



Irish Maternity Indicator System

National Report 2019

**National Women and Infants Health Programme
Clinical Programme for Obstetrics and Gynaecology**

October 2020

[Amended version dated November 2020]

IMIS 2019 National Report (amended version dated November 2020)

Note

This amended version of the IMIS 2019 National Report contains the following changes. The number of General anaesthetics for Caesarean section (Metric #35) in 2019 was corrected to 1,026 nationally (1.8% of total women delivered, or 10.5% of total Caesarean sections) (see pages 41 and 42). There is a retrospective correction on Adjusted Perinatal Deaths (Metric #9) in 2018. The correct number of adjusted perinatal deaths nationally in 2018 was 56 (0.92 per 1,000 total births) (see page 9).

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Introduction

This Irish Maternity Indicator System (IMIS) National Report 2019 shows data from the 19 maternity hospitals/units in Ireland from January through December 2019. It encompasses 40 multidisciplinary metrics across a range of domains, including demographics, deliveries, obstetric risks and complications, neonatal care, breastfeeding, laboratory metrics, and hospital activities (Appendix 2).

Clear implementation guidelines underpin the IMIS data collection, definitions, and reporting procedures. There are also guidelines for escalation at hospitals, within Hospital Groups, and nationally in the event of potential problems arising (Appendix 3).

The IMIS is a management instrument that serves several functions. It provides within-hospital tracking of monthly and annual data. It also provides national comparisons across all maternity units. To our knowledge, Ireland is the only country with a national standardised data-driven system for maternity services.

Since the IMIS was introduced in 2014, there is evidence of resultant improvements in the quality and efficiency of data collection and reporting at hospitals. Moreover, there is evidence that the information provided has led to improvements in maternity settings and the quality of care delivered. These developments are part of the envisaged outcomes of national recommendations for maternity services (Appendix 4).

IMIS reports are prepared by the Office of the National Women and Infants Health Programme (NWIHP) and the National Clinical Programme for Obstetrics and Gynaecology. The data presented in IMIS reports are provided by the 19 maternity hospitals and are entirely the hospitals' own. They are correct at the time of submission, but some figures may be subject to change subsequently as new information comes to light. The implementation of the IMIS is attributable to individual staff members at maternity hospitals (Appendix 1). They continually work to improving their data systems while concurrently performing full-time midwifery and other roles in their hospitals and, in many cases, without modern electronic data systems.

The NWIHP strives to achieve consistent delivery of high quality care in Ireland's maternity services. A fundamental aspect of this work is measurement and analysis for quality improvement and safety at national, network and service level. The IMIS is a key element in this process, providing timely data for hospital management and oversight. Under the National Maternity Strategy Implementation Plan (2017), the NWIHP is committed to continued development of the IMIS in collaboration with staff at the maternity hospitals and networks.

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October 2020

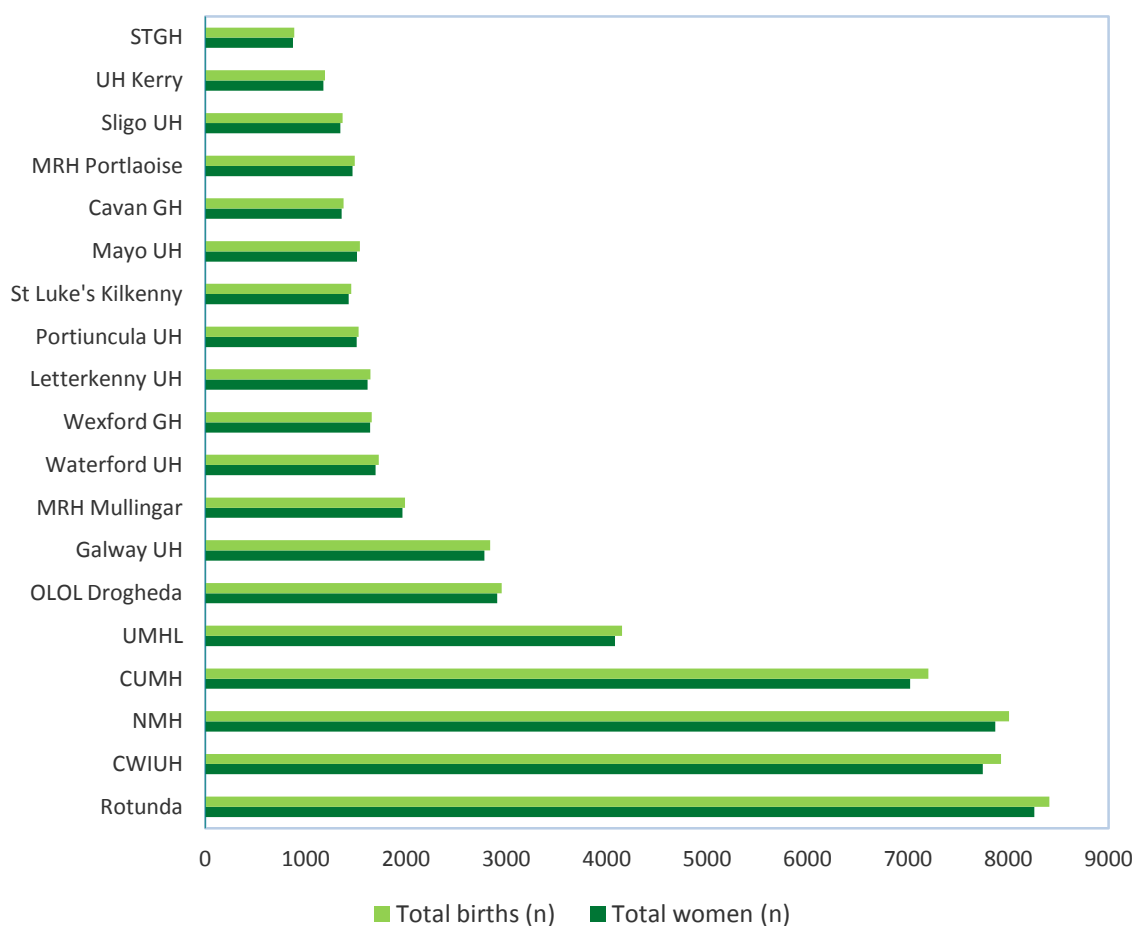
Demographics

Total women delivered (#1) and Total births (#4)

Definitions

Total births: Number of live births and stillbirths weighing $\geq 500\text{g}$.

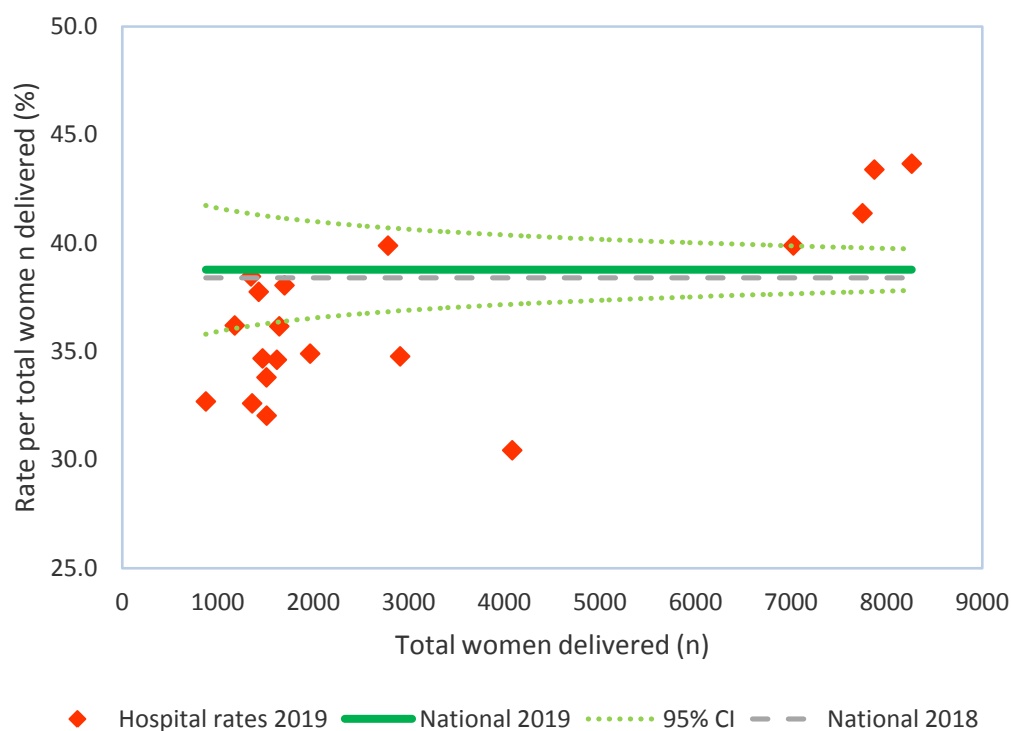
Total women delivered: Number of women delivering a baby weighing $\geq 500\text{g}$.



| | Total births | | Total women | |
|---|---------------|---------------|---------------|---------------|
| | 2018 | 2019 | 2018 | 2019 |
| National (n) | 61,084 | 59,352 | 59,981 | 58,272 |
| Mean (S.D.) | 3,215 (2,709) | 3,124 (2,642) | 3,157 (2,651) | 3,067 (2,585) |
| Range | 969–8,513 | 885–8,410 | 959–8,358 | 875–8,262 |
| Note: Total births in Ireland have fallen by 11.8% since the IMIS began in 2014 and by 19.7% since 2008 (<i>both</i> $p < 0.05$) (see Appendix 11). | | | | |

Total nulliparas (#2)

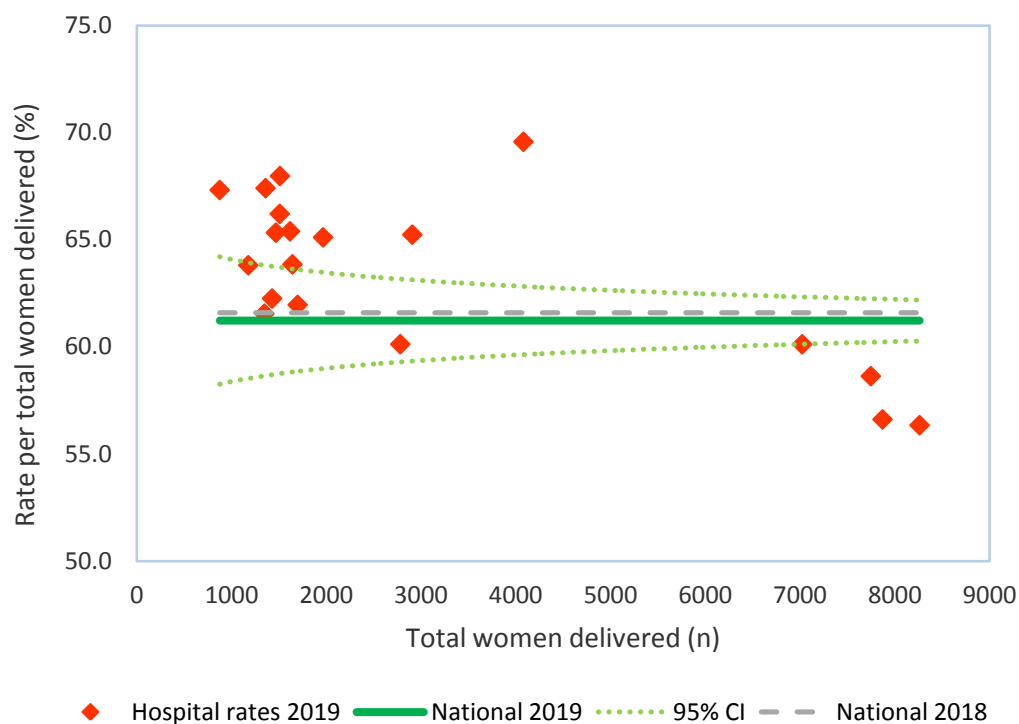
Definition Number of deliveries ($\geq 500\text{g}$) to women who have never had a previous pregnancy resulting in a live birth or stillbirth.



| | 2018 | 2019 |
|--|-------------|-------------|
| Rate (% total women delivered) | 38.4% | 38.8% |
| 95% Confidence interval (CI) | 38.0%–38.8% | 38.4%–39.2% |
| Range | 31.3%–43.2% | 30.4%–43.7% |
| Total nulliparas (n) | 23,047 | 22,591 |
| Total women delivered (n) | 59,981 | 58,272 |
| Note: More nulliparas attend large maternity hospitals than smaller units. This is an important metric for hospital future planning of healthcare provision. | | |

Total multiparas (#3)

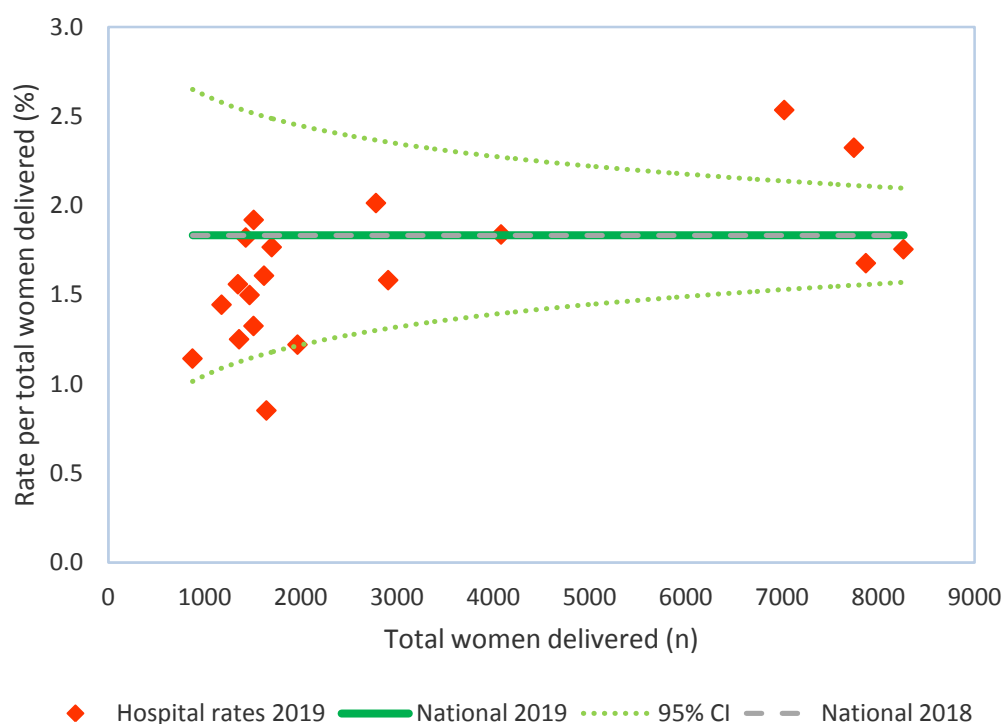
Definition Number of deliveries (≥ 500 g) to women who have had at least one previous pregnancy resulting in a live birth or stillbirth.



| | 2018 | 2019 |
|--------------------------------|-------------|-------------|
| Rate (% total women delivered) | 61.6% | 61.2% |
| 95% CI | 61.2%–62.0% | 60.8%–61.6% |
| Range | 56.8%–68.7% | 56.3%–69.6% |
| Total multiparas (n) | 36,934 | 35,681 |
| Total women delivered (n) | 59,981 | 58,272 |

Total multiple births (#6)

Definition Number of multiple births, based on the number of women with multiple births (not the number of babies born) occurring during the current month. A multiple birth results when more than one baby is born from a single pregnancy.



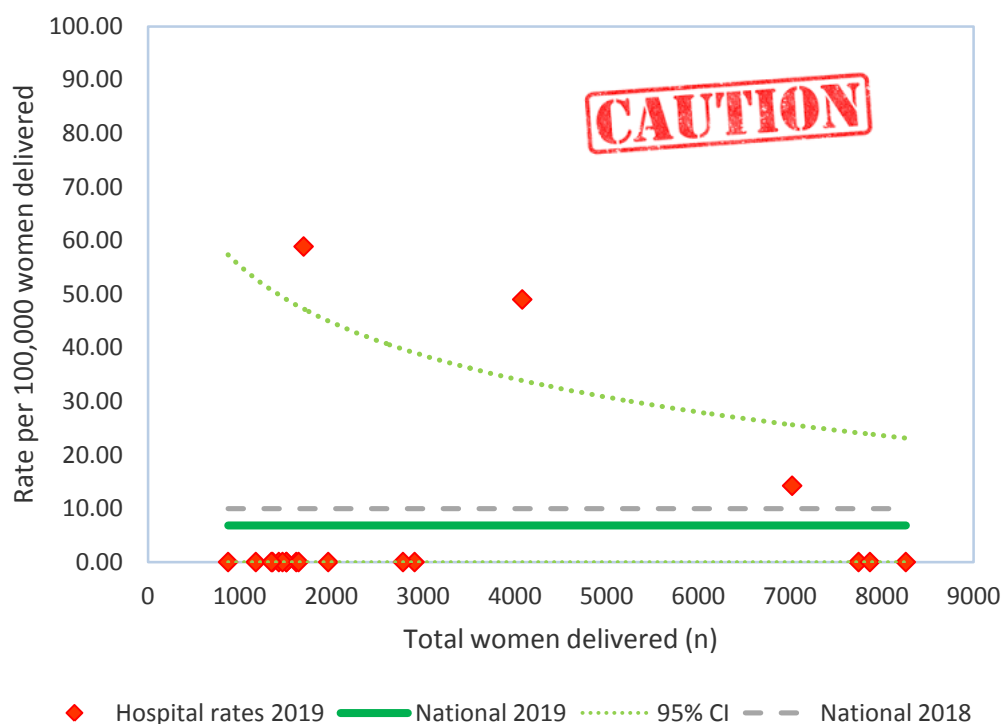
| | 2018 | 2019 |
|--|-----------|-----------|
| Rate (<i>per total women delivered, %</i>) | 1.8% | 1.8% |
| 95% CI | 1.7%–1.9% | 1.7%–1.9% |
| Range | 1.0%–2.3% | 0.9%–2.5% |
| Total multiple births (n) | 1,099 | 1,068 |
| Total women delivered (n) | 59,981 | 58,272 |

Note:

Higher rates of multiple deliveries at large maternity hospitals in Dublin and Cork increase hospital workloads, particularly in neonatal departments, with serious implications for the provision of maternity services at these sites.

Total maternal deaths (#7)

Definition Number of deaths of women while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes occurring during the current month.



| | 2018 | 2019 |
|------------------------------------|------------|------------|
| Rate (per 100,000 women delivered) | 10.00 | 6.86 |
| 95% CI | 0.00–18.01 | 0.00–13.59 |
| Total maternal deaths (n) | 6 | 4* |
| Total women delivered (n) | 59,981 | 58,272 |

*Two maternal deaths occurred at one maternity unit in 2019

Note:

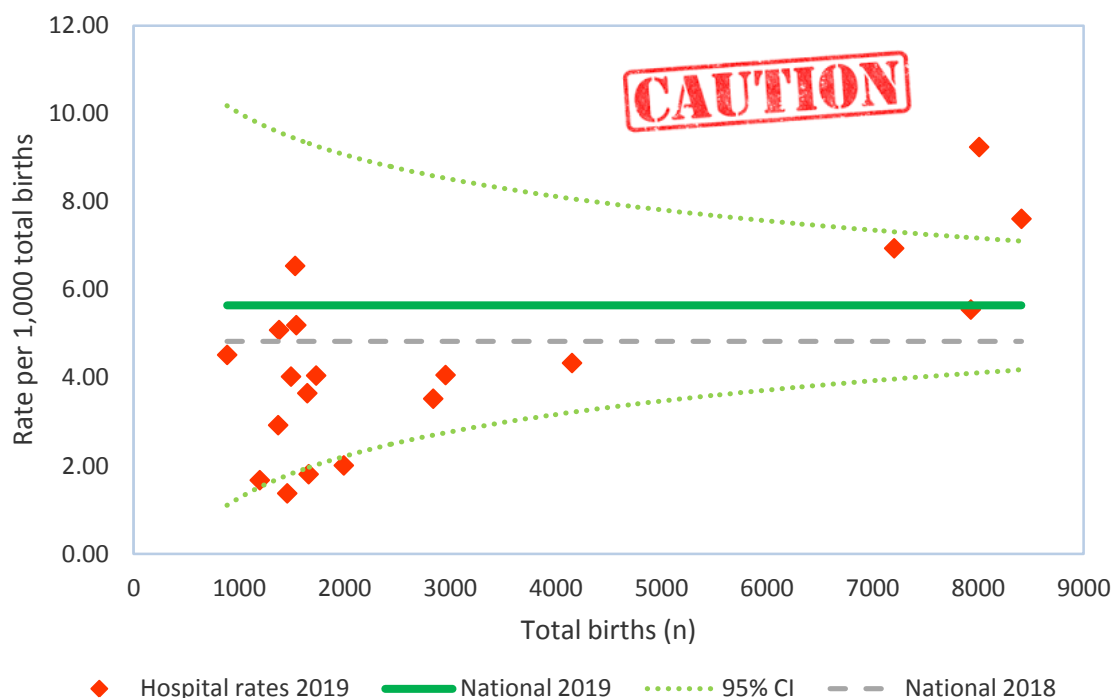
While maternal death in a single year is not considered a robust indicator of quality of clinical care in a maternity setting, lessons can be learned from the management of individual cases. The Maternal Death Enquiry Ireland reported a maternal death rate of 6.5 per 100,000 over three years 2013-15 (MDE Ireland, 2017).¹ The Confidential Maternal Death Enquiry Report 2018 reported 9.8 women per 100,000 died during pregnancy or up to six weeks after childbirth or the end of pregnancy over three years 2014-16 (MBRRACE-UK 2018).²

1 O'Hare MF, Manning E, Corcoran P, Greene RA on behalf of MDE Ireland. Confidential Maternal Death Enquiry in Ireland, Report for 2013 - 2015. Cork: MDE Ireland, December 2017.

