Maternal and Perinatal Mortality and Morbidity in Queensland
Queensland Maternal and Perinatal Quality Council Report 2015

In brief
The Queensland Maternal and Perinatal Quality Council (QMPQC) identifies where we need to make improvements for the ultimate benefit of future mothers and babies.

We do this by collecting and analysing clinical information regarding the outcomes of pregnancy, including mortality and morbidity of mothers and babies, so we can identify state-wide and facility-specific trends. This information is used to provide advice and recommendations to the Minister for Health and the Director-General of the Queensland Department of Health.

This summary report is intended to provide information for clinicians, women and families, so mothers and their babies can receive the best possible care. It examines outcomes of the 124,832 mothers and their 126,881 babies born in Queensland in 2012 and 2013.

Thank you to all our Council members – from neonatology, obstetrics, midwifery, neonatal nursing, specialist obstetrics /maternal fetal medicine, general practice obstetrics, Indigenous health, academic/research, data collection, statistical analysts and consumers – for your input and guidance.

Professor David Ellwood
Chair, Queensland Maternal and Perinatal Quality Council
In 2012 and 2013
124,832 women gave birth to 126,881 babies:

• 30.1 per cent of mothers had not previously given birth
• 6.1 per cent of mothers identified as Aboriginal or Torres Strait Islander
• 75.8 per cent were aged 20-34 years, 19.3 per cent aged 35 years or more and 4.9 per cent under 20 years old
• 33.3 per cent of births were by caesarean section (of which 12.3 per cent of all births were emergency caesarean and 21 per cent caesarean without labour)
• 17.8 per cent of babies were admitted to a neonatal intensive care unit and/or a special care baby unit
• There were eight maternal deaths due to causes directly or indirectly related to the pregnancy. There were also four maternal deaths due to incidental causes and 28 late maternal deaths¹
• The leading cause of death of women during pregnancy and within 365 days of the end of pregnancy was suicide
• There were 871 stillbirths and 401 neonatal deaths (the combined perinatal mortality rate is 10 per 1000 births), most commonly due to congenital abnormality, unexplained antepartum death and spontaneous preterm birth
• Congenital anomalies (one or more) were recorded in 60.7 babies per 1000 born in Queensland in 2012 and 2013. These babies were more likely to be born preterm and with a low birthweight.

¹ A late maternal death is the death of the mother more than 42 and fewer than 365 days after the end of the pregnancy.
Women giving birth

30.1% of mothers had not previously given birth

4.9% mothers were < 20 years
75% mothers were 20-34 years
19.3% mothers were ≥ 35 years

6.1% of mothers identified as Aboriginal or Torres Strait Islander

The percentage of women accessing private hospitals to give birth has fallen from 31.5 per cent since 2004 to 28.8 per cent in 2013.

Women giving birth in private hospitals has fallen from 31.5% to 28.8%

Between 2004-2013 the majority of women gave birth at gestations between 37 and 42 weeks (91.2 per cent to 91.9 per cent).

Women giving birth in private hospitals were more likely to have a caesarean without labour or induction of labour, and to give birth in the 37 to 39 week gestation period.
Between 2004 and 2013 the incidence of unassisted vaginal birth has progressively fallen from 60 per cent to 56 per cent, with an accompanying rise in the incidence of caesarean section birth to 34.1 per cent.

Unassisted vaginal births has fallen from 60% to 56% with an accompanying rise in the incidence of caesarean section birth to 34.1%

Comparisons of gestation at birth show a different profile between the public and private sectors with a higher proportion of term births in the private sector occurring at less than 39 weeks. This appears to be the result of both early induction of labour and caesarean without labour. There is increasing concern about the harmful effects of ‘early term birth’ and it is recommended that elective intervention should not occur before 39 weeks unless there is a valid medical indication.

