
<td>2,109 (18)</td>
<td>0.21</td>
<td>0.17 to 0.26</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Pre-labour rupture of membranes</td>
<td>336 (18)</td>
<td>3,782 (33)</td>
<td>0.43</td>
<td>0.38 to 0.49</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Spontaneous preterm labour</td>
<td>1,662 (87)</td>
<td>6,791 (59)</td>
<td>4.42</td>
<td>3.86 to 5.07</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Vaginal birth</td>
<td>1,339 (70)†</td>
<td>4,790 (42)†</td>
<td>3.21</td>
<td>2.89 to 3.56</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Male sex</td>
<td>1,104 (58)</td>
<td>6,155 (54)</td>
<td>1.16</td>
<td>1.05 to 1.28</td>
<td>0.003*</td>
</tr>
<tr>
<td>Gestational age in weeks Mean (SD)</td>
<td>27.8 (3.0)</td>
<td>28.3 (2.4)</td>
<td>−0.5</td>
<td>−0.6 to −0.4</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Birthweight in grams Mean (SD)</td>
<td>1237‡ (538)</td>
<td>1189§ (416)</td>
<td>48</td>
<td>27 to 70</td>
<td>&lt;0.001*</td>
</tr>
</tbody>
</table>

Data are n (%), unless otherwise specified. OR = Odds ratio; CI = Confidence interval.
*Denotes significant value; †n = 2 missing data; ‡n = 59 missing data; §n = 18 missing data; ††n = 10 missing data.

Table 2 Outcome at 1 year following livebirth between 23 and 31 weeks’ gestation in Victoria in 1990–2009

All 23+0 to 31+6 week livebirths in Victoria: 1990–2009 $n=12,999$

<table>
<thead>
<tr>
<th>Weeks gestation</th>
<th>Livebirths $n=1,757$</th>
<th>Died by 1 year‡</th>
<th>Livebirths $n=11,242$</th>
<th>Died by 1 year‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>106</td>
<td>102 (96)</td>
<td>363</td>
<td>271 (75)</td>
</tr>
<tr>
<td>24</td>
<td>118</td>
<td>92 (78)</td>
<td>535</td>
<td>213 (40)</td>
</tr>
<tr>
<td>25</td>
<td>65</td>
<td>27 (41)</td>
<td>733</td>
<td>175 (24)</td>
</tr>
<tr>
<td>26</td>
<td>137</td>
<td>32 (23)</td>
<td>959</td>
<td>126 (13)</td>
</tr>
<tr>
<td>27</td>
<td>129</td>
<td>21 (16)</td>
<td>1052</td>
<td>107 (10)</td>
</tr>
<tr>
<td>28</td>
<td>227</td>
<td>20 (9)</td>
<td>1336</td>
<td>77 (6)</td>
</tr>
<tr>
<td>29</td>
<td>195</td>
<td>9 (5)</td>
<td>1545</td>
<td>69 (4.5)</td>
</tr>
<tr>
<td>30</td>
<td>311</td>
<td>10 (3)</td>
<td>2053</td>
<td>38 (2)</td>
</tr>
<tr>
<td>31</td>
<td>469</td>
<td>7 (2)</td>
<td>2666</td>
<td>37 (1.4)</td>
</tr>
<tr>
<td>Total</td>
<td>1,757</td>
<td>320 (18%)</td>
<td>11,242</td>
<td>1,113 (9.9%)</td>
</tr>
</tbody>
</table>

Data are n (%) unless otherwise specified. Mortality data not reported for 162 outborn and 191 inborn 22-week livebirths for de-identification purposes.
†Postneonatal infant mortality data were unavailable for 1,163/1,259 infants in 1999–2000, but 96 neonatal deaths are included.
an increased risk of mortality reported in comparable international\textsuperscript{2,5,7} and local population-based cohort studies.\textsuperscript{1} In this study, mortality rates for outborn infants, 22–31 weeks’ gestation, were 2.8 times higher than for inborns. The difference was most apparent for livebirths at 23–27 weeks’ gestation, who had three times the risk of infant mortality compared with inborn peers. Although mortality rates were lower by 2006–2009 compared with 1990–1994 for all livebirths, the gap between outborn and inborn mortality risk widened in 2006–2009, whereas it had been previously narrowing.

Victoria has a well-organised structure of regionalised perinatal care, including systems to facilitate in utero transfer of at-risk pregnancies to a tertiary centre. It is therefore unclear why the outborn birth rate increased after declining to 9% during the late 1990s given there were no major changes in the structure of perinatal referral services in Victoria between 1999 and 2005.

In New South Wales, the introduction of a perinatal advice line (PAL) and state-wide coordination of in utero transfers was attributed to a 25% reduction in non-tertiary livebirths at 23–28 weeks’ gestation, from 19.7% in 1991–1995 to 14.9% in 1997–2002.\textsuperscript{10} A similar service, the Perinatal Emergency Referral Service (PERS) was established in Victoria in 2005. Additional strategies to reduce preterm births in non-tertiary hospitals were implemented, including the establishment of service level agreements with Ambulance Victoria to facilitate preferential transfer of women with threatened preterm labour before 34 weeks to a tertiary centre. Fetal fibronectin testing was introduced from March 2007 to identify women at imminent risk of preterm birth and to identify women who did not require immediate in utero transfer (in the absence of other risk factors requiring tertiary care). Despite these initiatives, the proportion of outborn births in non-tertiary hospitals in Victoria continued to increase, from 13.5% in 2001–2005 to 16% in 2006–2009.