2 MBRRACE-UK: Saving Lives, Improving Women's Care report for 2018.

Perinatal deaths (total) (#8)

Definition Number of deaths, including stillbirths and early neonatal deaths from delivery to six completed days occurring during the current month. A stillbirth in this report refers to the death of a fetus weighing $\geq 500\text{g}$, irrespective of duration of pregnancy; an early neonatal death refers to the death of a live born infant during the first seven days of life. This metric is not adjusted to exclude congenital anomalies.



| | 2018 | 2019 |
|-------------------------------|-----------|-----------|
| Rate (per 1,000 total births) | 4.83 | 5.64 |
| 95% CI | 4.28–5.38 | 5.04–6.25 |
| Range | 1.53–6.87 | 1.38–7.61 |
| Total perinatal deaths (n) | 295* | 335 |
| Total births (n) | 61,084 | 59,352 |

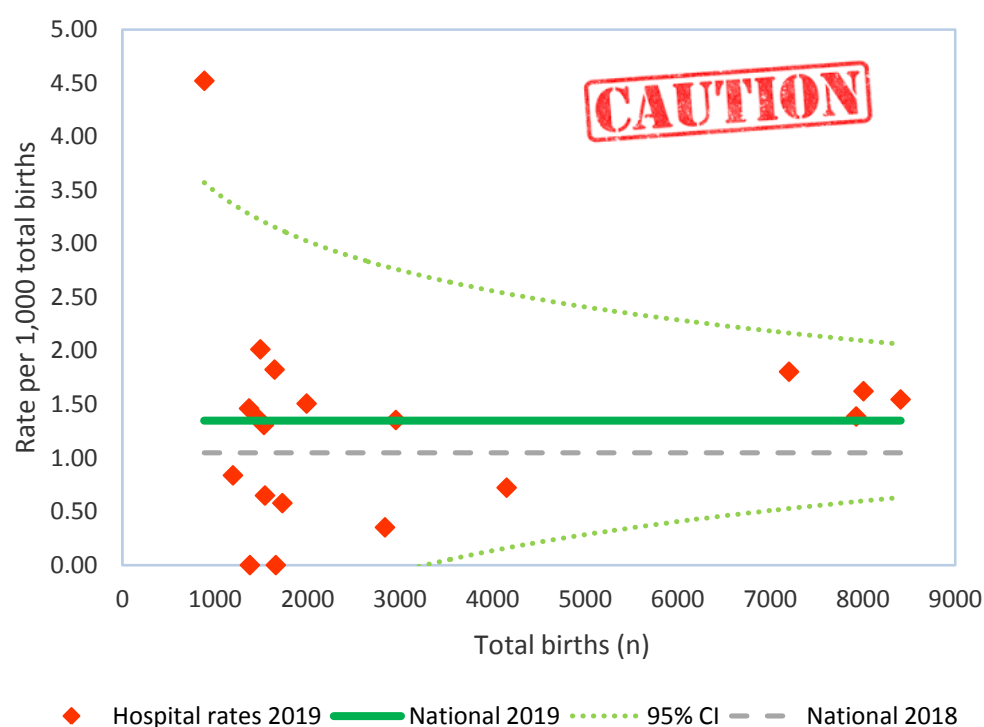
*Figures for 2018 were amended by some maternity hospitals subsequent to publication of the IMIS 2018 National Report

Note:

There has been a downward trend in total perinatal deaths in recent years since 2008 ($p < 0.05$) (see Appendix 11). This trend altered in 2019, when there was an increase of 16.8% on the previous year. The average rate across the 19 maternity units remained stable in both years (mean=4.4). Careful monitoring of this metric is advised. As with all indicators with small values, it should be interpreted with caution.

Adjusted perinatal deaths (#9)

Definition Number of perinatal deaths (stillbirths and early neonatal deaths) weighing 2.5kg or more without physiological or structural abnormalities that develop at or before birth and are present at the time of birth.



| | 2018 | 2019 |
|-------------------------------|-----------|-----------|
| Rate (per 1,000 total births) | 0.92 | 1.35 |
| 95% CI | 0.68–1.16 | 1.05–1.64 |
| Range | 0.00–2.38 | 0.00–4.52 |
| Adjusted perinatal deaths (n) | 56 | 80 |
| Total births (n) | 61,084 | 59,352 |

Note:

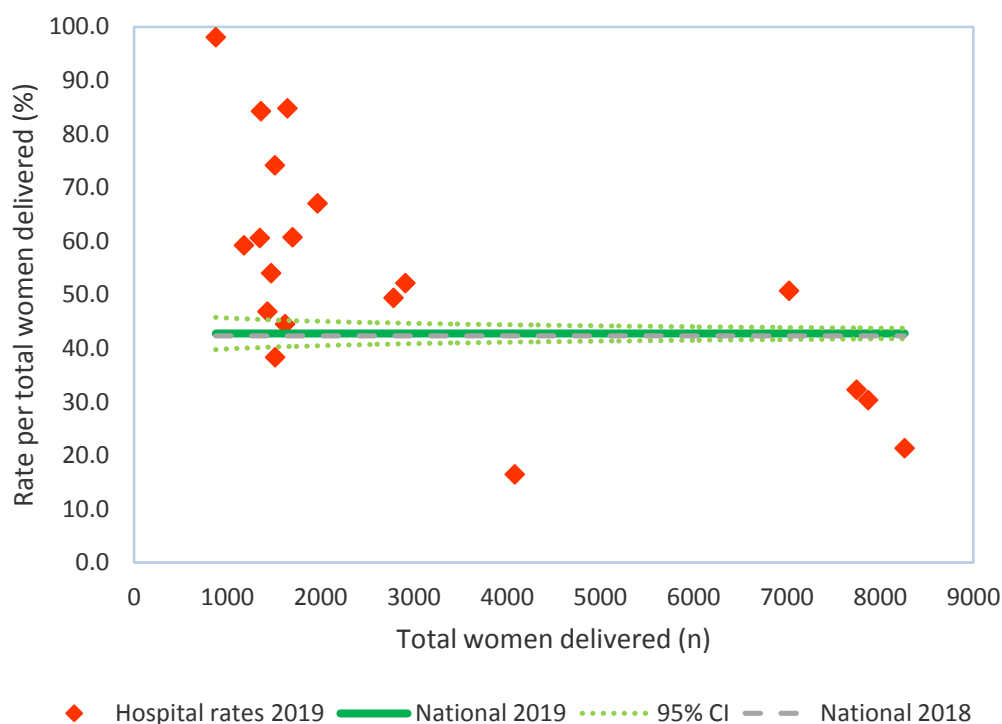
There was an increase in the rate of total adjusted perinatal deaths from 0.92 per 1,000 total births in 2018 to 1.35 in 2019 ($p < 0.05$).

Careful monitoring of this metric is advised. As with all metrics with small values, it should be interpreted with caution.

Hospital Activities

EPAU first visits (#10)

Definition Number of first visits to the Early Pregnancy Assessment Unit (EPAU) occurring during the current month (do not count the combined number of first and return visits).



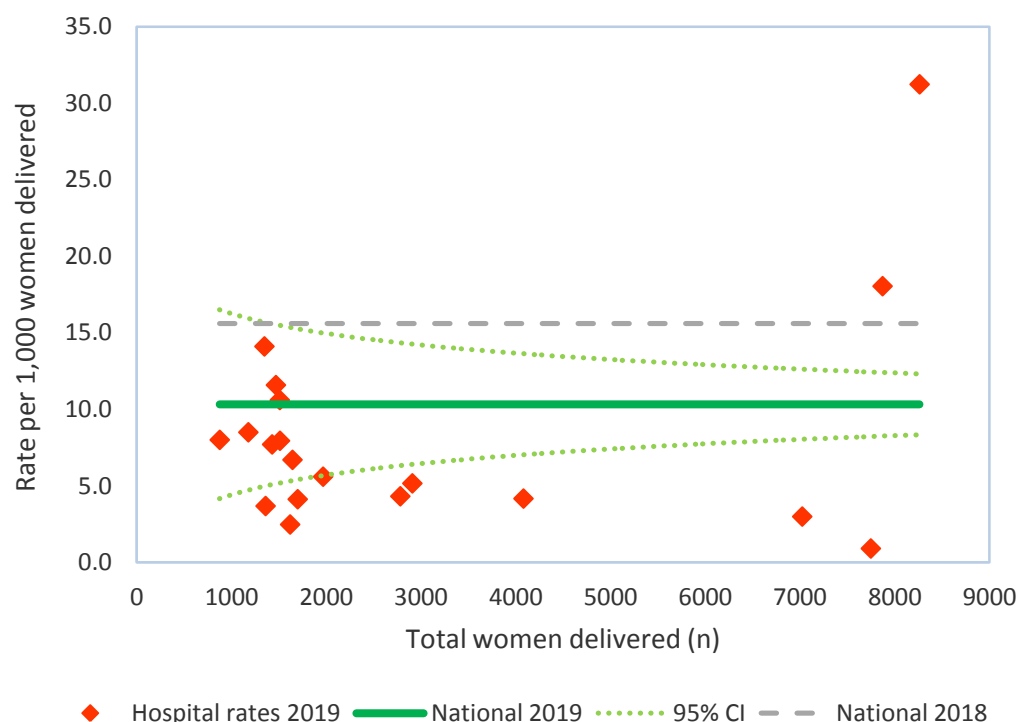
| | 2018 | 2019 |
|-----------------------------------|-------------|-------------|
| Rate (% of total women delivered) | 42.3% | 42.8% |
| 95% CI | 41.9%–42.7% | 42.4%–43.2% |
| Total EPAU first visits (n) | 25,365 | 24,915 |
| Total women delivered (n) | 59,981 | 58,272 |

Note:

There is extreme variation, or 'over-dispersion', in the measurement of EPAU first visits (i.e., nearly all maternity units lie beyond the 95% thresholds), which implies the indicator may not be measuring the same type of activity at all maternity units. Thus, it is more informative for maternity hospitals to compare their own activities in EPAU over time, rather than make comparisons nationally.

Maternal transfers (#7)

Definition Number of women transferred for critical care to Level 2 care and/or Level 3 care (e.g., Critical Care Unit, Intensive Care Unit, High Dependency Unit) either within the hospital or to another hospital/unit. Serious obstetric events that require women to be transferred should be reported by the hospital where she gave birth and not the hospital to which she was transferred and where she received treatment for the problem. There is no gestation parameter on this metric, i.e. it may include transfers from early pregnancy through post-natal readmissions.



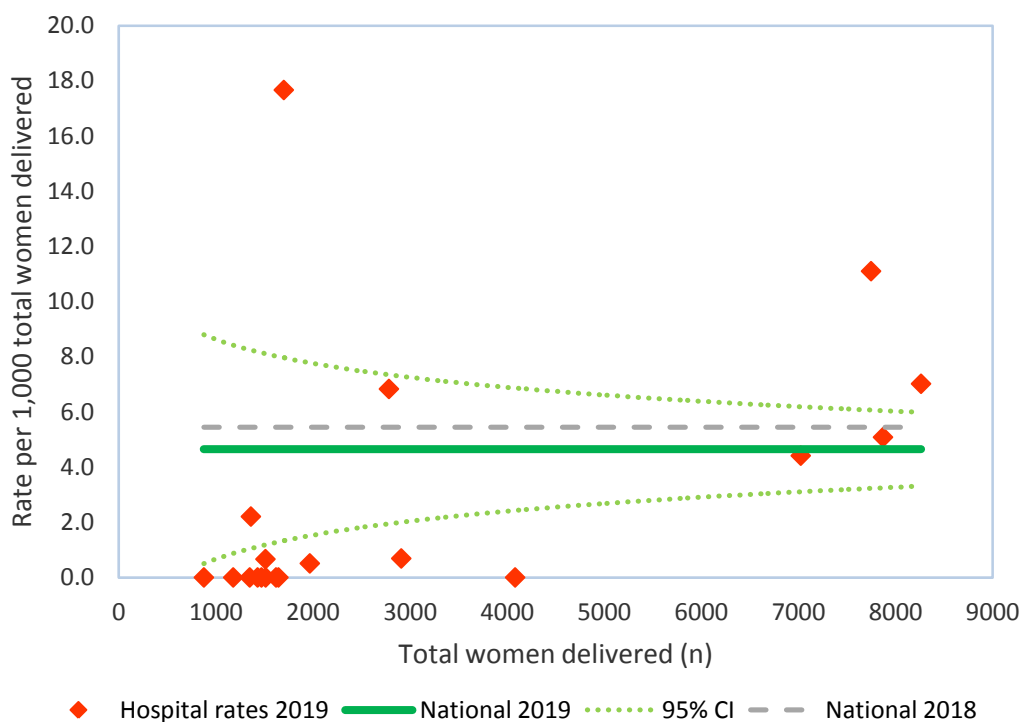
| | 2018 | 2019 |
|---|-----------|----------|
| Rate (<i>per 1,000 women delivered</i>) | 15.6 | 10.3 |
| 95% CI | 14.6–16.6 | 9.5–11.2 |
| Total maternal transfers (n) | 936 | 602 |
| Total women delivered (n) | 59,981 | 58,272 |

Note:

This metric may be more useful for internal comparisons of maternal transfer activity over time, rather than making comparisons across units. The apparent high rates at two large hospitals were predominantly internal transfers to HDU/CCU, reflecting critical care facilities at these hospitals. There were relatively low rates of transfers to other hospitals.

In-utero transfers admitted (#14)

Definition Number of women with a fetus in-utero admitted into the hospital after being transferred from another hospital *in the fetal interest*, during the current birth episode.



| | 2018 | 2019 |
|----------------------------------|---------|---------|
| Rate (per 1,000 women delivered) | 5.5 | 4.7 |
| 95% CI | 4.9–6.0 | 4.1–5.2 |
| In-utero transfers admitted (n) | 327 | 271 |
| Total women delivered (n) | 59,981 | 58,272 |

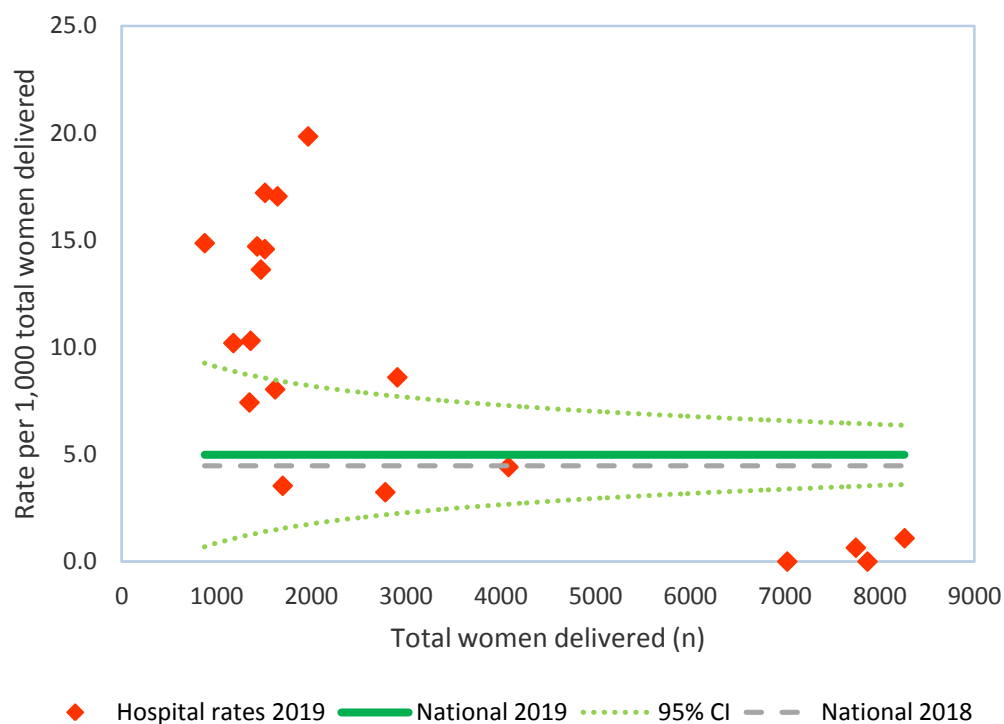
Note:

The metrics for in-utero transfers (admitted and sent out) may be useful for internal comparisons of in-utero transfer activities over time, rather than across-hospital comparisons. The hospital with the highest rate is due to existing transfer protocols in the south-east region, where women are routinely transferred from smaller units to UHW.

This metric should be read in conjunction with in-utero transfers sent out (see following page).

In-utero transfers sent out (#15)

Definition Number of women with a fetus in-utero transferred out of the hospital to another hospital *in the fetal interest*, during the current birth episode (refers to transfers of inpatients only, not outpatients.)

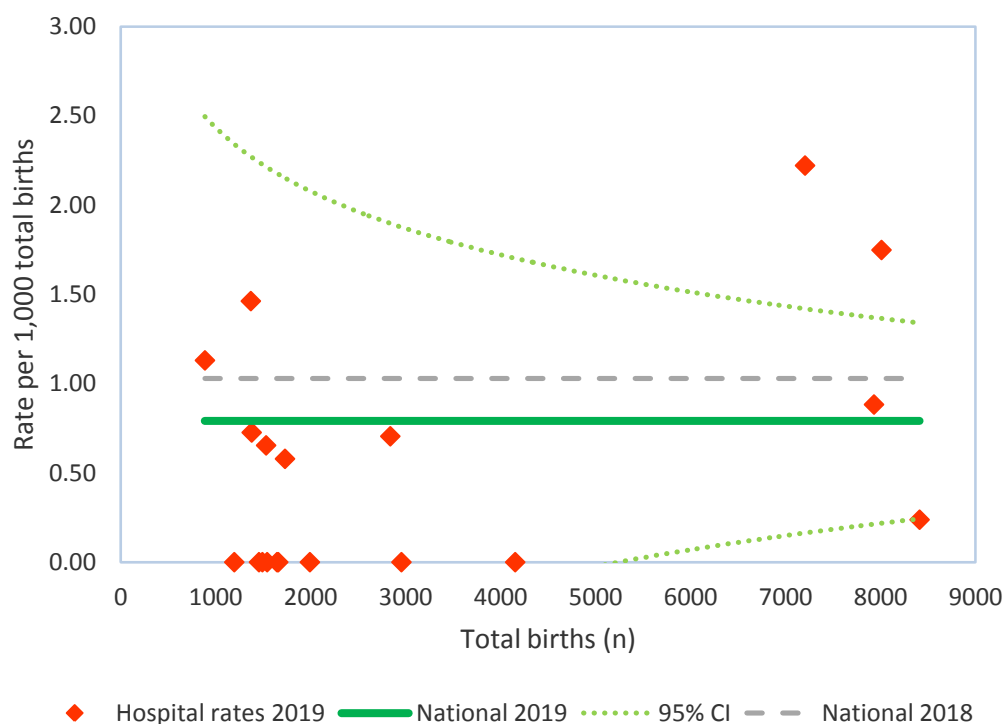


| | 2018 | 2019 |
|----------------------------------|---------|---------|
| Rate (per 1,000 women delivered) | 4.5 | 5.0 |
| 95% CI | 3.9–5.0 | 4.4–5.6 |
| In-utero transfers sent out (n) | 268 | 290 |
| Total women delivered (n) | 59,981 | 58,272 |

Neonatal Metrics

Brachial plexus palsy (#14)

Definition Number of neonatal brachial plexus palsies (BPP) diagnosed during the current birth episode. Obstetric BPP refers to loss of movement or weakness of the arm resulting from damage to the brachial plexus nerve network, which may occur from mechanical injury involving shoulder dystocia during difficult childbirth. May include Erb's Palsy, Klumpke's Palsy, and total plexus injury.



| | 2018 | 2019 |
|-------------------------------|-----------|-----------|
| Rate (per 1,000 total births) | 1.03 | 0.79 |
| 95% CI | 0.78–1.29 | 0.57–1.01 |
| Total BPP (n) | 63 | 47 |
| Total births (n) | 61,084 | 59,352 |

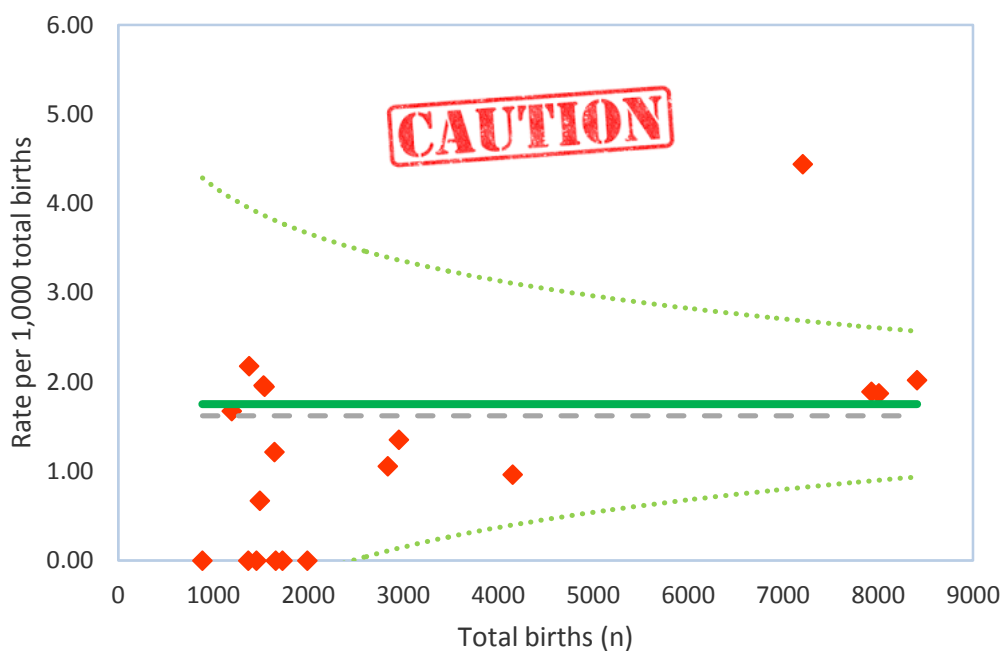
Note:

The rate of BPP reported by maternity units in Ireland is lower than expected: International research finds the rate of neonatal brachial plexus palsy is around 1.3 per 1,000 total births.³ This metric should be interpreted with caution.