Good practice points

Repeat caesarean section without labour and induction of labour before 39 weeks of gestation are common, yet are associated with respiratory and other adverse neonatal outcomes. Elective intervention in pregnancy before 39 weeks of gestation should be avoided wherever possible.
Multiple pregnancies

The incidence of multiple pregnancies between 2004-2013 varied between 1.6 per cent and 1.8 per cent of pregnancies and this increased significantly with maternal age, with women over 35 years being most likely to have a multiple pregnancy.

Multiple pregnancy is strongly associated with preterm birth, with between 58 per cent and 67 per cent of multiple pregnancies ending before 37 weeks. This compares to only seven per cent of singleton pregnancies.

Good practice points

Maternity care providers should provide clear information to women carrying multiple pregnancies regarding the risk of preterm labour, and steps that should be taken in the event that a woman carrying a multiple pregnancy suspects the onset of preterm labour.

Assisted conception

Approximately 4 per cent of births in Queensland in 2004 to 2013 were a result of pregnancies conceived with the aid of assisted conception techniques. Less than 3.7 per cent of singleton pregnancies were conceived with the aid of assisted conception techniques, but 29.3 per cent of multiple pregnancies were conceived with their aid.

Improvements in techniques for assisted conception have resulted in a steady fall in the incidence of multiple pregnancy over the decade 2004 to 2013 in association with these techniques. However, it is concerning to note that the same kind of improvement has not been seen in relation to the use of ovulation induction and/or artificial insemination, with the multiple pregnancy incidence associated with their use persistently in the region of eight per cent.

It should also be noted that babies conceived with assisted reproduction techniques were significantly more likely to be admitted to a neonatal intensive baby care unit or a special care baby unit than those conceived without these technologies (26.3 per cent vs 16.7 per cent).
Risk factors for pregnant women

There are a number of risk factors that increase the likelihood of stillbirth or neonatal death. The strongest predictor of these outcomes is being born prior to 37 weeks gestation. Other risk factors found in a recent multivariate analysis to contribute to an increased risk of stillbirths and/or neonatal death, either directly (*) or through the increased risk of preterm delivery (+), are shown in Table 1.

Table 1: Risk factors associated with an increased risk of stillbirth and neonatal deaths, Queensland, 2007-08 to 2011-12

<table>
<thead>
<tr>
<th>Maternal factors</th>
<th>Stillbirth</th>
<th>Neonatal death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-existing diabetes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-existing hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indigenous status of mother</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous stillbirth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mothers aged under 20 years2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mothers aged over 35 years2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not married or in de facto relationship</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous caesarean section</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEIFA: lowest 20% by residence3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pregnancy factors</th>
<th>Stillbirth</th>
<th>Neonatal death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antepartum haemorrhage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insufficient antenatal visits (&lt;5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-eclampsia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking after 20 weeks gestation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gestational diabetes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gestational hypertension</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Compared to mothers with a Body Mass Index (BMI) in the healthy weight range (20 to 24.99)
2 Compared to women aged 20-34 years
3 Socioeconomic Indexes for Areas

created by the Statistical Services Branch in collaboration with the Queensland Maternal and Perinatal Quality Council and the Aboriginal and Torres Strait Islander Health Unit.
There are many challenges linked to remote health care, including restricted accessibility to goods and services, and opportunities for social interaction. Women living in areas classed as remote and very remote were more likely to give birth before 37 weeks’ gestation and more likely to give birth to low birth weight babies.

Furthermore, the stillbirth rate, and to a lesser extent, the neonatal mortality rate of babies born in remote and very remote areas are also higher than those for the babies of women living in highly accessible and accessible areas.

Some women require transfer of care from one facility to another for the birth of their baby, for reasons such as a need for higher level of relevant medical services (e.g. increased risk of preterm birth requiring neonatal intensive care and complications of pregnancy requiring specialised care not available locally). The need for higher level of relevant medical services requiring antenatal transfer is associated with a higher risk of perinatal death in the babies of women transferred.