Outborn infants born before 32 weeks’ gestation had more than double the odds of mortality compared with inborn infants, and triple the odds of mortality if outborn between 23 and 27 weeks’ gestation, even after adjusting for gestational age, birthweight, sex and era of birth. This was higher than the adjusted odds ratio of 1.60 (95% CI 1.06–1.88) reported by Lasswell et al.\textsuperscript{3} in a meta-analysis of births before 32 weeks’ gestation in countries with comparable three-tiered regionalised perinatal care services.

**Table 3** Changes in infant mortality over four epochs for livebirths 23–31 weeks’ gestation, free of lethal anomalies. (Excluding 1999–2000)

<table>
<thead>
<tr>
<th>Epoch of birth</th>
<th>Outborn n = 496</th>
<th>Inborn n = 3,290</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>P=</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990–1994</td>
<td>96 (66)</td>
<td>259 (32)</td>
<td>4.12</td>
<td>2.83 to 5.99</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>1995–1998</td>
<td>38 (54)</td>
<td>177 (25)</td>
<td>3.60</td>
<td>2.18 to 5.93</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>2001–2005</td>
<td>32 (33)</td>
<td>189 (25)</td>
<td>1.46</td>
<td>0.93 to 2.29</td>
<td>0.10</td>
</tr>
<tr>
<td>2006–2009</td>
<td>85 (46)</td>
<td>211 (21)</td>
<td>3.31</td>
<td>2.38 to 4.59</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>All epochs combined</td>
<td>251 (51)</td>
<td>836 (25)</td>
<td>3.01</td>
<td>2.48 to 3.65</td>
<td>&lt;0.001*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Epoch of birth</th>
<th>Outborn n = 1,098</th>
<th>Inborn n = 6,856</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>P=</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990–1994</td>
<td>21 (7)</td>
<td>87 (5)</td>
<td>1.37</td>
<td>0.83 to 2.23</td>
<td>0.22</td>
</tr>
<tr>
<td>1995–1998</td>
<td>9 (5)</td>
<td>34 (2)</td>
<td>2.21</td>
<td>1.04 to 4.68</td>
<td>0.039*</td>
</tr>
<tr>
<td>2001–2005</td>
<td>4 (2)</td>
<td>31 (2)</td>
<td>0.86</td>
<td>0.30 to 2.45</td>
<td>0.78</td>
</tr>
<tr>
<td>2006–2009</td>
<td>9 (2)</td>
<td>55 (3)</td>
<td>0.92</td>
<td>0.45 to 0.87</td>
<td>0.81</td>
</tr>
<tr>
<td>All epochs combined</td>
<td>43 (4)</td>
<td>207 (3)</td>
<td>1.31</td>
<td>0.94 to 1.83</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Data are n (%) unless otherwise specified.

*Denotes significant value.
We had hypothesised that mortality rates may not have changed significantly for infants born at 23–27 weeks’ gestation between 2001 and 2009 as there had been no new advancements in perinatal care during the 2000s other than the widespread use of caffeine, shown to improve long-term outcome.\(^1\) We found that inborn mortality rates decreased, whereas outborn mortality rates increased.

We speculate that the increase in mortality in 23–27 week outborn infants in 2006–2009 may be explained in part by a shift in attitude towards providing intensive care for infants born in the ‘grey zone’ between 23 and 25 weeks’ gestation, given the high risk of neurodevelopmental sequelae in survivors.\(^12,13\) In 2006–2009, higher proportions of 23-week livebirths were outborn compared with previous eras, but with limited data available, it was not possible to determine whether it was parental and/or practitioner choice not to transfer in utero, or inability to access a tertiary maternal bed before 24 weeks’ gestation that led to the increase in outborn births.

More mature infants, 28–31 weeks’ gestation had lower rates of mortality overall and the differences between outborn and inborn mortality rates were much narrower. This should not be interpreted to mean that these infants could be safely delivered in a non-tertiary hospital. Further research is required to investigate rates of serious short-term and long-term morbidity in 28–31 week outborn infants and the likelihood that these infants will require transfer to a tertiary centre after birth.

The major strength of this study is that it is population-based, reporting outcomes for every registered birth, 22–31 weeks’ gestation in Victoria over a 20 year time period. Mortality data are reported for all livebirths, including delivery room deaths. These are important data, as the risk of mortality can be grossly underestimated when outcomes are only reported for infants admitted to NICU.\(^14,15\) Reporting outcomes over 20 years also enabled changes in infant mortality to be reported from the time that surfactant was introduced into routine clinical care in 1991.

This study was limited by the inability to separate delivery room deaths following unsuccessful resuscitation attempt from deaths where resuscitation was withheld. These data, in combination with complete in utero transfer and NICU admission data would have provided valuable insight into changes in attitude towards the management of extremely preterm births in tertiary and non-tertiary hospitals over time. From the data available, it was not possible to determine the proportion of livebirths that were selectively retained in non-tertiary centres because they were considered non-viable.

The findings of this study have implications for families, healthcare providers and for healthcare policy. In Victoria, extremely preterm infants remain at a distinct disadvantage if born in a non-tertiary hospital. While survival rates for inborn infants 23–27 weeks’ gestation are now 79% or greater, 1-year survival rates for outborn infants are much lower at 53%. Reasons for the increase in outborn births remain unclear, but warrant further investigation if this trend is to be reversed. A review of perinatal care guidelines for the management of extremely preterm births is also indicated.

In conclusion, in 1997 the Victorian Infant Collaborative Study Group stated that ideally 100% of extremely preterm infants would be delivered in a tertiary centre.\(^1\) Clearly, the situation has deteriorated in Victoria, rather than improved since 1997. While it is inevitable that some high-risk births will continue to occur in non-tertiary hospitals, the higher mortality rate for immature outborn infants compared with inborn infants highlights the importance of early identification and prompt in utero transfer of women at high risk of delivery before 32 weeks’ gestation.

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References