3 Chauhan SP, Blackwell SB, Ananth CV. Neonatal brachial plexus palsy: incidence, prevalence, and temporal trends. Semin Perinatol 2014 Jun;38(4):210-18.

Neonatal encephalopathy (#15)

Definition All infants with ≥ 35 weeks' gestation who, during the first week of life, have either seizures alone and/or signs of neonatal encephalopathy, which are defined as clinical findings in three or more of the following domains: Level of consciousness, spontaneous activity when awake or aroused, posture, tone, primitive reflexes, and autonomic system. Note, Hypoxic Ischaemic Encephalopathy (HIE) is a subset of NE and is the most common cause of NE; not all encephalopathies have a HIE.



◆ Hospital rates 2019 — National 2019 95% CI — National 2018

| | 2018 | 2019 |
|--|-----------|-----------|
| Rate (<i>per 1,000 total births</i>) | 1.62 | 1.75 |
| 95% CI | 1.30–1.94 | 1.42–2.09 |
| Total NE (n) | 99 | 104 |
| Total births (n) | 61,084 | 59,352 |

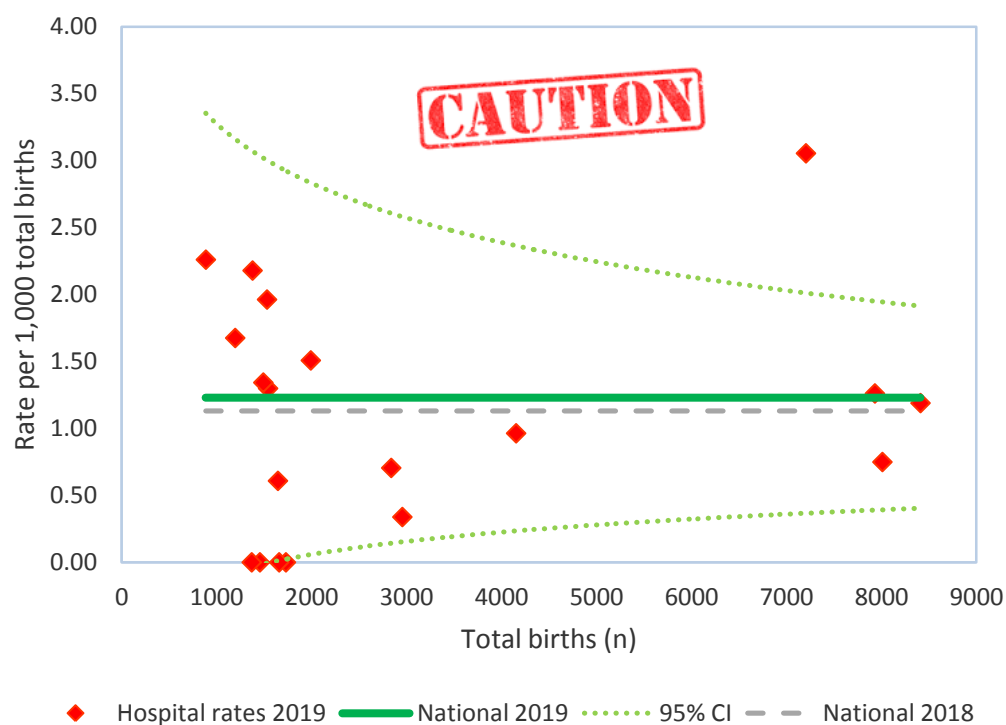
Note:

The Neonatal Therapeutic Hypothermia in Ireland report 2016-17 estimated the incidence of NE was 3.0 per 1,000 live births.⁴ There was a relatively higher rate of severe-moderate NE at one of the large maternity hospitals. The definition of this metric will be reviewed to ensure it captures 'severe-moderate' diagnoses and excludes mild cases of NE. Caution is advised when dealing with small values.

4 Meaney S, McGinley J, Horkan S, Corcoran P, Greene RA, Murphy J, on behalf of Neonatal Therapeutic Hypothermia Working Group. Neonatal Therapeutic Hypothermia in Ireland Annual Report 2016-2017. Cork: National Perinatal Epidemiology Centre, 2018.

Whole body neonatal cooling (Inborn) (#16)

Definition WBNC refers to therapeutic ‘active’ (not passive) cooling administered during the current birth episode as a treatment for Hypoxic Ischemic Encephalopathy (HIE). WBNC is conducted at the four large maternity hospitals in Dublin and Cork. Babies may be transferred from smaller maternity units around the country via the National Neonatal Transport Programme, which operates 24 hours a day, seven days a week.



| | 2018 | 2019 |
|---------------------------------|-----------|-----------|
| Rate (per 1,000 total births) | 1.13 | 1.23 |
| 95% CI | 0.86–1.40 | 0.95–1.51 |
| Total WBNC of inborn babies (n) | 69 | 73 |
| Total births (n) | 61,084 | 59,352 |

Note:

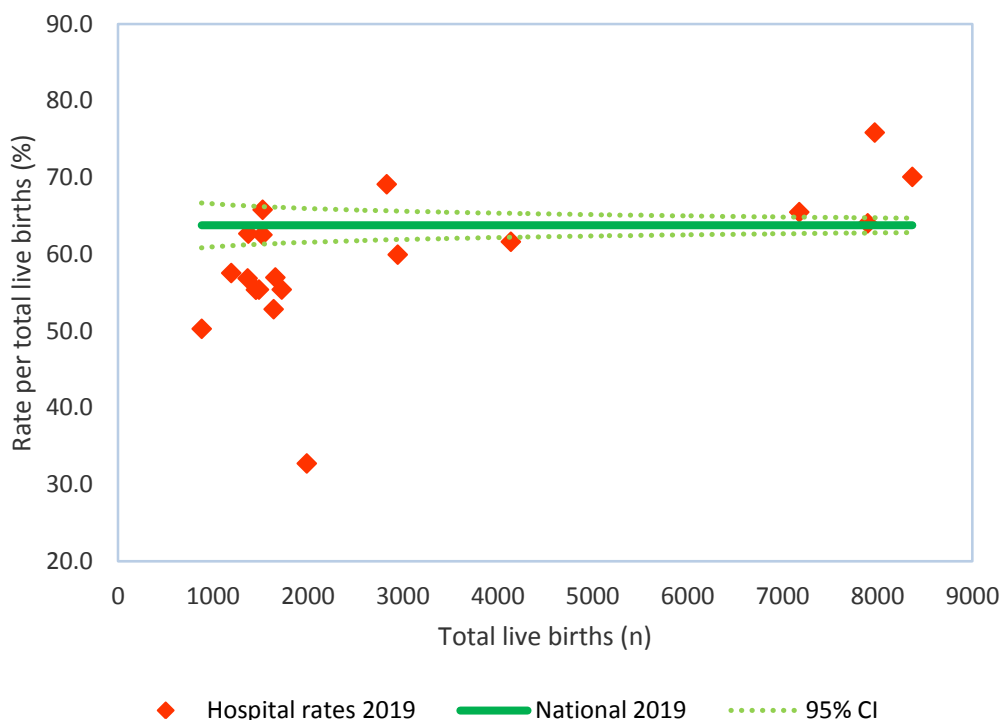
The chart depicts rates of babies cooled based on the hospital where they were born. Approximately two-thirds of babies cooled were born at the four large maternity hospitals in Dublin and Cork (65.8%) and one-third was transferred from smaller units (34.2%). These rates compare with the National Therapeutic Hypothermia in Ireland Report (2018), which found, in 2016-17, 60.0% of babies who were actively cooled were born in a large maternity hospital, while 40.0% were transferred from smaller units.⁵

5 Meaney S, McGinley J, Horkan S, Corcoran P, Greene RA, Murphy J on behalf of Neonatal Therapeutic Hypothermia Working Group. Neonatal Therapeutic Hypothermia in Ireland, Annual Report 2016-2017. Cork: National Perinatal Epidemiology Centre, 2018.

Breastfeeding Metrics

Breastfeeding initiated (#17)

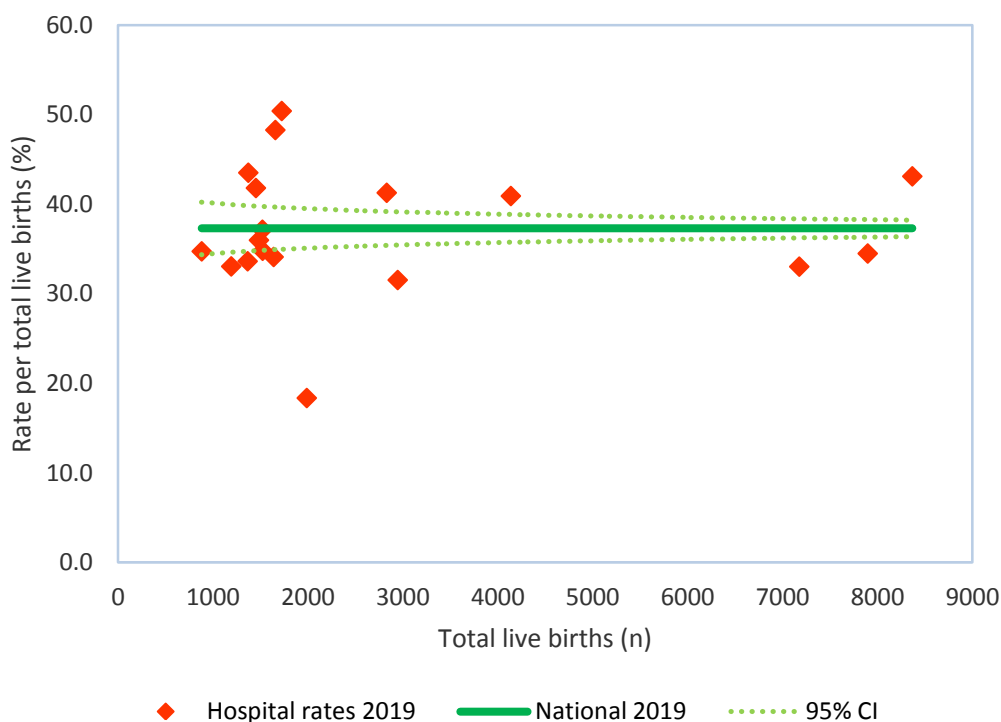
Definition Numbers of babies breastfed at first feed following birth, i.e., direct from the breast or expressed. Rate is calculated per total live births.



| | 2018 | 2019 |
|---|------|-------------|
| Rate (<i>per total live births</i>) | N/A | 63.8% |
| 95% CI | N/A | 63.4%–64.2% |
| Range | N/A | 32.8%–75.9% |
| Breastfeeding (BF) initiated (n) | N/A | 37,696 |
| Total live births (n) | N/A | 59,123 |
| Note: Data collection for breastfeeding commenced on the IMIS in 2019. There is large variation across all hospitals on each of the three breastfeeding metrics. The breastfeeding initiation rate of 63.8% in maternity hospitals in Ireland is among the lowest in the world, compared to rates of 90% in Australia, 81% in the UK and 79% in the USA (HSE, 2016; NHS, 2011; PHAA, 2010, CDC, 2014). | | |

Breastfeeding (BF) exclusively on discharge

Definition Numbers of babies who receive only breast milk without any additional food or drink, not even water, prior to discharge. The number should accord with the Birth Notification Form (BNF01) from the Labour Ward and hospital post-natal records. Rate is calculated per total live births.



| | 2018 | 2019* |
|---------------------------------|------|-------------|
| Rate (per total live births) | N/A | 37.3% |
| 95% CI | N/A | 36.9%–37.7% |
| Range | N/A | 18.4%–50.4% |
| BF exclusively on discharge (n) | N/A | 19,076 |
| Total live births (n) | N/A | 51,152 |

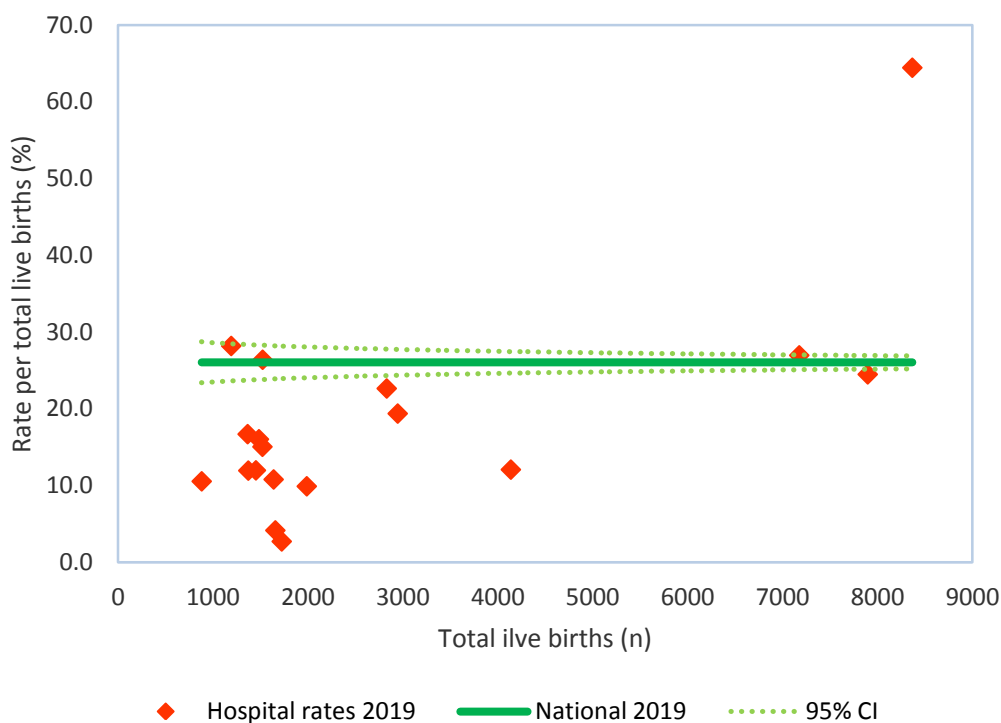
*Missing case=1 maternity hospital

Note:

The WHO Global Targets to improve maternal, infant and young child nutrition include the target of an increase, by 2025, to a rate of at least 50% exclusive breastfeeding in the first six months. According to WHO World Health Statistics 2013, 15% of children in Ireland are exclusively breastfed for the first six months compared with the global average of 38% and WHO European average of 25% (WHO, 2013).

Breastfeeding (BF) non-exclusively on discharge (#19)

Definition Number of babies who were breastfed and had other food or drink prior to discharge. The number should accord with the Birth Notification Form (BNF01) from the Labour Ward and hospital post-natal records. Rate is calculated per total live births.



| | 2018 | 2019* |
|------------------------------------|------|-------------|
| Rate (per total live births) | N/A | 26.1% |
| 95% CI | N/A | 25.7%–26.4% |
| Range | N/A | 2.7%–64.4% |
| BF non-exclusively on discharge(n) | N/A | 13,326 |
| Total live births (n) | N/A | 51,152 |

*Missing case=1 maternity hospital

Note:

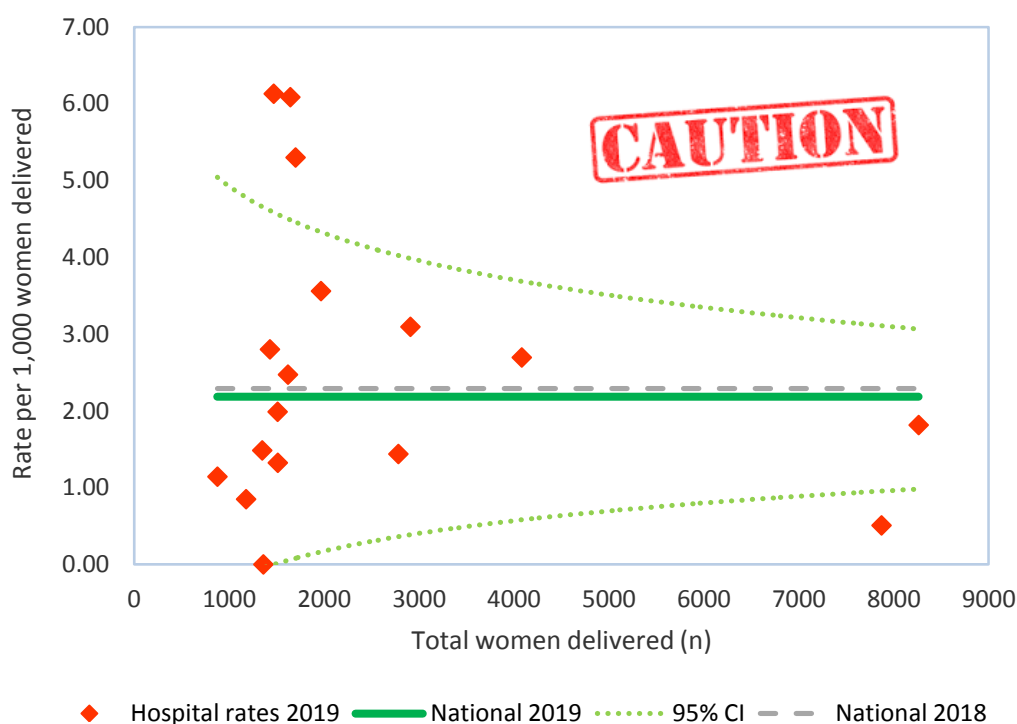
Together, this metric and Metric #18 suggest a rate of 63.4% for ‘any’ breastfeeding (exclusive and non-exclusive) on discharge from hospital. The Breastfeeding Action Plan 2016–2021 sets out four priority areas around breastfeeding:

- Implementation of policies at hospital and community level
- Investment in breastfeeding training for healthcare staff
- Provision of additional lactation specialist posts
- Partnership working to promote a culture that accepts and supports breastfeeding.

Laboratory Metrics

Maternal bacteraemia (#20)

Definition Diagnosis of bacteraemia is based on laboratory definition only and does not include clinical indications. Diagnosis of bacteraemia is based on ONE positive blood culture for a recognised bacterial pathogen (e.g. *Staphylococcus aureus*, *Escherichia coli*). Cases of blood culture contamination (e.g. skin contaminants) should be excluded (ECDC 2012: 47). Cases should be defined as 'maternal' if the positive blood culture is taken at any time during pregnancy or within 42 days of the end of pregnancy.



| | 2018* | 2019† |
|----------------------------------|---------|---------|
| Rate (per 1,000 women delivered) | 2.3 | 2.2 |
| 95% CI | 1.8–2.8 | 1.8–2.6 |
| Total maternal bacteraemia (n) | 84 | 95 |
| Total women delivered (n) | 36,631 | 43,502 |

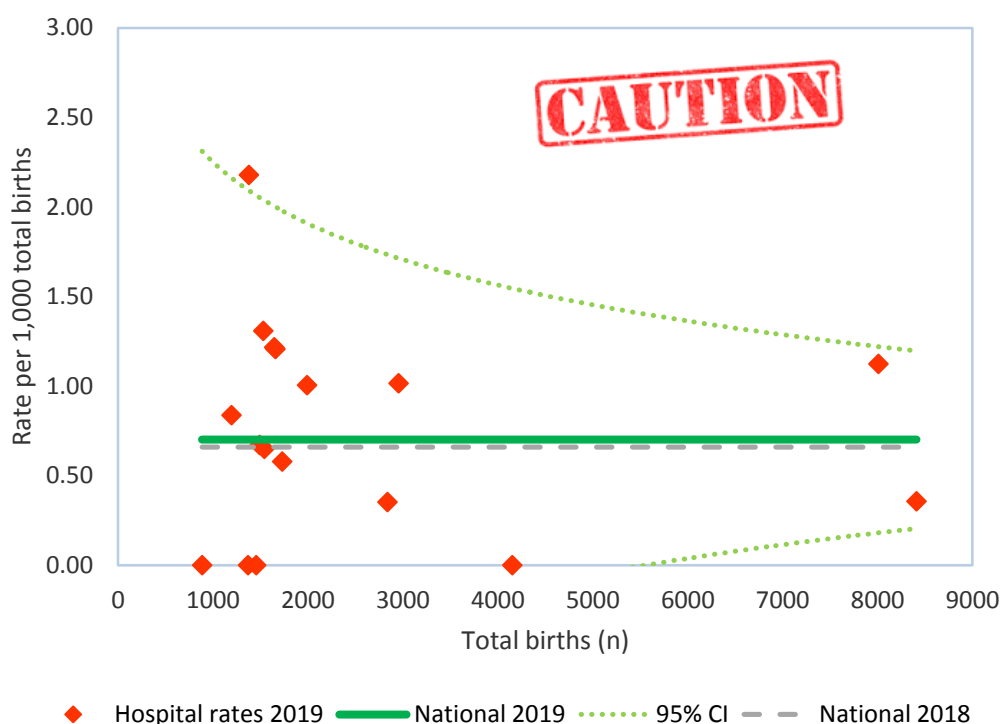
*Missing cases=3 maternity hospitals/units. † Missing cases=2 maternity hospitals/units.

Note:

The large amount of missing data on this metric from large tertiary maternity skews the calculations of national rates.