### Good practice points

Smoking cessation programs as part of routine antenatal care reduces fetal exposure to cigarette smoke, low birthweight and preterm birth, and should form part of routine antenatal care.

### Recommendation

That Queensland Health undertake a coordinated and detailed study of pregnancy outcomes for women requiring antenatal transfer during their care, to understand the reasons for, and significance of, the differences between outcomes for metropolitan or inner regional mothers and their babies when compared with rural and remote women and their babies.
Maternal deaths

Maternal death is an uncommon but tragic outcome of pregnancy.

During 2012 and 2013 eight of the 124,832 women who gave birth died due to causes directly or indirectly related to their pregnancy. This brought the total number of maternal deaths that occurred between 2004 and 2013 to 53. These deaths occurred during pregnancy or within 42 days of the end of pregnancy.

There were also four maternal deaths due to incidental causes and 28 late maternal deaths. Five of the 40 women who died were of Aboriginal and/or Torres Strait Islander origin; all of these deaths were late maternal deaths with causation incidental to the pregnancy.

Table 2: Maternal mortality ratios (MMR), Queensland and Australia 2000 to 2011

<table>
<thead>
<tr>
<th>Trienium</th>
<th>Direct</th>
<th>Indirect</th>
<th>Number of women who gave birth in Queensland</th>
<th>MMR Queensland</th>
<th>MMR Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000–2002</td>
<td>8</td>
<td>10</td>
<td>145,756</td>
<td>12.3</td>
<td>11.1</td>
</tr>
<tr>
<td>2003–2005</td>
<td>9</td>
<td>12</td>
<td>153,900</td>
<td>13.6</td>
<td>8.4</td>
</tr>
<tr>
<td>2006–2008</td>
<td>6</td>
<td>7</td>
<td>175,274</td>
<td>7.4</td>
<td>6.9</td>
</tr>
<tr>
<td>2009–2011</td>
<td>4</td>
<td>12</td>
<td>183,176</td>
<td>8.7</td>
<td>7.2</td>
</tr>
</tbody>
</table>

The clinical characteristics of these deaths are outlined in table 3.

Thirty-four per cent of these deaths were thought to be avoidable or potentially avoidable.

Table 3: Clinical characteristics of direct and indirect maternal deaths, Queensland 2004 to 2013

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death classification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td>25</td>
<td>47.2</td>
</tr>
<tr>
<td>Indirect</td>
<td>27</td>
<td>50.9</td>
</tr>
<tr>
<td>Classification uncertain (sudden cardiac death)</td>
<td>1</td>
<td>1.9</td>
</tr>
<tr>
<td>Timing of death</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death occurred in trimester 1 of pregnancy</td>
<td>4</td>
<td>7.5</td>
</tr>
<tr>
<td>Death occurred in trimester 2 of pregnancy</td>
<td>4</td>
<td>7.5</td>
</tr>
<tr>
<td>Death occurred in trimester 3 of pregnancy</td>
<td>4</td>
<td>7.5</td>
</tr>
<tr>
<td>Death occurred after the woman gave birth</td>
<td>31</td>
<td>58.5</td>
</tr>
<tr>
<td>Death occurred after a miscarriage</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>Death occurred after a termination of pregnancy</td>
<td>8</td>
<td>15.2</td>
</tr>
<tr>
<td>Autopsy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autopsy performed</td>
<td>43</td>
<td>81.1</td>
</tr>
<tr>
<td>Autopsy not performed</td>
<td>10</td>
<td>18.9</td>
</tr>
<tr>
<td>Avoidability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoidable</td>
<td>3</td>
<td>5.7</td>
</tr>
<tr>
<td>Potentially avoidable</td>
<td>15</td>
<td>28.3</td>
</tr>
<tr>
<td>No avoidable factors</td>
<td>33</td>
<td>62.3</td>
</tr>
<tr>
<td>Avoidability uncertain</td>
<td>2</td>
<td>3.8</td>
</tr>
</tbody>
</table>

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2 A late maternal death occurs when the mother dies between 42 and 365 days after the end of pregnancy.
The causes of death of these 53 women are shown in figure 2. Overall the most common causes were psychosocial (e.g. suicide, homicide, substance abuse), cardiovascular disease and thromboembolism.