Neonatal bacteraemia (early-onset) (#21)

Definition Diagnosis of neonatal bacteraemia refers to early-onset clinically significant bacteraemia in neonates (<72 hours of age) based on a laboratory definition of bacteraemia and does not include clinical indications. Diagnosis of bacteraemia is based on ONE positive blood culture for a recognised bacterial pathogen (e.g. *Staphylococcus aureus*, *Escherichia coli*). Cases of blood culture contamination (e.g. skin contaminants) should be excluded (ECDC 2012: 47).



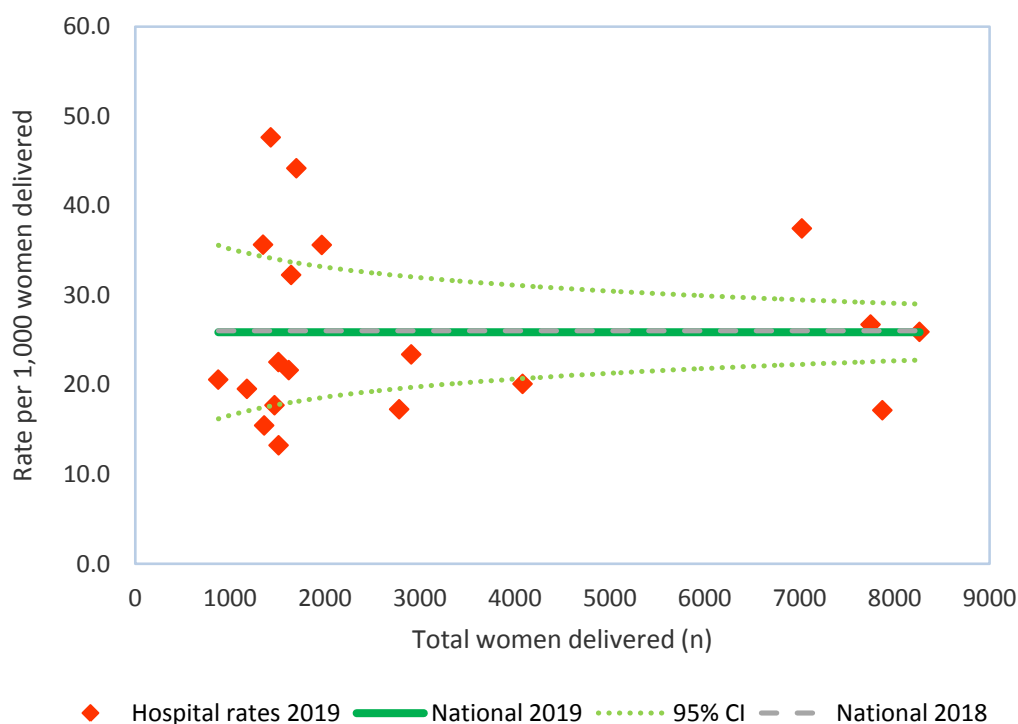
| | 2018* | 2019* |
|--|---------|---------|
| Rate (per 1,000 total births) | 0.7 | 0.7 |
| 95% CI | 0.4–0.9 | 0.5–1.0 |
| Total early-onset neonatal bacteraemia (n) | 30 | 31 |
| Total births (n) | 45,177 | 44,218 |

*Missing cases=2 maternity hospitals/units.

The large amount of missing data on this metric from large tertiary maternity skews the calculations of national rates.

Obstetric blood transfusion (#22)

Definition Number of obstetric patients who receive one or more units of blood components/products (including red cells, plasma, platelets, etc.), not including clotting factors or recombinant products. Report obstetric patients only, exclude gynaecology patients. Obstetric is defined as from the time of diagnosis of pregnancy (based on a positive pregnancy test).



| | 2018 | 2019 |
|---|-----------|-----------|
| Rate (<i>per 1,000 women delivered</i>) | 26.0 | 25.9 |
| 95% CI | 24.8–27.3 | 24.6–27.2 |
| Range | 13.5–48.8 | 13.2–47.6 |
| Total OBT (n) | 1,562 | 1,508 |
| Total women delivered (n) | 59,981 | 58,272 |

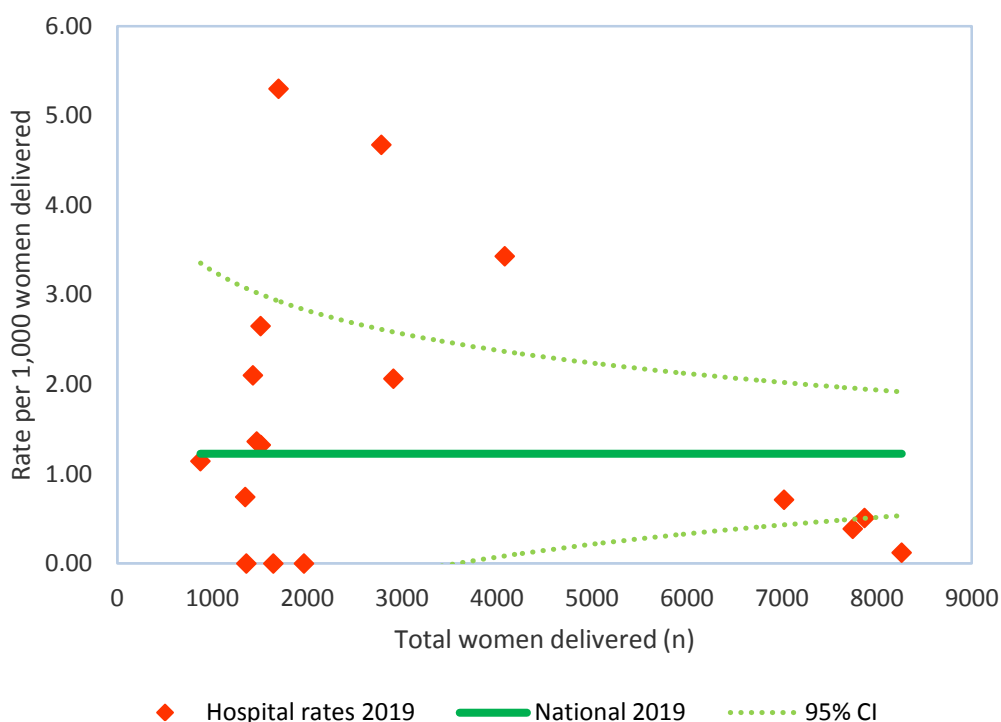
Note:

There is considerable variation across hospitals on this metric, with rates of OBT ranging from 13.2 to 47.6 per 1,000 women delivered. This metric should be viewed in conjunction with Metrics #30 and #31, Primary postpartum haemorrhage with vaginal deliveries and CS (see pages 35-6).

Obstetric Risks/Complications

Maternal sepsis (#24)

Definition Number of women diagnosed with maternal sepsis. According to the WHO (2017) definition, maternal sepsis is a life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or postpartum period, i.e., within 42 days of termination of pregnancy. If sepsis develops during pregnancy, while or after giving birth, or after an abortion, it is called maternal sepsis.



| | 2018 | 2019* |
|-----------------------------------|------|-----------|
| Rate (per 1,000 women delivered)* | N/A | 1.23 |
| 95% CI | N/A | 0.93–1.52 |
| Range | N/A | 0.00–5.30 |
| Maternal sepsis (n) | N/A | 68 |
| Total women delivered (n) | N/A | 55,477 |

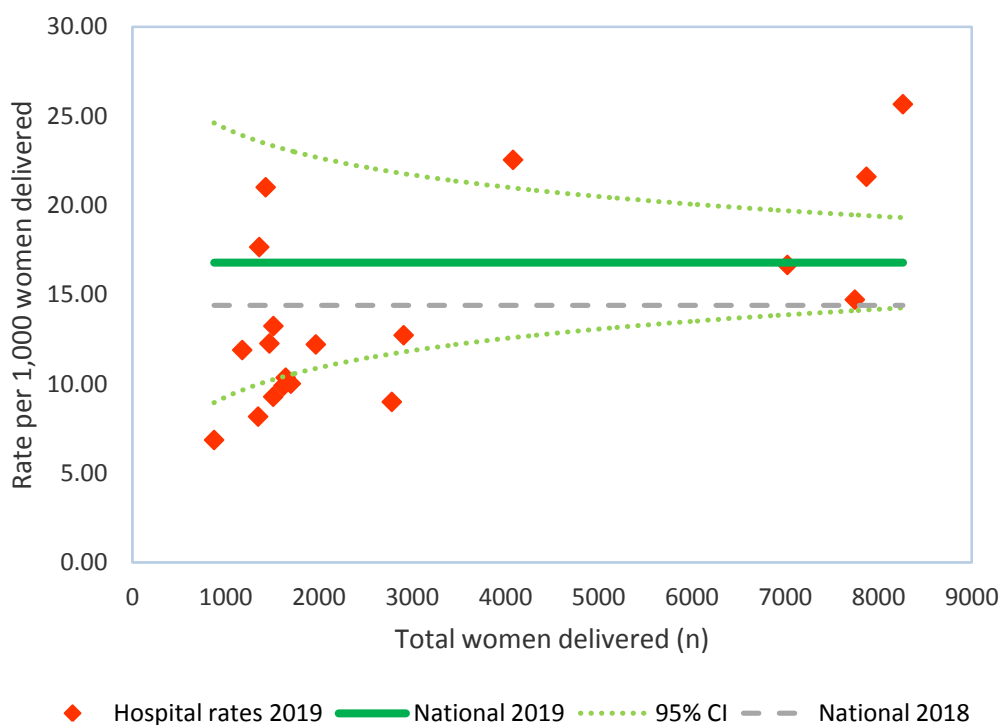
*Missing cases=2 maternity units

Note: This metric was introduced on the IMIS in 2019. This is the first time data have been collected nationally in Ireland using the new WHO definition. The NPEC reported a rate of septicaemic shock of 3.3% in the incidence of specific severe maternal morbidities (2017). Maternal sepsis and septicaemic shock are defined differently. Despite major advances in the last century, maternal sepsis remains a common and potentially preventable cause of direct maternal death globally (Turner 2019).⁶ In addition to maternal concerns, the fetus is at increased risk of miscarriage, stillbirth, preterm birth, and infection.

6 Turner MJ. Maternal sepsis is an evolving challenge. *International Journal of Gynecology & Obstetrics* 2019; 1-4.

Ectopic pregnancy (#24)

Definition Number of women diagnosed during the current month with an ectopic pregnancy, including abdominal pregnancy, tubal pregnancy, ovarian pregnancy, and other/unspecified pregnancy. Do not source data on ectopic pregnancies from the HIPE.



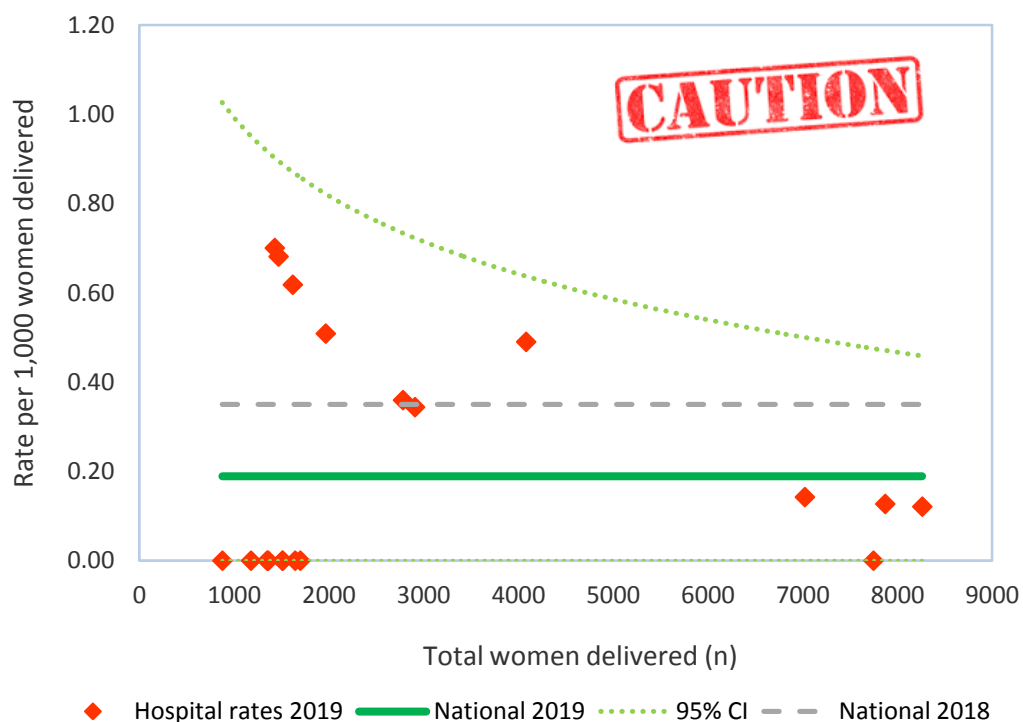
| | 2018 | 2019 |
|--|-----------|-----------|
| Rate (<i>per 1,000 women delivered</i>)* | 14.4 | 16.8 |
| 95% CI | 13.4–15.3 | 15.7–17.8 |
| Range | 5.4–25.9 | 6.9–25.7 |
| Total ectopic pregnancies (n) | 863 | 978 |
| Total women delivered (n) | 59,981 | 58,272 |

*Note: Rates are calculated using total women as a proxy denominator, since total number of pregnant women is unavailable.

The prevalence of ectopic pregnancy appears to be rising internationally as well as in Ireland, where the rate has increased by over 32% since 2008 ($p < 0.05$). This may be, in part, because of earlier and more accurate diagnosis of pregnancies. Also, increased incidence of sexually transmitted infections, earlier diagnosis of pelvic inflammatory disease resulting in tubal damage, and the rise in the number of ectopic pregnancies resulting from assisted reproductive technologies may account for the overall increases.

Eclampsia (#25)

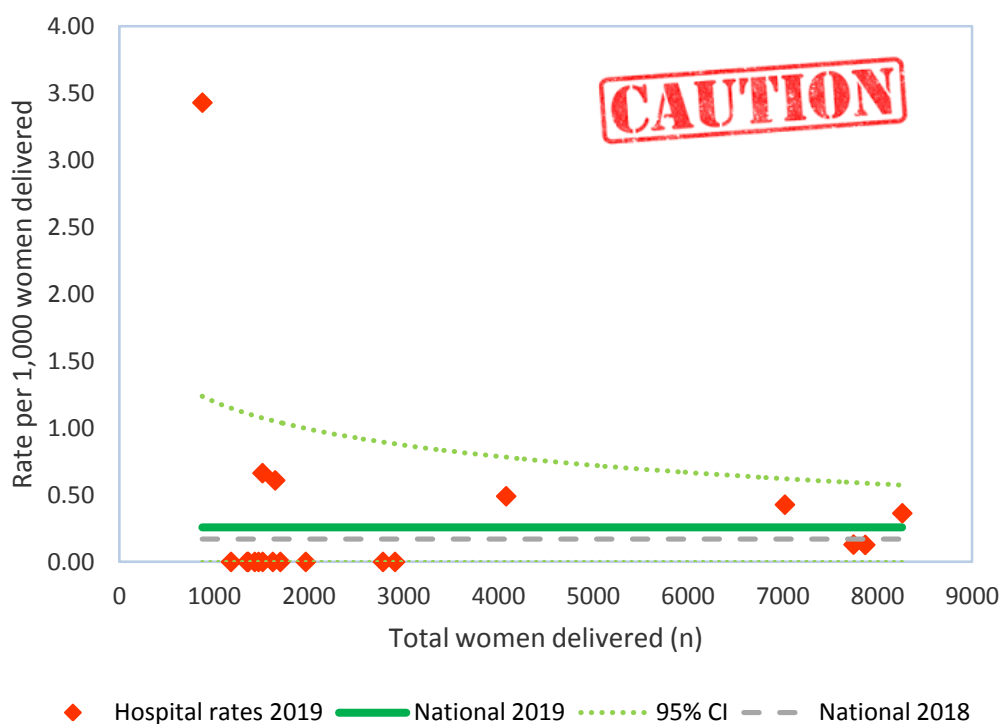
Definition Number of women diagnosed during the current month with eclampsia during any antenatal hospital event or at delivery, including eclampsia in pregnancy, in labour, in the puerperium, and eclampsia unspecified as to time period. The metric does not include severe pre-eclampsia.



| | 2018 | 2019 |
|---|-----------|-----------|
| Rates (<i>per 1,000 women delivered</i>) | 0.35 | 0.19 |
| 95% CI | 0.20–0.50 | 0.08–0.30 |
| Total eclampsia (n) | 21 | 11 |
| Total women delivered (n) | 59,981 | 58,272 |
| Note: The continuing fall in the national rate of eclampsia in 2019 is significant ($p < 0.05$). Caution is advised when dealing with small numbers of cases. | | |

Uterine rupture (#26)

Definition Number of women diagnosed during the current month with rupture of uterus before onset of labour or during labour, including cases that may not be diagnosed until after delivery. The IMIS definition of uterine rupture refers to complete rupture.



| | 2018 | 2019 |
|--|-----------|-----------|
| Rates (<i>per 1,000 women delivered</i>) | 0.18 | 0.26 |
| 95% CI | 0.08–0.29 | 0.13–0.39 |
| Total uterine rupture (n) | 11 | 15 |
| Total women delivered (n) | 59,981 | 58,272 |

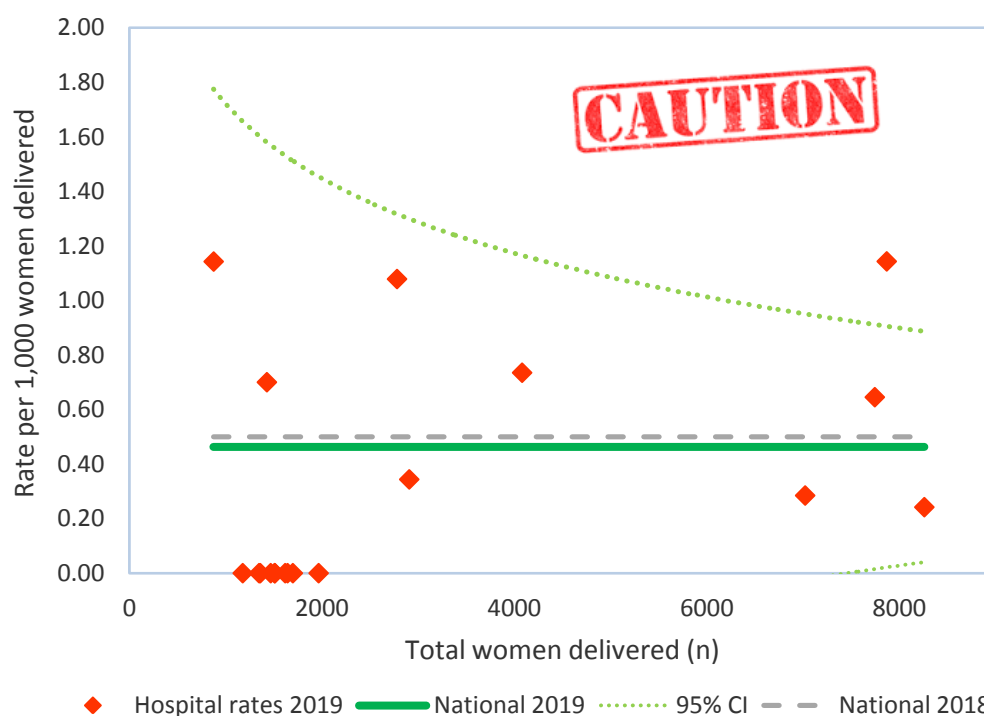
Note:

The risk of uterine rupture tends to be higher after trial of labour among women with previous Caesarean sections (CS), compared with repeat elective CS. Induction of labour (using prostaglandins) is also associated with high risk of uterine rupture.

The outlying maternity unit had three cases of uterine rupture. Caution is advised when dealing with small numbers.

Peripartum hysterectomy (#27)

Definition Number of hysterectomy procedures completed during the current month, usually following a caesarean section, including hysterectomies performed during pregnancy and/or procedures within seven completed days after delivery.



| | 2018 | 2019 |
|--|-----------|-----------|
| Rates (<i>per 1,000 women delivered</i>) | 0.52 | 0.46 |
| 95% CI | 0.33–0.70 | 0.29–0.64 |
| Total peripartum hysterectomy (n) | 31 | 27 |
| Total women delivered (n) | 59,981 | 58,272 |

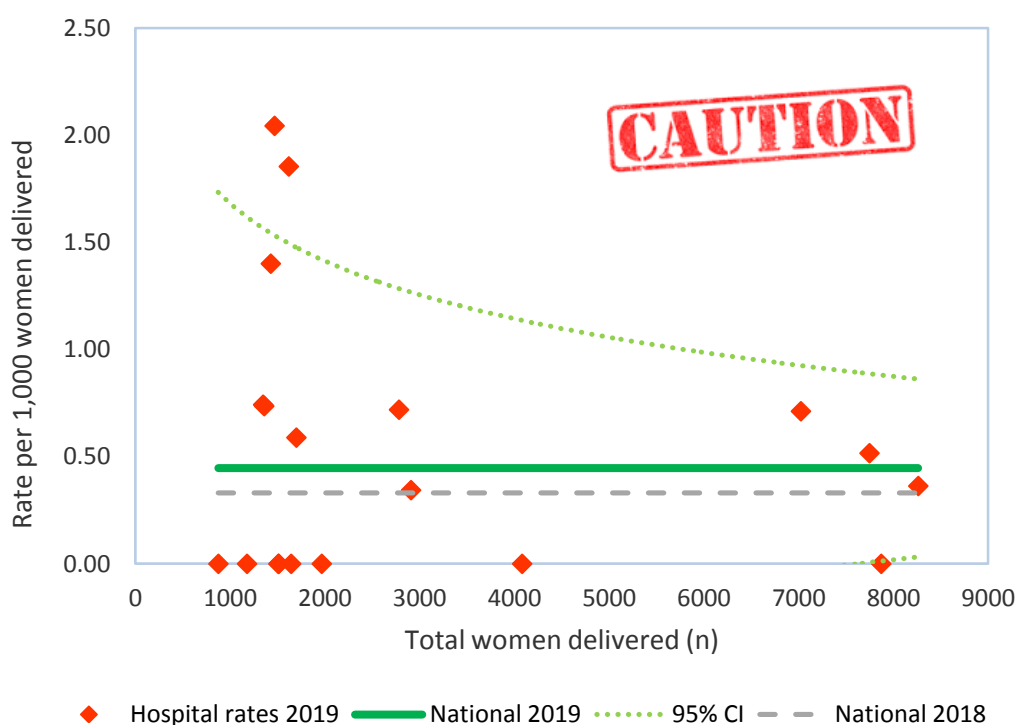
Note:

Peripartum hysterectomy is rare in modern obstetrics. It can cause significant morbidity and mortality and is usually only performed in emergency situations. It may be associated with maternal age, Caesarean sections, and placenta praevia/accreta (Huque et al 2018).⁷ Caution is advised when dealing with small numbers.

⁷ Huque S, Roberts I, Fawole B, et al. Risk factors for peripartum hysterectomy among women with postpartum haemorrhage: analysis of data from the WOMAN trial. *BMC Pregnancy Childbirth* 2018; 18:186.

Pulmonary embolism (#28)

Definition Number of women diagnosed during the current month with obstetric pulmonary emboli in pregnancy and/or the puerperium and excludes embolism complicating abortion or ectopic or molar pregnancy.



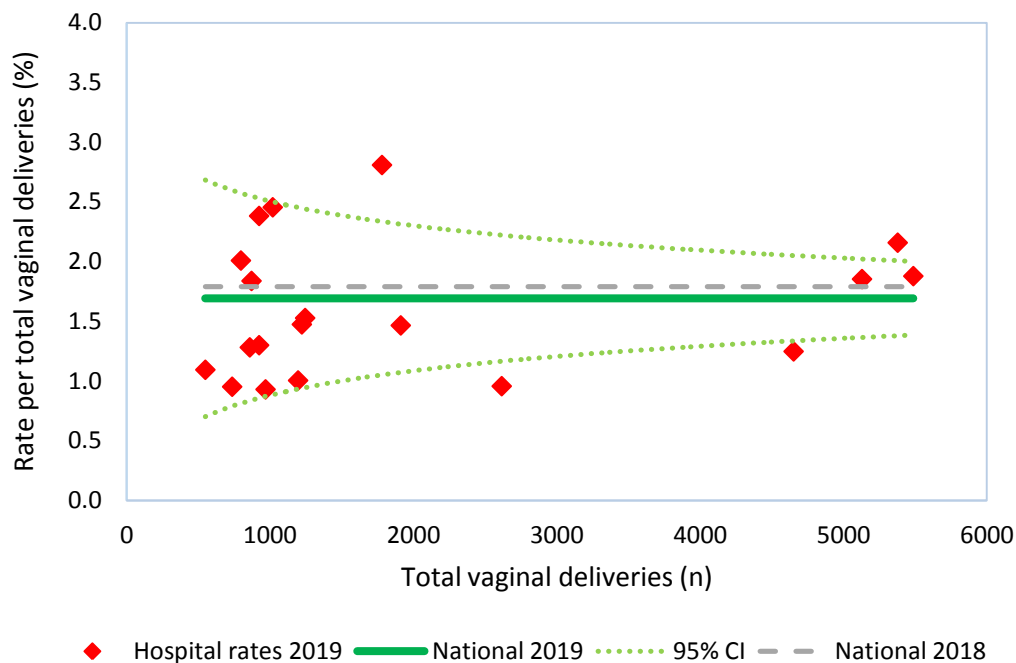
| | 2018 | 2019 |
|--|-----------|-----------|
| Rates (<i>per 1,000 women delivered</i>) | 0.33 | 0.45 |
| 95% CI | 0.19–0.48 | 0.27–0.62 |
| Total pulmonary embolism (n) | 20 | 26 |
| Total women delivered (n) | 59,981 | 58,272 |

Note:

Pulmonary embolism is a leading cause of maternity mortality in developed countries. The national rate has fallen by 15.4% since the IMIS began in 2014, which it is hoped was a response to hospitals' implementation of the National Clinical Guideline, *Venous Thromboprophylaxis in Pregnancy* (2013). However, the increase of 36.4% in 2019 on the previous year is concerning. Caution is advised when dealing with small numbers.

Perineal tears (#29)

Definition Number of women with third-degree and/or fourth-degree perineal lacerations during the current month, including tears in the vaginal tissue, perineal skin, and perineal muscles that extend into the anal sphincter and/or go through the anal sphincter and the tissue underneath it.



| | 2018* | 2019 |
|----------------------------------|-----------|-----------|
| Rates (% total vaginal delivery) | 1.8% | 1.7% |
| 95% CI | 1.7%–1.9% | 1.6%–1.8% |
| Range | 0.4%–2.7% | 0.9%–2.8% |
| Total perineal tears (n) | 611 | 648 |
| Total vaginal delivery (n) | 34,184 | 38,266 |

*Missing data from 1 maternity hospital

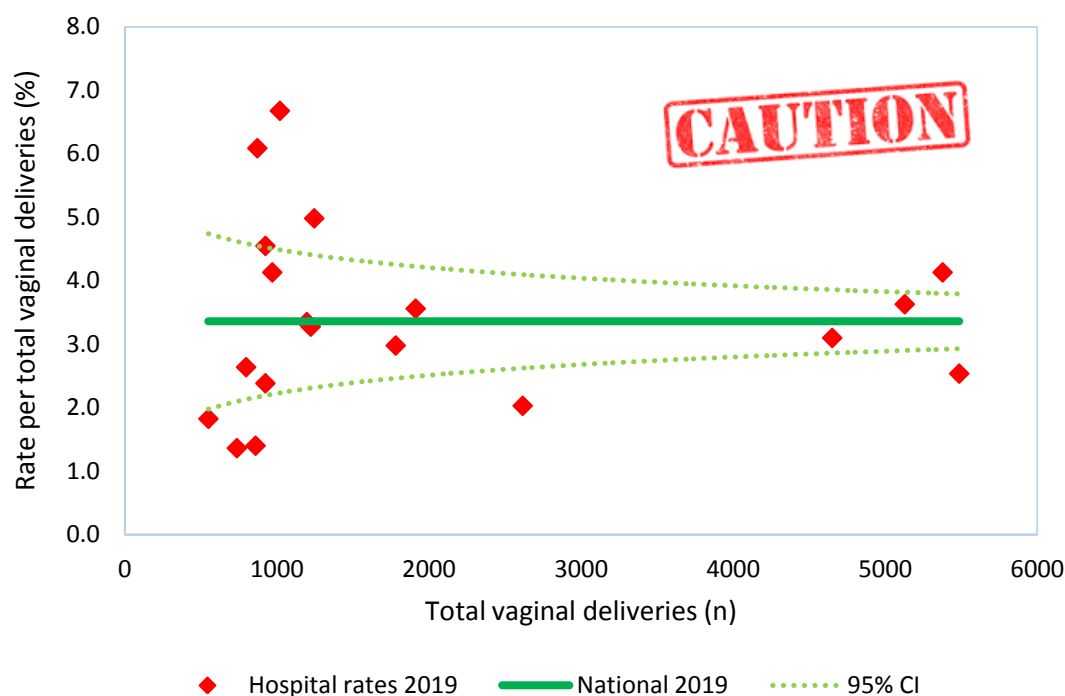
Note:

In 2019, the rate of severe perineal tears across the 19 maternity units ranged from 0.9% to 2.8%. Similar variation exists across European countries (e.g., 0.1% in Romania, 4.9% in Iceland⁸). The rate of severe perineal tears among women with vaginal deliveries has fallen in recent years ($p < 0.05$) (see Appendix 11).

8 Blondel B, Alexander S, Bjarnadóttir R, et al. Variations in rates of severe perineal tears and episiotomies in 20 European countries: a study based on routine national data in Euro-Peristat Project. Acta Obstet Gynecol Scand. 2016 Jul; 95(7):746-54.

PPH Vaginal delivery (#30)

Definition Number of women with one episode of blood loss of $\geq 1,000\text{mL}$ following a vaginal delivery and prior to discharge from the labour ward. Do not count PPH after discharge from labour ward. Discount/exclude liquor from the measurement of blood loss. PPH is the most common form of major obstetric haemorrhage.

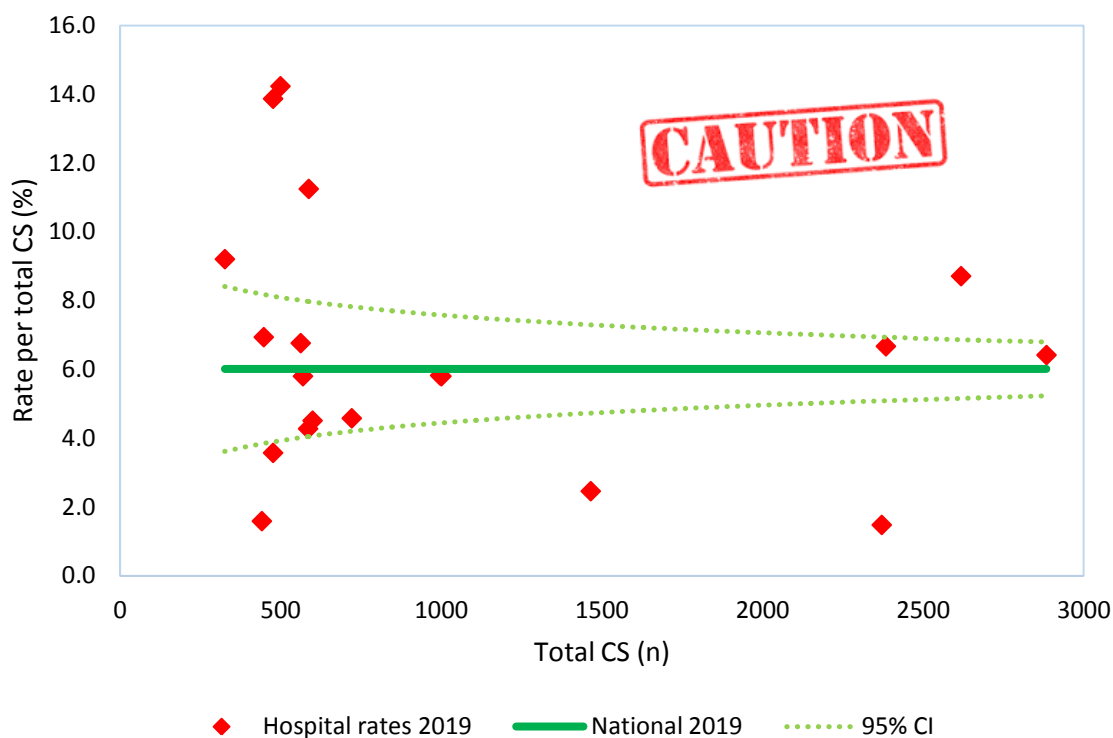


| | 2018 | 2019 |
|---|------|-----------|
| Rates (% total vaginal delivery) | N/A | 3.4% |
| 95% CI | N/A | 3.2%–3.5% |
| Range | N/A | 1.3%–6.7% |
| PPH per total vaginal delivery (n) | N/A | 1,285 |
| Total vaginal delivery (n) | N/A | 38,266 |
| Note: In 2019, the metric for PPH was modified to count blood loss of 1,000mL or more among vaginal deliveries and among Caesarean section deliveries separately. International research finds rates of PPH range from to 1.9% (Sosa et al 2011) to 5.1% (Calvert et al) to 8.7% (Fukami et al 2019). ⁹ | | |

9 Sosa CG, Althabe F, Belizan JM, Buekens P. Am J Obstet Gynecol. 2011 Mar; 204(3):238.e1-5. Calvert C, Thomas SL, Ronsmans C, Wagner KS, Adler AJ, Filippi V. PLoS One. 2012; 7(7):e41114. Fukami T, M Goto, M Ando, et al. Incidence and risk factors for

PPH Caesarean section (#31)

Definition Number of women with one episode of blood loss of $\geq 1,000\text{mL}$ following Caesarean section delivery and prior to discharge from the labour ward. Do not count PPH following discharge from theatre. Discount/exclude liquor from the measurement of blood loss. PPH is the most common form of major obstetric haemorrhage.



| | 2018 | 2019 |
|--|------|------------|
| Rates (% total Caesarean section (CS)) | N/A | 6.0% |
| 95% CI | N/A | 5.7%–6.3% |
| Range | N/A | 1.5%–14.2% |
| PPH per total CS (n) | N/A | 1,203 |
| Total CS (n) | N/A | 20,006 |

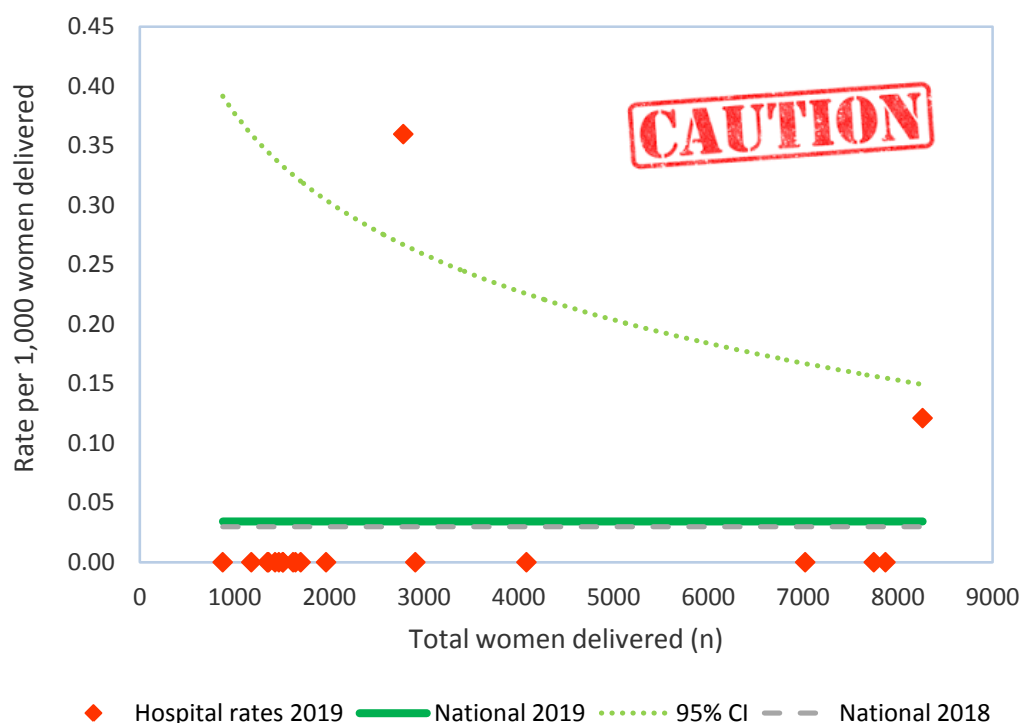
Note: The definition for PPH at Caesarean section includes 1,000ml blood loss. International research has found a primary PPH rate of 4.84% at elective CS and 6.75% at emergency CS (Magann 2005).¹⁰ There may be an association between this metric and GA for CS (see Metric #35, page 41), as well as rates of OBT.

postpartum hemorrhage among transvaginal deliveries at a tertiary perinatal medical facility in Japan. PLoS One 2019; 14(1): e0208873.

10 Magann EF, Evans S, Hutchinson M, Collins R, Lanneau G, Morrison JC. Postpartum hemorrhage after cesarean delivery: an analysis of risk factors. Southern Medical Journal 2005;98:681-5.

Miscarriage misdiagnosis (#32)

Definition Number of women diagnosed during the current month with a spontaneous miscarriage when a subsequent ultrasound confirms an ongoing pregnancy.



| | 2018 | 2019 |
|--|-----------|-----------|
| Rates (<i>per 1,000 women delivered</i>) | 0.03 | 0.03 |
| 95% CI | 0.00–0.08 | 0.00–0.08 |
| Total miscarriage misdiagnoses (n) | 2 | 2 |
| Total women delivered (n) | 59,981 | 58,272 |

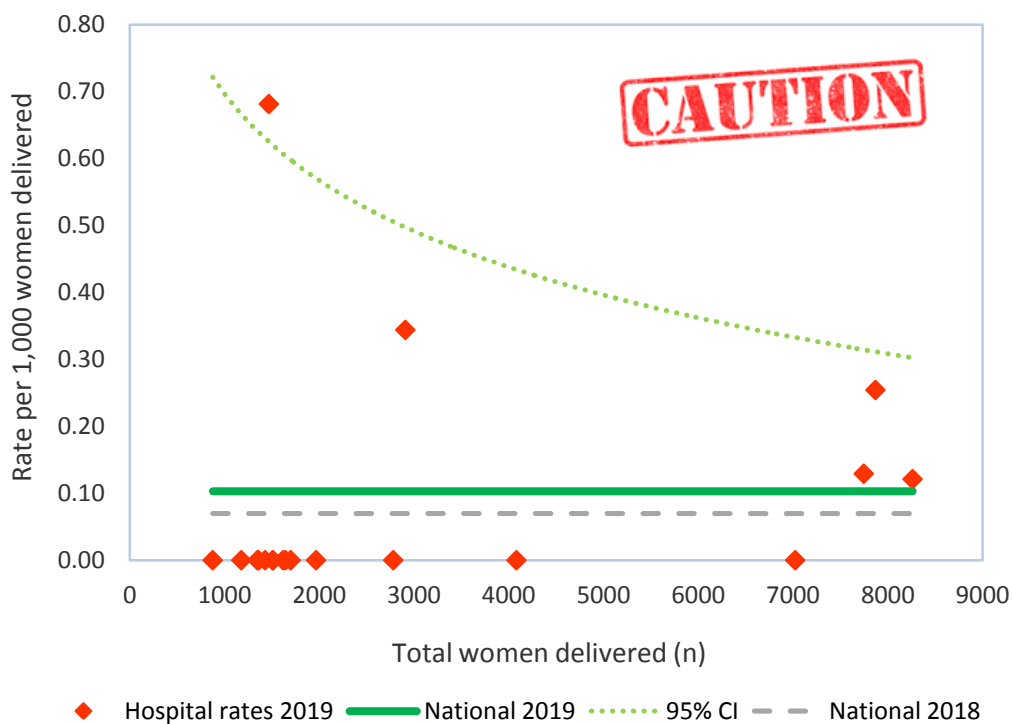
Note:

Two cases of miscarriage misdiagnosis per annum have been reported since 2017. This is disappointing, given improvements in Early Pregnancy Assessment Units after 2011 (Ledger and Turner, 2016) and the development of a national training program and the national clinical guideline, *Management of Early Pregnancy Miscarriage (2012)*. While miscarriage is common, estimated as affecting one in five pregnancies, incorrect diagnosis of miscarriage may result in some pregnancies being terminated unnecessarily.

Caution is advised when dealing with small numbers.

Retained swabs (#33)

Definition Number of women during the current month who have a swab retained unintentionally in the vagina after a vaginal delivery.



| | 2018 | 2019 |
|-----------------------------------|-----------|-----------|
| Rates (per 1,000 women delivered) | 0.07 | 0.10 |
| 95% CI | 0.00–0.13 | 0.02–0.19 |
| Total retained swabs (n) | 4 | 6* |
| Total women delivered (n) | 59,981 | 58,272 |

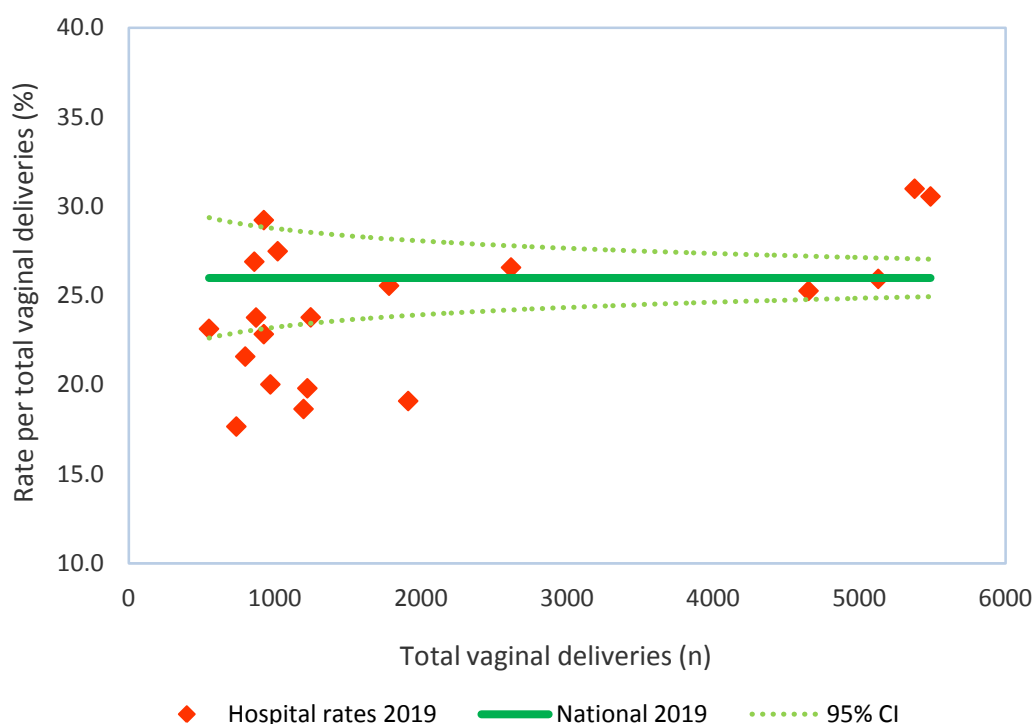
* One hospital experienced two cases of retained swabs.