When we compare these causes of death with maternal mortality reports from the 1980s and 1990s it becomes clear there is a trend towards the developing predominance of indirect causes of death (rather than direct causes of death).

Consequently, training for, and resourcing of, obstetric medicine services and perinatal mental health services is becoming increasingly important.

It is concerning to note that suicide was, and continues to be, the leading cause of death in women during pregnancy and within 365 days of the end of pregnancy.

We believe that the reported number of mothers who suicide in association with pregnancy is underestimated and is actually greater than is counted in these figures, as there is a lack of available information regarding the number of miscarriages and terminations of pregnancy in Queensland.

It is essential that we identify pregnant women and new mothers who might benefit from appropriate care from mental health professionals.

It is particularly important that we show a greater appreciation for the potential for depression and other mental health issues, particularly in association with the termination of pregnancy. Practitioners referring women for termination of pregnancy or undertaking termination of pregnancy need to ensure adequate follow-up for these women, especially if the procedure is undertaken due to mental health concerns.

Equally, active follow-up of the women known to be at risk of depression from prenatal and postnatal screening needs to be universal and effective.

The rate of suicide of new mothers is alarming to the QMPQC and, as health professionals, we need to work together with our colleagues and the broader community so we can reduce this leading cause of death.

Professor David Ellwood, Chair QMPQC
Good practice points

Women with a history of serious mental illness (e.g. schizophrenia, bipolar affective disorder, schizoaffective disorder) should routinely be offered mental health follow-up for at least the first twelve months post-partum. The woman’s GP would be the most appropriate health practitioner to undertake such follow-up in most circumstances.

Mental health screening is performed almost universally in the public sector but less so in the private sector. Use of the Edinburgh Post Natal Depression Score in the private sector may help to identify women who warrant further follow-up.

Monitoring the weight gained in pregnancy is critical if we are to manage the high rate of gestational and pre-gestational diabetes, as well as the major public health issue of obesity in pregnancy. The majority of women who died were not weighed as part of their regular antenatal care, and in some instances weight gain may have been helpful in alerting clinicians to more serious underlying pathology. Rapid weight gain may alert the clinician to conduct a careful search for features of pre-eclampsia, peripartum cardiomyopathy, fetal issues, or simply provide counselling about diet and exercise.

Good practice points

Women should be weighed regularly throughout antenatal care and have their weight gain compared to Institute of Medicine guidelines for weight gain in pregnancy.

Clinicians should be wary of inadequate weight gain or weight loss during pregnancy, especially in the presence of disturbed bowel habits and/or unexpected or poorly responsive iron deficiency. Adequate diagnosis of conditions that may cause such symptoms and signs is difficult in pregnancy.

The increase in obesity in our society means that monitoring the weight of pregnant women is essential to helping manage the high rate of gestational and pre-gestational diabetes, as well as other weight related health issues that can be exacerbated in pregnancy.

Dr Nikki Whelan, Chair Maternal Mortality Sub-Committee
Stillbirths and neonatal deaths (perinatal deaths)

There were 871 stillbirth\textsuperscript{3} and 401 neonatal\textsuperscript{4} deaths in 2012 to 2013. This is a total of 1272 babies that died out of a total of 126,881 babies born in this period.

The combined perinatal mortality rate of these deaths is 10.1 per 1000 births (stillbirth rate 6.9 per 1000 births and neonatal mortality rate 3.2 per 1000 live births).

The rate of stillbirths and neonatal mortality has not changed significantly in Queensland over the decade 2004-2013. One key component of prevention is undertaking a high quality clinical audit of every death to identify areas for practice improvement. The QMPQC is working across Queensland and nationally to implement such programs.