Note:

The increased incidence of retained swabs in 2019 is concerning.
Caution is advised when dealing with small numbers.

Episiotomy (#34)

Definition Number of women undergoing episiotomy procedures. Episiotomy is a surgical cut made at the opening of the vagina during childbirth, to aid a difficult delivery and prevent rupture of tissues. The procedure may be performed by a midwife or obstetrician, usually during second stage of labour. Usually performed under local anaesthetic and requires suturing after delivery.



| | 2018 | 2019 |
|---|------|-------------|
| Rates (<i>per total vaginal delivery</i>) | N/A | 26.0% |
| 95% CI | N/A | 25.6%–26.5% |
| Range | N/A | 17.7%–31.0% |
| Total episiotomy (n) | N/A | 9,945 |
| Total vaginal delivery (n) | N/A | 38,266 |

Note:

This metric was introduced on the IMIS in 2019. This first data collection indicates variation in rates across the 19 maternity units from 17.7% to 31.0% per total vaginal deliveries. Variation in rates of episiotomy has been found internationally, for example, 9.7% in Sweden in 1999–2000, 12.0% in Denmark, 13.0% in England, 44.4% in Germany in 2002–2003, and 58.0% in Italy in 1999 (Graham et al 2005).¹¹

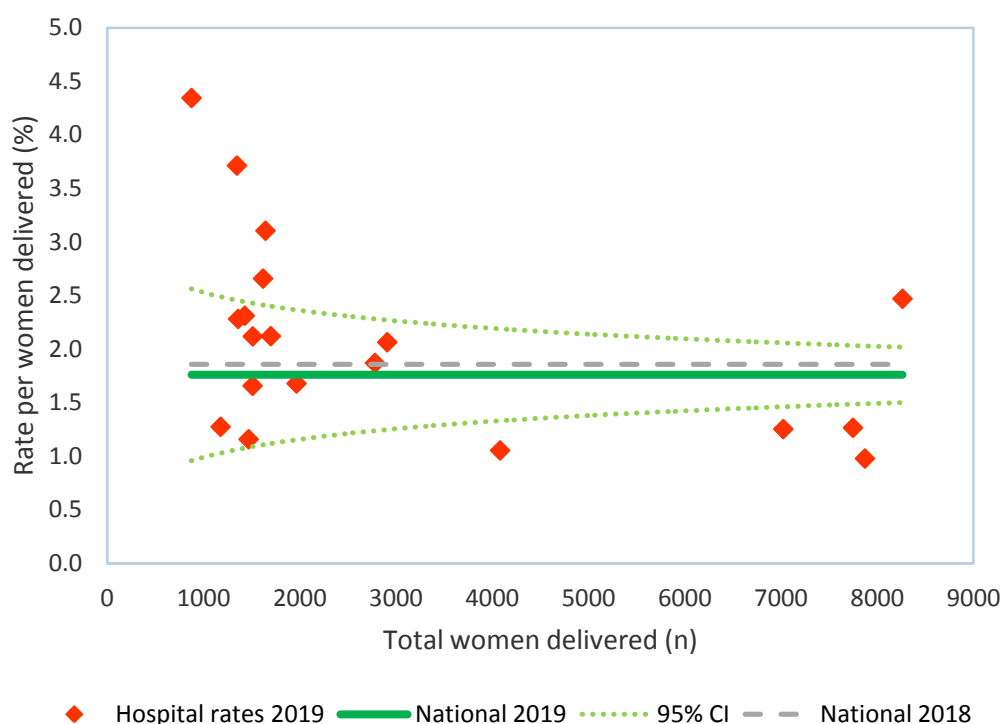
11 Graham ID, Carroli G, Davies C, Medves JM. Episiotomy rates around the world: an update. Birth. 2005;32(3):219–23.

Deliveries

General anaesthetic for Caesarean section (#35)

(Per total women delivered)

Definition Number of women during the current month who underwent a Caesarean section and were administered a general anaesthetic (GA), including primary GA and also conversion to GA from regional anaesthetic (epidural or spinal).



| | 2018* | 2019 |
|---------------------------------|-----------|-----------|
| Rates (% total women delivered) | 1.9% | 1.8% |
| 95% CI | 1.8%–2.0% | 1.7%–1.9% |
| Range | 1.0%–3.8% | 1.0%–4.3% |
| Total GA for CS (n) | 973 | 1,026 |
| Total women delivered (n) | 52,186 | 58,272 |

*Missing data from 1 maternity unit

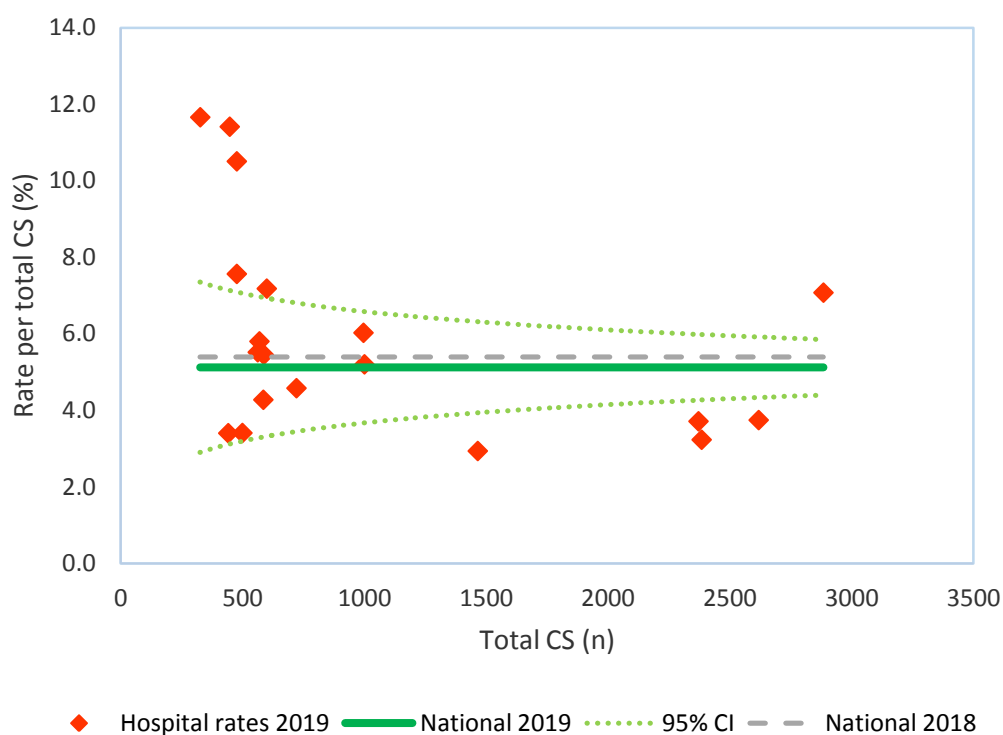
Note:

This metric should be examined in association with postpartum haemorrhage rates among CS deliveries (Metric #31, see page 36).

General anaesthetic for Caesarean section (#35)

(Per total Caesarean sections (CS))

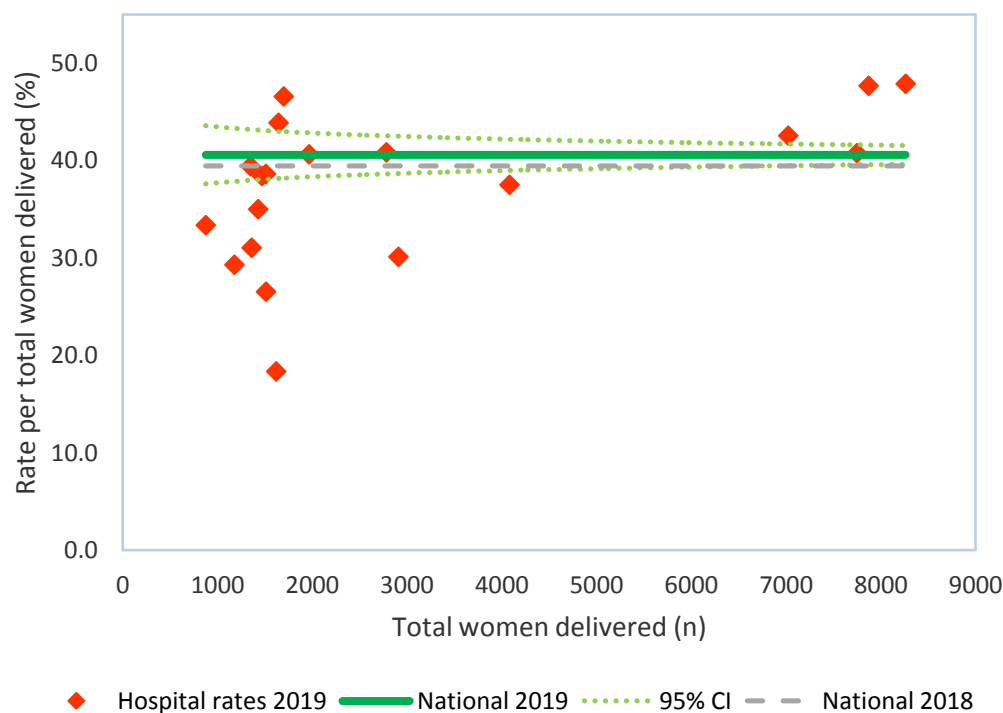
Definition Number of women during the current month who underwent a Caesarean section and were administered a general anaesthetic (GA), including primary GA and also conversion to GA from regional anaesthetic (epidural or spinal).



| | 2018* | 2019 |
|-------------------------------------|-----------|------------|
| Rates (% total CS) | 5.4% | 5.1% |
| 95% CI | 5.1%–5.7% | 4.8%–5.4% |
| Range | 3.2%–9.4% | 2.9%–11.7% |
| Total GA for CS (n) | 973 | 1,026 |
| Total CS (n) | 18,002 | 20,006 |
| *Missing data from 1 maternity unit | | |

Labour epidural (#36)

Definition Number of women for whom labour epidural was administered during the current month, including neuraxial block during labour and neuraxial block during labour and delivery procedure.



| | 2018 | 2019 |
|----------------------------------|-------------|-------------|
| Rates (% total women delivered)* | 39.4% | 40.6% |
| 95% CI | 39.1%–39.8% | 40.2%–41.0% |
| Range | 18.9%–47.0% | 18.4%–47.9% |
| Total labour epidural (n) | 23,657 | 23,645 |
| Total women delivered (n) | 59,981 | 58,272 |

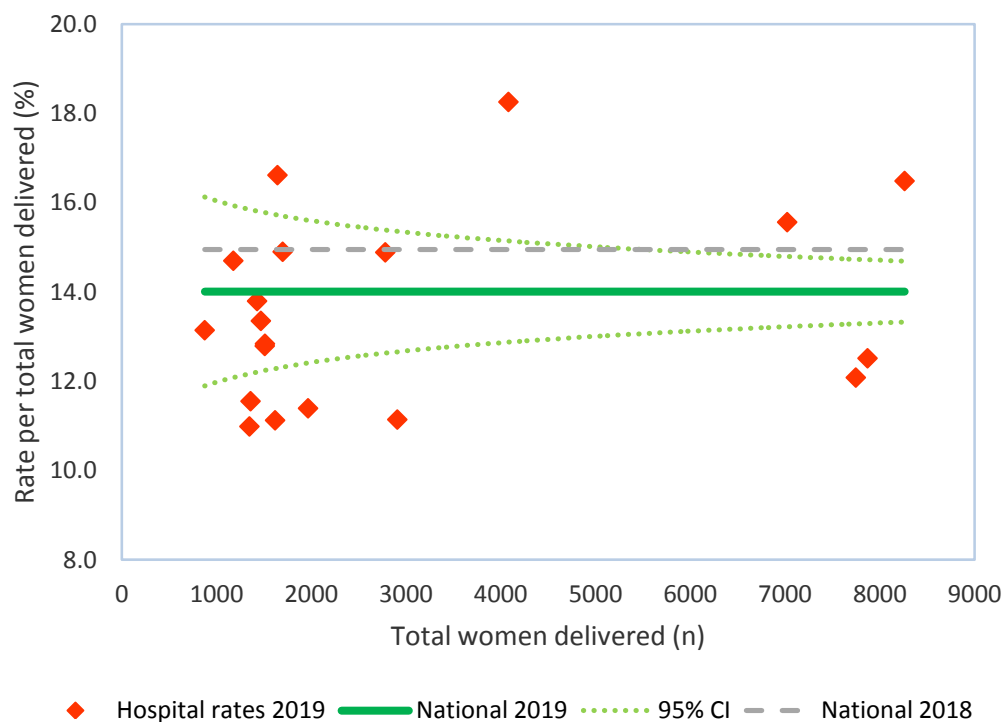
* The base 'per total women delivered' is a proxy denominator for total women in labour

Note:

There is over-dispersion in the funnel chart (i.e., most of the maternity units lie beyond the 95% thresholds), with rates ranging from 18.4% to 47.9%. The higher rates of epidural at large tertiary hospitals may be related to higher rates of nulliparae attending these sites. The data provided to us do not allow us to explore the relationship between epidural rates and parity, but staff at the hospitals may examine this hypothesis at their own sites.

Total operative vaginal delivery (#37)

Definition Number of women undergoing operative vaginal delivery (OVD), or instrumental delivery. This metric includes forceps delivery and vacuum extraction, assisted breech delivery with forceps to after-coming head and breech extraction with forceps to after-coming head. Excludes failed forceps and failed vacuum extraction.

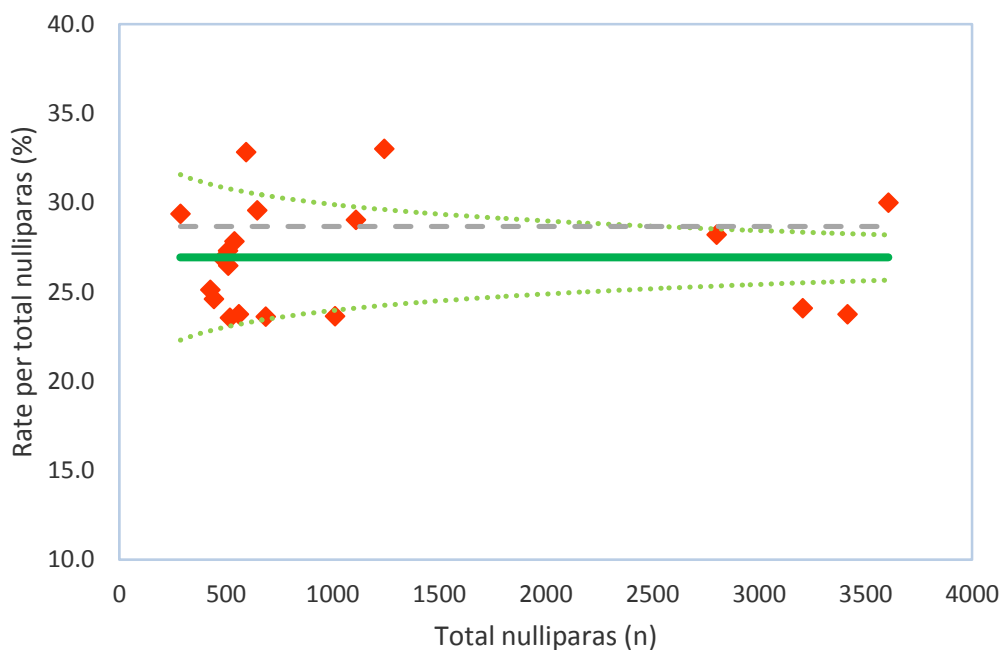


| | 2018 | 2019 |
|---------------------------------|-------------|-------------|
| Rates (% total women delivered) | 15.0% | 14.0% |
| 95% CI | 14.7%–15.2% | 13.7%–14.3% |
| Range | 10.3%–18.2% | 11.1%–18.3% |
| Total OVD (n) | 8,970 | 8,162 |
| Total women delivered (n) | 59,981 | 58,272 |

Note:

The drop in the rate of OVD in 2019 on the previous year continues a trend that has been observed since the introduction of the IMIS in 2014 ($p < 0.05$). This trend, as well as the trend in variation across hospitals nationally, is reflected in international research (Appendix 11).¹² Declining and diverse usage of OVD procedures, as well as variations in the instruments of choice by obstetricians, have serious implications for obstetric training.

¹² Merriam AA, Ananth CV, Wright JD, et al. Trends in operative vaginal delivery, 2005-2013: a population-based study. BJOG 2017;124(9): 1365. Hubena Z, Workneh A, Siraneh Y. Prevalence and outcome of operative vaginal delivery among women who gave birth at Jimma University Medical Centre, Southwest Ethiopia. Journal of Pregnancy, 2018, Article 7423475.

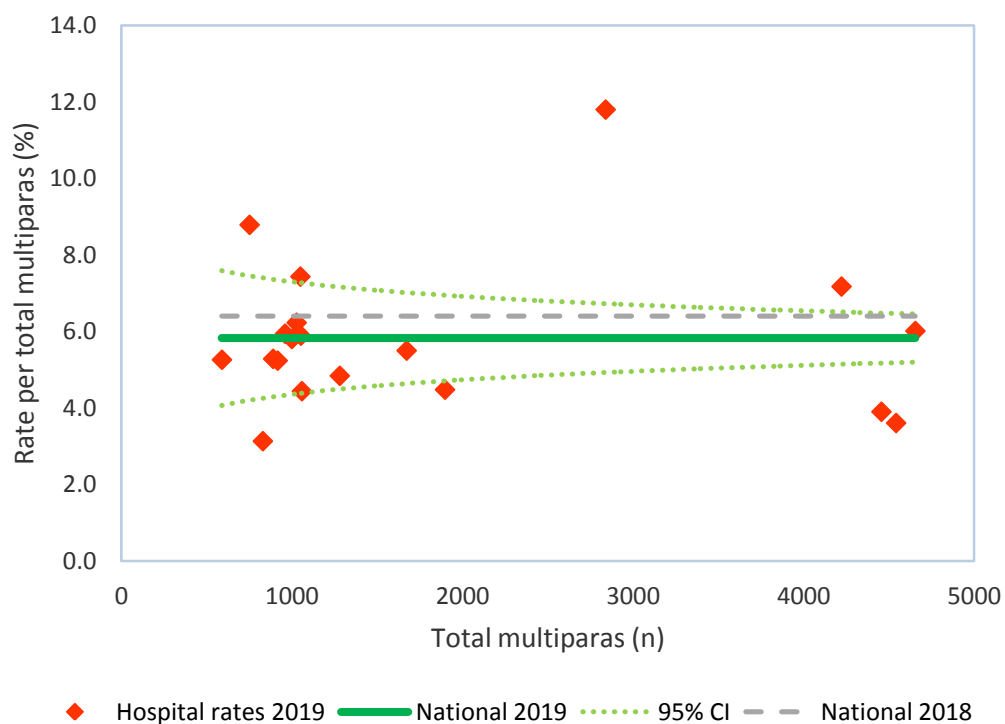
OVD among nulliparas (#37a)*Definitions as before*

◆ Hospital rates 2019 — National 2019 95% CI - - National 2018

| | 2018 | 2019 |
|--------------------------|-------------|-------------|
| Rates (% nulliparas) | 28.7% | 26.9% |
| 95% CI | 28.1%–29.2% | 26.4%–27.5% |
| Range | 21.7%–33.6% | 23.6%–33.0% |
| OVD among nulliparas (n) | 6,605 | 6,083 |
| Total nulliparas (n) | 23,047 | 22,591 |

OVD among multiparas (#37b)

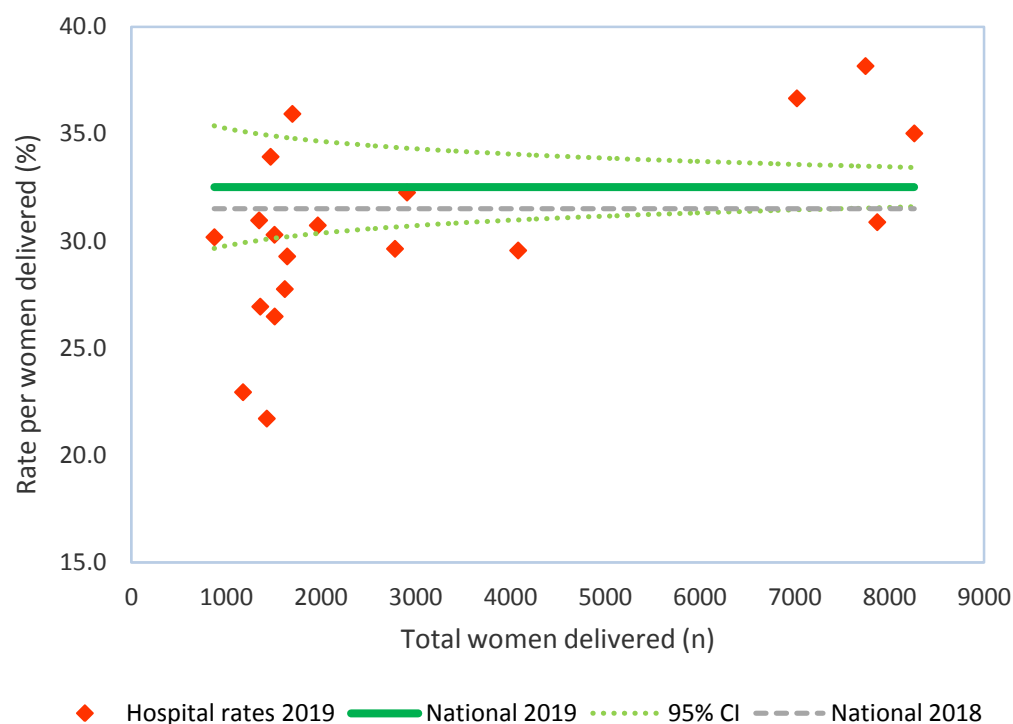
Definitions as before



| | 2018 | 2019 |
|--------------------------|------------|------------|
| Rates (% multiparas) | 6.4% | 5.8% |
| 95% CI | 6.2%–6.7% | 5.6%–6.1% |
| Range | 4.2%–11.1% | 3.1%–11.8% |
| OVD among multiparas (n) | 2,365 | 2,079 |
| Total multiparas (n) | 36,934 | 35,681 |

Total Induction of labour (IOL) (#38)

Definition Number of women during the current month undergoing induction of labour (IOL), including medical and/or surgical inductions of labour. Include use of oxytocin, prostaglandin, or other. Include artificial rupture of membranes or other surgical means. Include synchronous medical and surgical IOL.



| | 2018 | 2019 |
|---------------------------------|-------------|-------------|
| Rates (% total women delivered) | 31.5% | 32.5% |
| 95% CI | 31.1%–31.9% | 32.1%–32.9% |
| Range | 19.9%–37.0% | 22.9%–38.2% |
| Total IOL (n) | 18,900 | 18,947 |
| Total women delivered (n) | 59,981 | 58,272 |

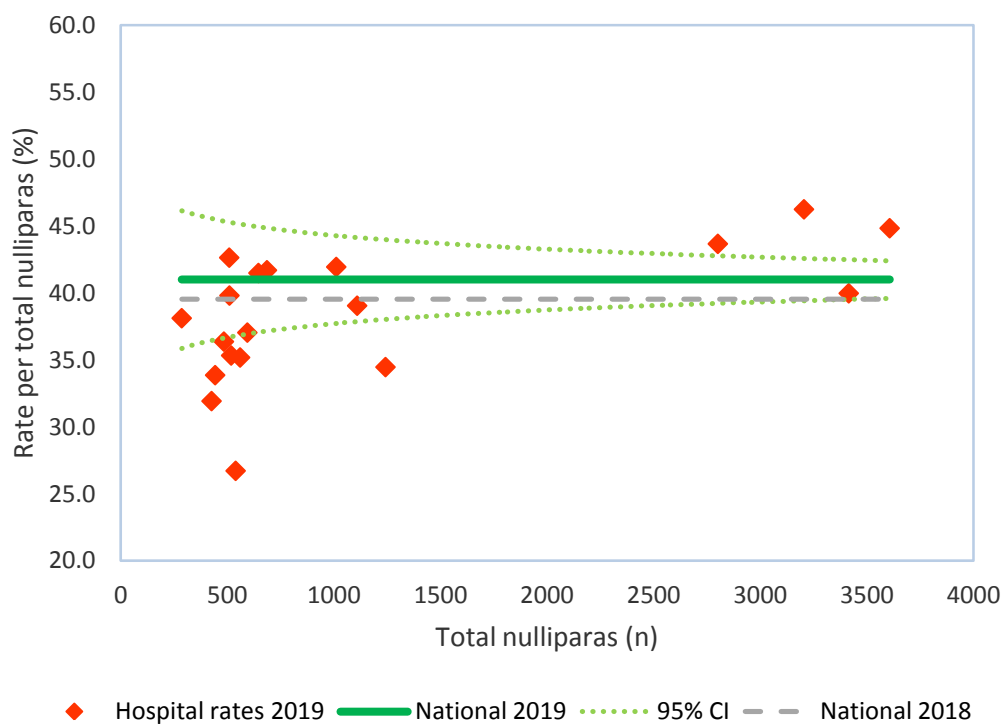
Note:

The increase in the rate of IOL in 2019 on the previous year is part of a continuing trend that has been observed since the IMIS began in 2014. There is no known optimum rate of IOL. There was broad variation in IOL rates across hospitals, from approximately 23% to 38%. Similar variation is reflected in research (Sinnott et al., 2016)¹³. The IMIS does not explore reasons for variations, but explanations probably include clinical factors, sociodemographic trends, and organisational behaviour and practices.

13 Sinnott SJ, Layte R, Brick A, Turner MJ. (2016). Variation in induction of labour rates across Irish hospitals: A cross-sectional study. *European Journal of Public Health*, 2016, June 5.

IOL among nulliparas (#38a)

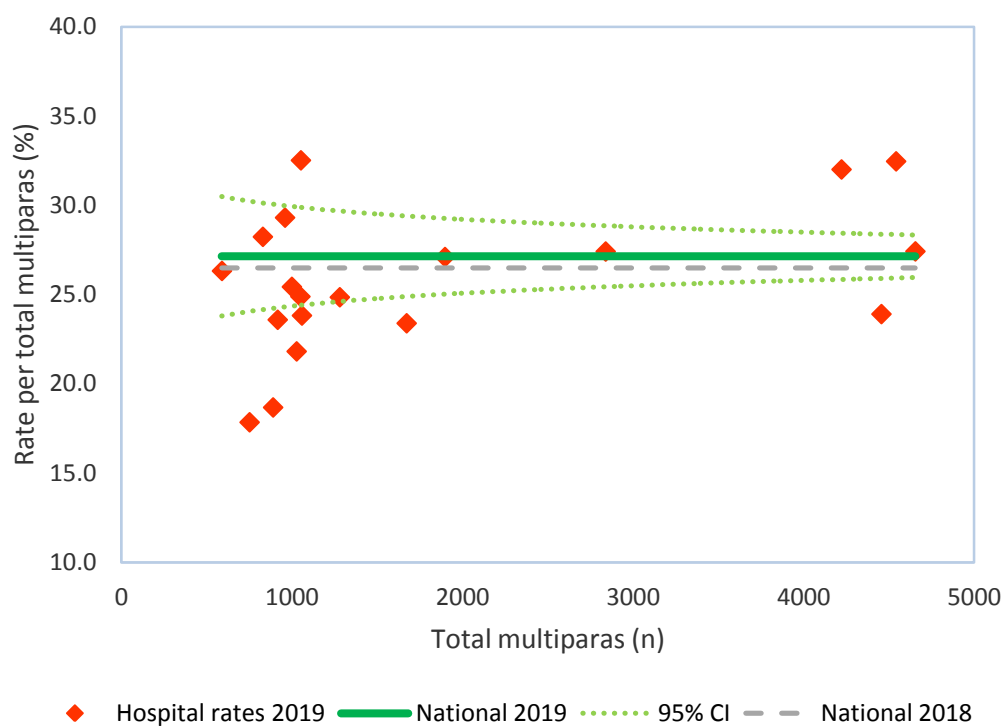
Definitions as before



| | 2018 | 2019 |
|--------------------------|-------------|-------------|
| Rate (% nulliparas) | 39.5% | 41.0% |
| 95% CI | 38.9%–40.2% | 40.4%–41.6% |
| Range | 27.4%–47.4% | 26.7%–46.2% |
| IOL among nulliparas (n) | 9,111 | 9,261 |
| Total nulliparas (n) | 23,047 | 22,591 |

IOL among multiparas (#38b)

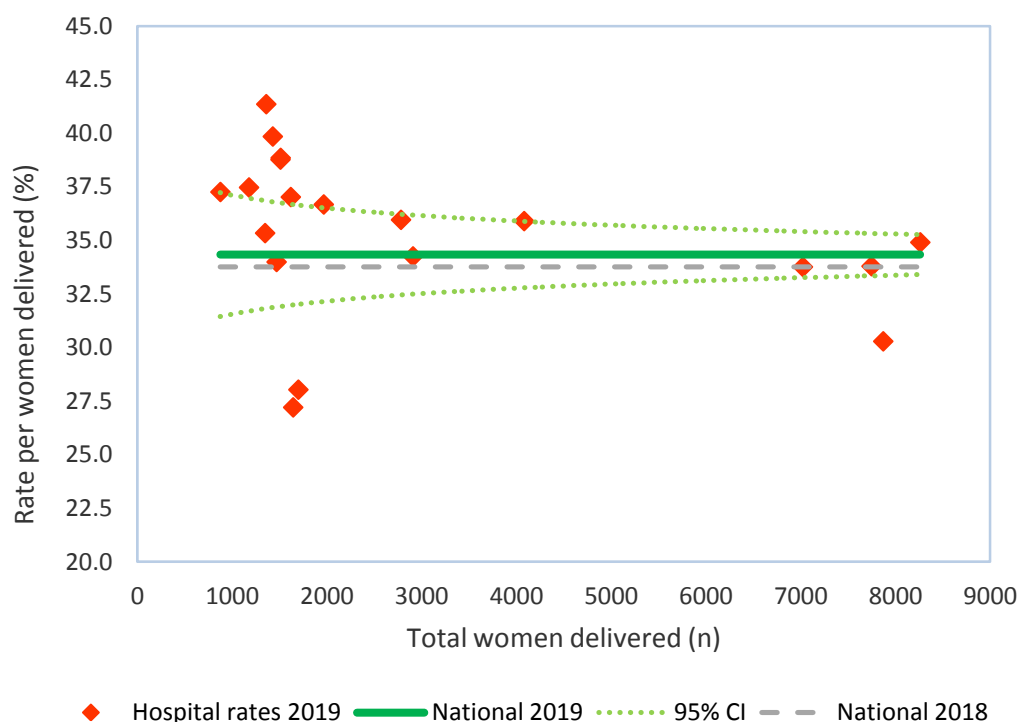
Definitions as before



| | 2018 | 2019 |
|--------------------------|-------------|-------------|
| Rate (% multiparas) | 26.5% | 27.2% |
| 95% CI | 26.1%–27.0% | 26.7%–27.6% |
| Range | 15.8%–32.4% | 17.8%–32.7% |
| IOL among multiparas (n) | 9,789 | 9,686 |
| Total multiparas (n) | 36,934 | 35,681 |

Total Caesarean section (#39)

Definition Number of women during the current month giving birth by Caesarean section (CS), including elective classical Caesarean section, emergency classical Caesarean section, elective lower segment Caesarean section, and emergency lower segment Caesarean section.



| | 2018 | 2019 |
|--------------------------------|-------------|-------------|
| Rate (% total women delivered) | 33.8% | 34.3% |
| 95% CI | 33.4%–34.1% | 34.0%–34.7% |
| Range | 26.4%–42.2% | 27.2%–41.4% |
| Total CS (n) | 20,249 | 20,006 |
| Total women delivered (n) | 59,981 | 58,272 |

Note:

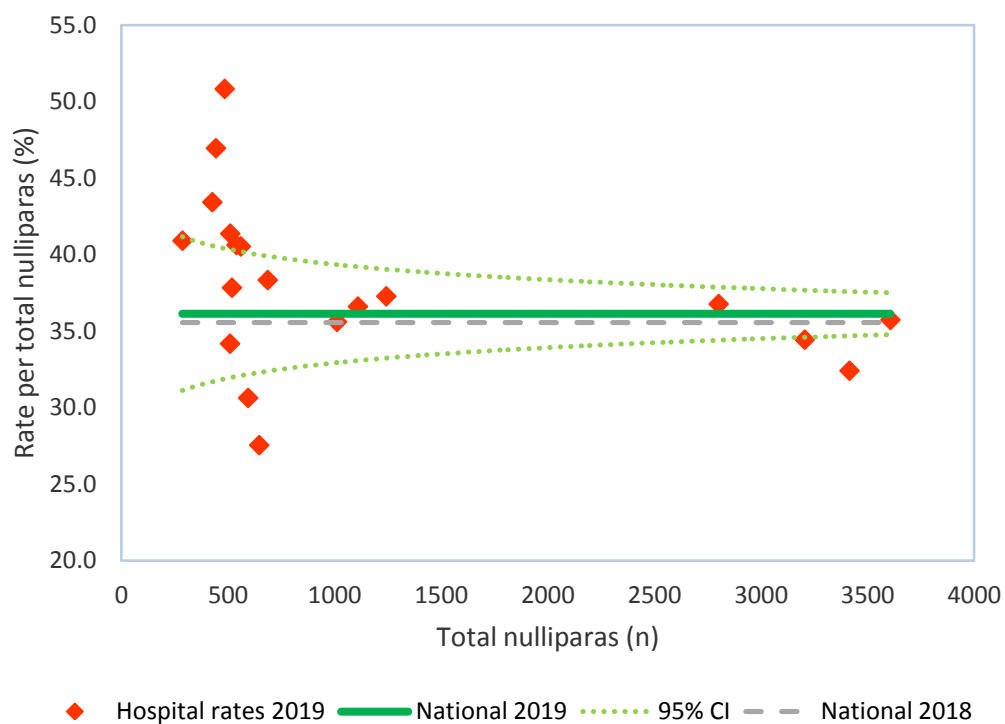
The rate of CS in 2019 was 1.5% higher than 2018, continuing the upward trend of recent years (see Appendix 11). There was considerable variation in CS rates across maternity units in 2019, ranging from approximately 27% to 41%. In terms of the increasing rates and variation across hospitals, research indicates Ireland is largely similar to other jurisdictions.¹⁴

¹⁴ Betrán AP, Ye J, Moller AB, et al. 2016. The Increasing Trend in Caesarean Section Rates: Global, Regional and National Estimates:

1990-2014. PlosOne <https://doi.org/10.1371/journal.pone.0148343>

CS among nulliparas (#39a)

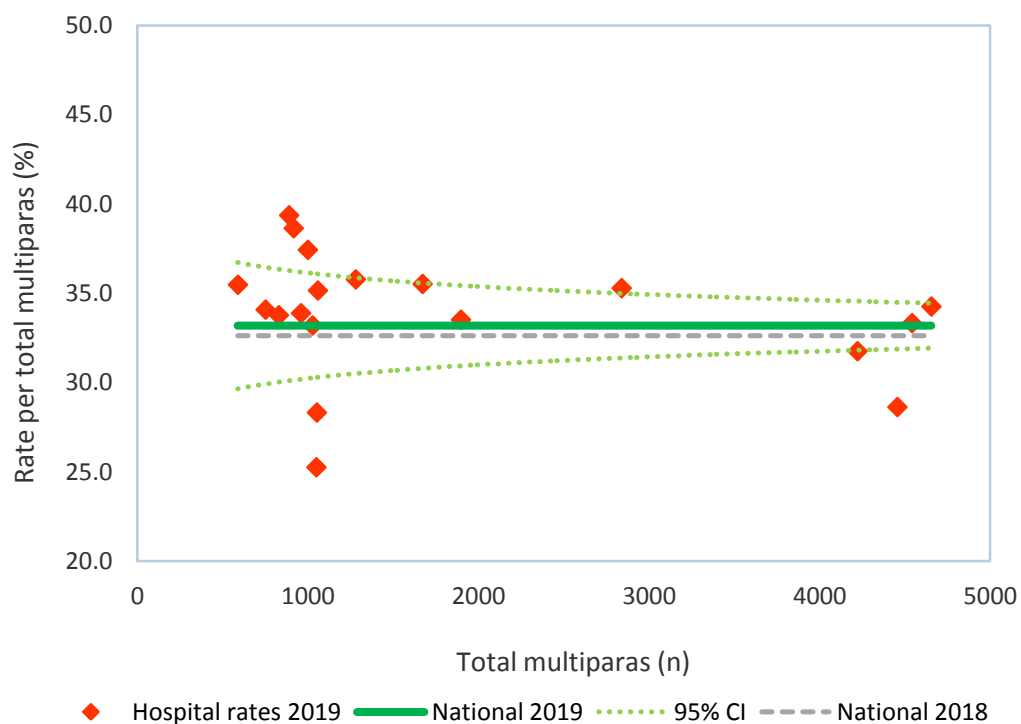
Definitions as before



| | 2018 | 2019 |
|--|-------------|-------------|
| Rate (% nulliparas) | 35.6% | 36.1% |
| 95% CI | 35.0%–36.2% | 35.5%–36.8% |
| Range | 26.6%–48.8% | 27.6%–50.8% |
| CS among nulliparas (n) | 8,196 | 8,165 |
| Total nulliparas (n) | 23,047 | 22,591 |
| Note: | | |
| It is notable that at one maternity unit in 2019, more than half of women having their first baby had a CS delivery. | | |

CS among multiparas (#39b)

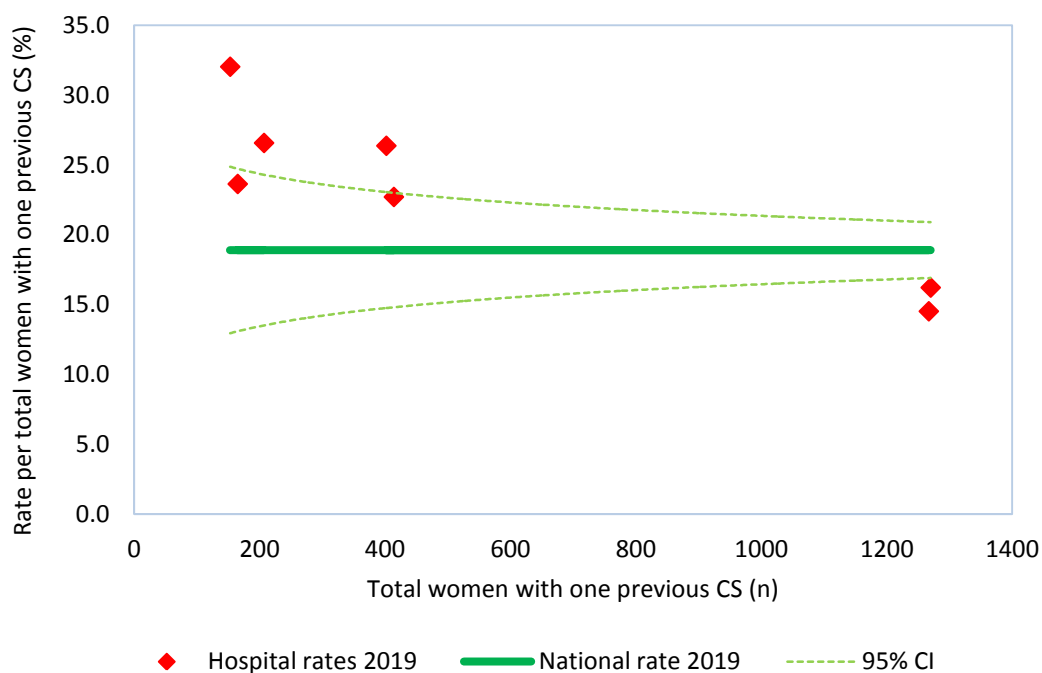
Definitions as before



| | 2018 | 2019 |
|-------------------------|-------------|-------------|
| Rate (% multiparas) | 32.6% | 33.2% |
| 95% CI | 32.2%–33.1% | 32.7%–33.7% |
| Range | 26.2%–38.6% | 25.3%–39.4% |
| CS among multiparas (n) | 12,053 | 11,840 |
| Total multiparas (n) | 36,934 | 35,681 |

VBAC (#40)

Definition Delivery through the birth canal in a pregnancy subsequent to one in which delivery was by Caesarean section (VBAC). The previous CS may or may not have been directly prior to the current pregnancy.



| | 2018 | 2019 |
|---|------|-------------|
| Rate (% women with one previous CS) | N/A | 18.9% |
| 95% CI | N/A | 17.7%–20.1% |
| VBAC (n) | N/A | 733 |
| Total women with one previous CS (n) | N/A | 3,878 |
| <i>Missing cases=Data from 12 maternity hospitals/units</i> | | |
| Note: Collected on the IMIS for the first time in 2019, there was considerable missing data on this metric and/or on the denominator (total women with one previous CS). Corrective steps are being taken at all units to ensure data completion in 2020. | | |

Appendices

Appendix 1: Acknowledgements

IMIS Officers/Teams in maternity units:

Karen Malocca, Rukhsana Majeed, Ann Arnott, Margaret Mulvany,
Cavan General Hospital
Claire Everard, Cork University Maternity Hospital
Julie Sloane, Emma McNamee, Coombe Women & Infants University Hospital
Claire Shannon, Our Lady of Lourdes Hospital, Drogheda
Anne-Marie Grealish, Claire Greaney, Galway University Hospital
Mary Stack-Courtney, Mairéad Griffin, Sandra O'Connor, University Hospital Kerry
Connie McDonagh, Fiona Dalton, Paula Power, St Luke's Hospital, Kilkenny
Evelyn Smith, Eileen Egan, Marion Doogan, Mary Lynch, Letterkenny University Hospital
Stephen Culligan, University Maternity Hospital Limerick
Andrea McGrail, Mayo General Hospital, Castlebar
Marie Corbett, Midland Regional Hospital, Mullingar
Fionnuala Byrne, National Maternity Hospital, Dublin
Priscilla Neilan, Melinda O'Rourke, Portiuncula University Hospital
Ita Kinsella, Eithne Whelan, Midland Regional Hospital, Portlaoise
Kathy Conway, Rotunda Hospital, Dublin
Juliana Henry, Niamh McGarvey, Colette Kivlehan, Sligo University Hospital
Sinéad Heaney, South Tipperary General Hospital
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Helen McLoughlin, Wexford General Hospital

Advisory Subgroup:

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Mr Alan Cahill, Department of Health (from 2014)
Ms Deirdre Carey, HSE (until 2017)
Ms Anne Gallen, HSE Nursing & Midwifery Planning and Development Unit
Dr Howard Johnson, HSE Health Intelligence Unit
Ms Aoife Lawton, HSE
Dr John Loughrey, Consultant Anaesthetist, Rotunda Hospital
Dr Bob McDonnell, HSE Health Intelligence Unit (until 2017)
Dr Hugh Magee, Department of Health (2013-14)
Dr Jennifer Martin, HSE (until 2015)