Aboriginal and Torres Strait Islander women continue to have higher rates of adverse pregnancy outcomes compared to non-Indigenous women, as indicated in figure 4. The rate of stillbirths and neonatal deaths for babies born to Aboriginal and Torres Strait Islander mothers was approximately 50 per cent higher than the rates for babies born to non-Indigenous mothers.

\textsuperscript{3} A stillbirth or fetal death is a child who has shown no sign of respiration or heartbeat, or other sign of life, after completely leaving the child’s mother; and who has been gestated for 20 weeks or more; or weighs 400g or more.

\textsuperscript{4} Neonatal deaths are those occurring in live births within the first 28 days of life.
The most common causes of stillbirth and neonatal death in 2012 and 2013 were congenital abnormality and spontaneous preterm birth. Over one-third (33 per cent) of all stillbirths remain unexplained. The most common causes of perinatal death in normally formed term infants was hypoxic peripartum death. However, 45 per cent of normally formed stillbirths remained unexplained.

Less than one third of babies dying in the perinatal period have an autopsy, making it difficult to determine a cause of death in many instances. It is recommended that all parents should be offered the option of an autopsy examination following the death of their baby in the perinatal period.

The Perinatal Society of Australia and New Zealand (PSANZ) recommends clinicians request placental histopathology in every case of stillbirth, neonatal death and high risk newborn according to the PSANZ Perinatal Mortality Guidelines. Placentas should be sent to pathology fresh and un-fixed.

The IMPROVE program (IMproving Perinatal Review and Outcomes Via Education) has been developed by the Australian and New Zealand Stillbirth Alliance (ANZSA) in collaboration with the PSANZ Perinatal Mortality Group. This educational program is for maternity health care professionals to improve standards in clinical practice, and address a real gap in knowledge and expertise for many front-line clinicians when caring for parents following a perinatal death.

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**Recommendation**

That all front line clinicians (medical officers, nursing staff and bereavement support personnel) involved in Queensland Hospital Maternity and Newborn Services attend the IMPROVE educational program to enhance optimal clinical practice around the time of a perinatal death according to the PSANZ Perinatal Mortality Guidelines.

For further information contact Vicki Flenady, vicki.flenady@mater.uq.edu.au

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The IMPROVE (IMproving Perinatal Review and Outcomes Via Education) program aims to assist medical, midwifery and nursing staff to provide optimal care after a stillbirth and neonatal death with a focus on accurately identifying the causes of death, effective respectful communication (including around autopsy consent) and support for parents and families. The program has been well received by all disciplines involved in care at this difficult time for both families and their care providers.

*Associate Professor Vicki Flenady, Co-Chair, Perinatal Mortality Sub-Committee*
Congenital anomalies

Approximately one third of stillbirths and neonatal deaths are related to congenital anomalies.

Congenital anomalies (one or more) were recorded in 7707 babies (60.7 per 1000 babies) born in Queensland in 2012 and 2013.

One or more congenital anomalies were present in 60.7 babies per 1000 births in Queensland in 2012 and 2013.

The prevalence of major anomalies is shown in figure 5.

*Figure 5: Number of congenital anomalies reported in the pregnancy and newborn period, Queensland 2012 to 2013 (multiple item reporting is possible for each baby; CNS = central nervous system)*
Babies born with one or more congenital anomalies were more likely to be born preterm and low birthweight, and die in the perinatal period. Some of these cases are related to termination of pregnancy, but these data are incompletely recorded in Queensland.

It should be noted that there is variation in the rates of some congenital anomalies by socio-demographic factors, however, further analysis is required to better understand risk factors for each condition.

**Good practice points**

Clinicians making a diagnosis of a congenital anomaly should take particular care to record that anomaly in the medical record, including within the Discharge Summary.

We know that various characteristics of mothers can result in a higher risk of their babies being born with congenital anomalies. These include younger and older mothers, mothers with a low or high BMI, mothers who smoke and mothers who live remotely. Knowing this allows opportunities to reduce the risk of congenital anomalies with their increased risk of perinatal death.

*Professor Paul Colditz, Chair, Congenital Anomaly Sub-Committee*
Critical congenital heart disease

Congenital heart disease is found in approximately 11.4 infants per 10,000 births and is one of the commonest congenital anomalies associated with perinatal death in Queensland.

Many of these infants are born with critical congenital heart disease, where initial care may be urgent and complex.

Table 4: Infants with critical congenital heart disease by Birth Hospital, Queensland 2007 to 2011

<table>
<thead>
<tr>
<th>Condition</th>
<th>Total critical congenital heart disease births (n)</th>
<th>Births outside Cardiac Hospital (n)</th>
<th>Births outside Cardiac Hospital (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetralogy of Fallot</td>
<td>81</td>
<td>42</td>
<td>51.9</td>
</tr>
<tr>
<td>Hypoplastic Left Heart Sequence</td>
<td>78</td>
<td>39</td>
<td>50.0</td>
</tr>
<tr>
<td>Transposition of the Great Vessels</td>
<td>85</td>
<td>31</td>
<td>36.5</td>
</tr>
<tr>
<td>Pulmonary Atresia</td>
<td>43</td>
<td>8</td>
<td>18.6</td>
</tr>
<tr>
<td>Total</td>
<td>287</td>
<td>120</td>
<td>41.8</td>
</tr>
</tbody>
</table>

Good practice points

Infants with critical congenital heart disease should be delivered at or near a tertiary paediatric cardiac hospital as previous studies have associated improved short and long term outcomes with newborn care in such facilities.

A major remedial factor in improving delivery planning and outcome in infants with Transposition of the Great Vessels, Tetralogy of Fallot and Pulmonary Atresia would be to improve antenatal scan detection rates. An improved fetal detection rate in these critical congenital heart disease lesions has been reported after adoption of standardised ultrasound screening views.
Hospital comparisons

For the first time data have been provided on the differences between hospitals using clinical indicators that measure birth outcomes. Firstly, public hospitals have been grouped into five categories (A-E) based on the type of services offered, with private hospitals grouped together into one separate category. Differences between the categories generally show less birth interventions in the smaller public hospitals, with higher rates in private hospitals.

Comparisons between individual hospitals show marked variation in some indicators. For example, caesarean section rates for first time mothers in the larger public hospitals (categories A & B) vary from 14 to 31 per cent. Whilst some of this variation will be understandable due to patient population differences this amount of variation must also reflect major differences in practice.

Anyone who is interested in these comparison data is encouraged to access the full QMPQC report at www.health.qld.gov.au/caru/networks/qmpqc_publications.asp

Queensland Clinical Guidelines

Maternity and neonatal guidelines

The QMPQC has a close working relationship with the Statewide Maternity and Neonatal Clinical Network (SMNCN) and views that body as the peak clinical body in Queensland for maternity and newborn care. Queensland Clinical Guidelines, established by Queensland clinicians and working also in close partnership with both the SMNCN and the QMPQC, has an effective program of developing clinical guidelines with further work progressing on implementation and evaluation of health outcomes and healthcare research for mothers and babies.

Guidelines may be accessed at www.health.qld.gov.au/qcg
The QMPQC 2015 Report contains seven recommendations and 23 Good Practice Points. For more information and to access the full report please go to www.health.qld.gov.au.

This report wouldn’t have been possible without the support of the members of the Queensland Maternal and Perinatal Quality Council.

For further information:
Queensland Maternal and Perinatal Quality Council
Level 2, 15 Butterfield Street, HERSTON QLD 4029
QMPQC@health.qld.gov.au
07 33289364
www.health.qld.gov.au
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Summary of the Queensland Maternal and Perinatal Quality Council Report 2015

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Department of Health