Appendix 2: IMIS data collection instrument (2019)

| IMIS 2019 | | | Previous year | | Current year | |
|---------------------|-----|---|---------------|-----|--------------|-----|
| | | | Month | YTD | Month | YTD |
| DEMOGRAPHICS | 1. | Total women delivered (n) | | | | |
| | 2. | Total nulliparas (n) | | | | |
| | 3. | Total multiparas (n) | | | | |
| | 4. | Total births (n) | | | | |
| | 5. | Total live births (n) | | | | |
| | 6. | Total multiple births (n) | | | | |
| | 7. | Maternal death (n) | | | | |
| | 8. | Total perinatal death (n) | | | | |
| | 9. | Adjusted perinatal death (n) | | | | |
| HOSPITAL ACTIVITIES | 10. | EPAU first visits (n) | | | | |
| | 11. | Maternal transfers (n) | | | | |
| | 12. | In-utero transfers admitted (n) | | | | |
| | 13. | In-utero transfers sent out (n) | | | | |
| NEONATAL METRICS | 14. | Brachial plexus palsy (n) | | | | |
| | 15. | Neonatal encephalopathy (n) | | | | |
| | 16. | Whole body neonatal cooling (n) | | | | |
| BREASTFEEDING | 17. | BF initiated (n) | | | | |
| | 18. | BF exclusively on discharge (n) | | | | |
| | 19. | BF non-exclusively on discharge (n) | | | | |
| LABORATORY | 20. | Maternal bacteraemia (n) | | | | |
| | 21. | Neonatal bacteraemia (n) | | | | |
| | 22. | Obstetric blood transfusions (n) | | | | |
| OBSTETRIC RISKS | 23. | Maternal sepsis (n) | | | | |
| | 24. | Ectopic pregnancy (n) | | | | |
| | 25. | Eclampsia (n) | | | | |
| | 26. | Uterine rupture (n) | | | | |
| | 27. | Peripartum hysterectomy (n) | | | | |
| | 28. | Pulmonary embolism (n) | | | | |
| | 29. | Perineal tears (3 rd / 4 th degree) (n) | | | | |
| | 30. | PPH vaginal delivery (n) | | | | |
| | 31. | PPH Caesarean section (n) | | | | |
| | 32. | Miscarriage misdiagnosis (n) | | | | |
| | 33. | Retained swabs (n) | | | | |
| | 34. | Episiotomy (n) | | | | |
| DELIVERIES | 35. | General anaesthetic for CS (n) | | | | |
| | 36. | Labour epidural (n) | | | | |
| | 37. | Operative vaginal delivery (n) | | | | |
| | 38. | Induction of labour (n) | | | | |
| | 39. | Caesarean section (n) | | | | |
| | 40. | VBAC (n) | | | | |

Appendix 3: IMIS Implementation Guidelines

1. The IMIS is designed to capture and measure clinical activities in the maternity unit. It is intended for within-hospital use: the data will be collected by hospital staff within the maternity hospital/unit and reviewed by senior hospital managers.
2. The IMIS should be based entirely on data sourced directly from maternity units.
3. Monthly completion of the IMIS is mandatory for the 19 maternity units.
4. The IMIS is approved by the National Implementation Group HSE/HIQA Maternity Services Investigations and is aligned with national recommendations in the Investigation Report of the HSE National Incident Management Team (2012); HIQA Investigation Report (2012); Report of Chief Medical Officer on Perinatal Deaths 2006-date (February 2014), Safety Incident Management Policy (June 2014), Review by Dr Peter Boylan (June 2015), the National Maternity Strategy 2016-2026, and the HSE Maternity Clinical Complaints Review (May 2016).
5. The Quality Assurance (QA) Officers in all 19 maternity units were nominated to work part-time on implementing the IMIS; the QA Officer should have access to maternity hospital/unit data files and should be accustomed to dealing with data within the hospital/unit.

IMIS Monthly data collection and reporting

6. The reporting period is the calendar month (i.e., from first to last day of the month).
7. The monthly report should be completed by the 20th day of the following month.
8. The QA Officer should send a monthly IMIS report to senior managers in the hospital/unit:
 - Chief Executive Officer or Master
 - Clinical Director(s), as appropriate
 - Director of Midwifery/Nursing
9. The senior managers should review the monthly IMIS. If they have concerns arising from the IMIS, these should be discussed with the clinical staff and, if appropriate, reported to the Hospital Board or equivalent. In the event of concerns with national implications arising, these should be reported to the head of HSE Acute Hospitals Division via NWIHP.

IMIS Annual reporting

10. The annual IMIS data should be completed by **end of February** of the following year.
11. The QA Officer should send the annual IMIS data to the following people:
 - a) Senior managers of the hospital (as above)
 - b) NWIHP Programme Director
 - c) IMIS Project Manager
12. Staff at the NWIHP will check and verify annual data in collaboration with staff at maternity hospitals/units.
13. The NWIHP will prepare IMIS reports and disseminate to maternity hospitals/units and relevant organisations.
14. If senior managers of the hospitals have concerns arising from the annual IMIS data, these should be discussed and escalated as above.
15. Reviews of the IMIS format will be conducted by the NWIHP and changes introduced on an annual basis.

Appendix 4: National recommendations

There follows an outline of the relevant national recommendations and initiatives produced since June 2013, which align with and support the IMIS as a management instrument for quality improvement in maternity services.

1. HSE NIMT Recommendations, Incidental factor 1 (June 2013)

‘The review team recommends consideration of a National Quality Assurance Programme of Obstetrics and Gynaecology as an initial step to maintain confidence amongst patients/services users, staff, the public administrators and regulators and to put into place safety systems and interventions before a catastrophe happens. Monthly workloads, clinical outcomes, and adverse incidents should be monitored by using a dashboard to include green, amber and red signals to warn of the possibilities of impending problems.’ (HSE, June 2013).

2. HIQA National Recommendations (October 2013)

In October 2013, the HIQA produced national statutory recommendations, two of which refer directly to quality assurance in the maternity services.

‘The HSE and key stakeholders should agree and implement effective arrangements for consistent, comprehensive national data collection for maternity services in order to provide assurance about the quality and safety of maternity services. This should include the development of an agreed and defined dataset and standardised data definitions to support performance monitoring, evaluation and management of key patient outcome and experience indicators.’ (National Recommendation N16)

‘The arrangements for collecting, reviewing and reporting maternal morbidity and mortality should be reviewed by the HSE to facilitate national and international benchmarking for improved learning and safety in the provision of maternity services. This should include a formal process for the implementation of recommendations of the Confidential Maternal Death Enquiries.’ (National Recommendation N17)

3. HSE Midland Regional Hospital, Portlaoise, Report of Chief Medical Officer on Perinatal Deaths 2006-date (2014):

In February 2014, Dr Tony Holohan, Chief Medical Officer, reported to the Minister for Health Dr James Reilly TD, about perinatal deaths in Portlaoise. The report contained a list of recommendations, several of which are relevant to quality and safety (and measurement) in the maternity services and which led to the development (by the HSE Acute Hospitals Division, the Clinical Programme in Obstetrics and Gynaecology, the HSE Quality Assurance and Verification Division, and the HSE Quality Improvement Division) in May 2015 of the Maternity Patient Safety Statement (MPSS). The MPSS is intended to be a monthly statement on the quality of care in maternity units. It is based on the design of the IMIS and uses 16 IMIS indicators.

Theme IV recommendations:

- The HSE should issue a directive to all providers to require them to notify the director of quality and patient safety and HIQA of all 'never events' (R.21)
- The HSE should ensure that every maternity service (and later every health service provider) should be required to complete a Patient Safety Statement which is published and updated monthly (R.22) (O.R.10)

Overall recommendations:

- Every maternity service (and later every health service provider) be required to complete a Patient Safety Statement which is published and updated monthly (O.R.10)
- The Patient Safety Statement should be a requirement of hospital licensing (R.23) (O.R.10)
- A National Patient Safety Surveillance system should be established by HIQA (O.R.11)

4. HSE NIMT, Safety Incident Management Policy (June 2014)

In June 2014, the HSE National Incident Management Team drafted the Safety Incident Management Policy, which was approved by Dr Philip Crowley, National Director Quality and Patient Safety, HSE. The purpose of the document is to set out the HSE policy for managing safety incidents across a range of areas, including surgical events, product or device events, patient protection events, care management events, environmental events, and criminal events. Several of the Serious Reportable Events (SRE) are relevant to maternity services.

5. HIQA Report of the investigation into the safety, quality and standards of services provided by the Health Service Executive to patients in the Midland Regional Hospital, Portlaoise (May 2015)

Recommendation 6c: 'The Health Service Executive (HSE), along with the chief executive officers of each hospital group, must ensure that the new hospital groups prioritise the development of strong clinical networks underpinned by regular evaluation and audit of the quality and safety of services provided.'

6. Boylan P. Report, 'A Review of 28 Maternity Case Notes' (June 2015)

Recommendation: 'Each hospital in the State should implement a formal system of audit of pregnancy outcome classified according to the Ten Groups Classification as recently endorsed by the WHO. This audit should take place on a monthly basis and involve all relevant clinicians. Each hospital needs to supply relevant administrative support.' [...] 'Using data from individual maternity units, an annual audit of Irish maternity services should be implemented without delay.' [...] 'Ongoing audit in this manner will allow a pattern of adverse outcomes to be identified in a timely fashion so that appropriate action can be taken.'

7. 'Creating a better future together', National Maternity Strategy 2016-2026 (2017)

Action: Measurement and analysis for quality improvement and safety will occur at national, network and service level, based on an agreed minimum dataset (Action 4.14.5).

8. HSE Maternity Clinical Complaints Review (May 2017)

The final report of the Maternity Clinical Complaints Review concluded a review process commissioned by the HSE in 2014. The report reviewed complaints received from patients and their families and outlined recommendations for all maternity services nationally.

Recommendation: 'External oversight should be provided in order to assure the public of the quality of maternal services. The National Women and Infants Health Programme (NWIHP) should develop a model to ensure external oversight is applied across each hospital group. The Irish Maternity Indicator System (IMIS) currently provides information for local scrutiny of clinical maternity activity. The NWIHP will expand the role of IMIS to provide for Group and National level oversight, as well as local.'

9. HSE National Maternity Strategy Implementation Plan (October 2017)

Developed by the National Women and Infants Health Programme (NWIHP) in 2017, the Implementation Plan stipulates that the IMIS will be the agreed measurement instrument for quality improvement and safety at national, network and service level and the IMIS will form part of the standing agenda for monthly meetings with the maternity networks.

Appendix 5: IMIS data and methods

Data

The IMIS 2019 data were provided by nominated IMIS data officers at all maternity hospitals/units, following review and approval by hospital senior management. They were checked and verified by the NWIHP and NCPOG in collaboration with the IMIS data officers. Comparative national data for the national longitudinal trends were drawn from the National Perinatal Reporting System (NPRS),¹⁵ obtained from the HSE, and the Hospital In-Patient Enquiry system (HIPE).¹⁶

Methods

The IMIS data are analysed using MS Excel. National rates are calculated for all maternity units and hospital-level rates are calculated for each unit individually. Confidence intervals at 95% levels are calculated and customised funnel charts designed for the IMIS indicators.

Funnel charts

Funnel plots are a form of scatter plot in which observed area rates are plotted against area populations. Control limits are then overlaid on the scatter plot. The control limits represent the expected variation in rates assuming that the only source of variation is stochastic (i.e., including a random variable). The control limits are computed in a fashion very similar to confidence limits and exhibit the distinctive funnel shape as a result of smaller expected variability in larger populations.

Funnel plots are useful where observations for different hospitals are based on varying sample sizes. The funnel-shaped confidence limits indicate that, as sample sizes decrease, an observation must be further from the national rate to be considered significantly different. The purpose of the charts is to enable each maternity unit to observe their position relative to the national benchmark and the upper and lower control limits.

Caution is advised where small values are concerned.

Maternity hospitals/units lying beyond the confidence limits on the funnel plots may be considered in a 'warning' sector. However, since no statistical analysis has been conducted to take formal account of the multiple characteristics that are not shown in the funnel plot, in this report crossing a threshold does not indicate high or low 'quality'. We recommend senior managers at maternity units should investigate the reasons for variations at the hospital level before action is taken.

Several funnel plots in this report show evidence of a phenomenon known as overdispersion (Spiegelhalter 2005).¹⁷ This overdispersion is not an unusual phenomenon in health data and, in fact, can be useful in model specification (Birkmeyer 2001).¹⁸ Overdispersion occurs when a greater level of variability is demonstrated than can be explained by chance and the existence of a small number of outlying maternity hospitals/units.

Potential explanations for overdispersion are differences in data quality, lack/limitations of risk adjustment, and clinical uncertainty. Given that no risk adjustment has been executed in the

15 The NPRS provides national statistics on perinatal events based on approximately 70,000 birth records each year from 19 maternity units and all practicing self-employed community midwives.

16 The HIPE provides demographic, administrative, and clinical data on inpatient and day-case discharges from publicly-funded acute hospitals in Ireland.

17 Spiegelhalter DJ. (2005). Handling over-dispersion of performance indicators. *Qual Saf Health care* 14: 347–51.

18 Birkmeyer JD. (2001). Primer on geographic variation in health care. *Effective Clinical Practice* 4(5): 232–33.

analysis presented in this report, it is likely that these are the underlying reasons for much of the systematic variation between units. Consequently, it would be premature to draw conclusions from the charts alone about whether differences in the patterns of maternity care provision reflect differences in quality.

To compensate for the absence of statistical risk adjustment, notes are provided after the funnel charts. These notes contain crucial details that inform or explain the results. They are based on clinical expertise and hospital management experiences. The notes contribute explanations of the annual hospital rates where they lie above or below the national rates and, particularly, where they lie beyond the confidence limits.

Interpreting a funnel plot:

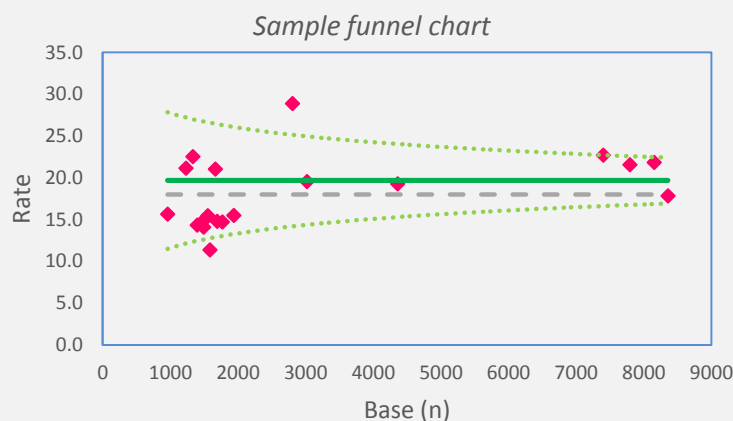
Diamond-shaped markers represent the 19 maternity hospitals/units.

The horizontal axis represents the base number (in most charts, the base is the number of total births or total maternities). The diamonds further to the right are maternity units with more births/maternities.

The vertical axis measures the frequency of the outcome, usually expressed as a percentage rate or rate per 1,000 women delivered or births. The diamonds placed higher up on the chart represent maternity units with higher rates of an outcome.

The solid horizontal green line shows the national rate in the current year. The horizontal dotted line shows the national rate in the previous year.

The dotted curved green lines constitute the statistical reference range or 95% confidence limits for the current year. The reference range defines what is regarded as the 'normal', or typical, range. Anything beyond the range is regarded as abnormal or non-standard. The reference range allows us to say that if the true value of the parameter lies beyond the 95% confidence limits, then an event has occurred which had a probability of 5% (or less) of happening by chance alone.



Appendix 7: Maternity hospitals/units in Republic of Ireland (n=19)



Appendix 8: HSE Maternity Networks

| | |
|----------------------------|---|
| Ireland East | National Maternity Hospital, Dublin (NMH) Midland Regional Hospital Mullingar (MRHM) St Luke's General Hospital, Kilkenny (SLK) Wexford General Hospital |
| RCSI | Rotunda Hospital, Dublin Cavan General Hospital Our Lady of Lourdes Hospital, Drogheda (LOL) |
| Dublin Midlands | Coombe Women and Infants University Hospital, Dublin (CWIUH) Midland Regional Hospital Portlaoise (MRHP) |
| University Limerick | University Maternity Hospital Limerick (UMHL) |
| South/South West | Cork University Maternity Hospital (CUMH) South Tipperary General Hospital (STGH) University Hospital Kerry (UHK) University Hospital Waterford (UHW) |
| Saolta | University Hospital Galway (UHG) Letterkenny University Hospital (LUH) Mayo University Hospital (MUH) Portiuncula University Hospital (PUH) Sligo University Hospital (SUH) |

Appendix 9: Relevant data sources/agencies

The following offices collect and provide health- and hospital-related data, including data on maternity and perinatal activities, in ROI:

- BNF01** Birth Notification Form
Four-part form completed by staff at maternity hospitals/units for each live birth and stillbirth and returned to the HPO for distribution to CSO, GRO, and NPRS.
- CSO** Central Statistics Office
Ireland's national statistical office provides vital statistics, including births, stillbirths, and deaths.
- GRO** General Register Office
Central civil repository for records including births, stillbirths, and deaths in Ireland.
- HIPE** Hospital In-Patient Enquiry system
A health information system designed to collect demographic, clinical, and administrative data on hospital day cases and in-patients as well as deaths from acute hospitals nationally. The HIPE is the only source of morbidity statistics available nationally for acute hospital services. All acute public hospitals participate in HIPE, reporting on over 1.5 million records annually.
- IMIS** Irish Maternity Indicator System
The IMIS is a standardised data-based management tool for individual maternity hospitals/units and national analysis. Data are collected and reviewed monthly. National reports are published annually.
- MPSS** Maternity Patient Safety Statement
Initiated by the Department of Health, the MPSS is published for all maternity hospitals/units on a monthly basis and is intended to provide assurance that maternity services are delivered in an environment that promotes open disclosure.
- NPEC** National Perinatal Epidemiology Centre, University College Cork
The NPEC collaborates with maternity services and publishes annual data on perinatal mortality and severe maternal morbidity using a range of research methodologies and drawing on the HIPE data.
- NPRS** National Perinatal Reporting System
Based on data derived from the BNF01, the NPRS provides national statistics on perinatal events, in particular data on pregnancy outcomes, perinatal mortality, and important aspects of perinatal care.
- NWIHP** National Women and Infants Health Programme
Established in 2017, the NWIHP leads the management, organisation, and delivery of maternity, gynaecology and neonatal services in line with the National Maternity Strategy. The NWIHP is overseeing development of maternity networks and has responsibility for allocating development funding for maternity services.

Appendix 10: Glossary and Abbreviations

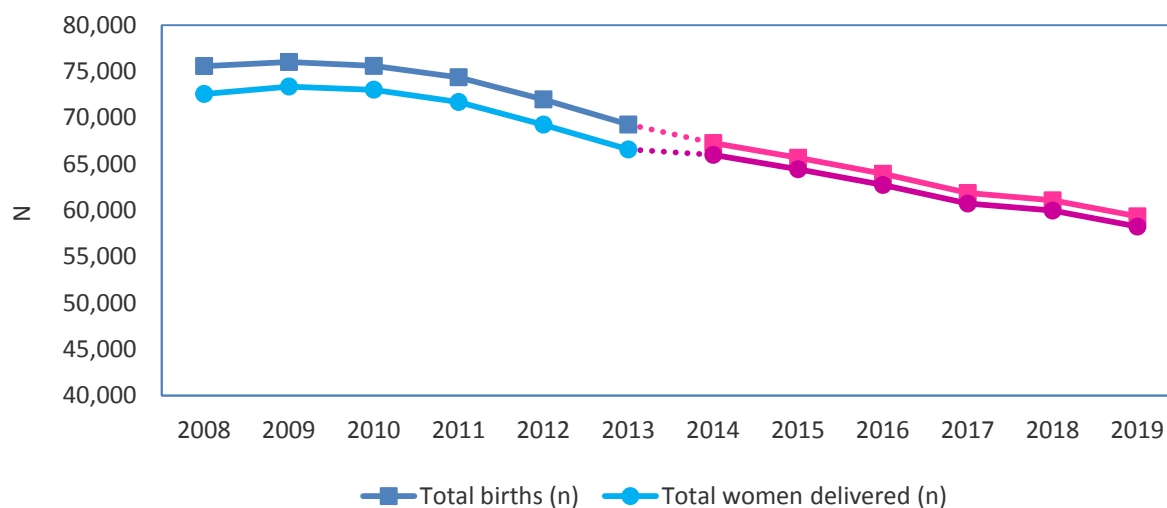
| | |
|-------|--|
| ACHI | Australian Classification of Health Interventions |
| BPP | Brachial plexus palsy |
| CA | Congenital anomaly |
| CS | Caesarean section |
| ECDC | European Centre for Disease Prevention and Control |
| EPAU | Early Pregnancy Assessment Units |
| GA | General anaesthetic |
| HIE | Hypoxic ischaemic encephalopathy |
| HIPE | Hospital In-Patient Enquiry system |
| HIQA | Health Information and Quality Authority |
| HPO | Healthcare Pricing Office |
| HSE | Health Services Executive |
| ICD | International Classification of Diseases |
| IMIS | Irish Maternity Indicator System |
| IOL | Induction of labour |
| NCG | National Clinical Guideline |
| NCPOG | National Clinical Programme for Obstetrics and Gynaecology |
| NE | Neonatal encephalopathy |
| NPEC | National Perinatal Epidemiology Centre |
| NPRS | National Perinatal Reporting System |
| NWIHP | National Women and Infants Health Programme |
| OVD | Operative vaginal delivery |
| PPH | Postpartum haemorrhage |
| QA | Quality Assurance |
| WBNC | Whole body neonatal cooling |
| WHO | World Health Organisation |

Appendix 11: National longitudinal trends, 2008-2019

1. Total women delivered and Total births

Total women delivered: Number of women delivering a baby weighing ≥ 500 g.

Total births: Total number of births weighing ≥ 500 grams (in accordance with WHO guidelines), including both live births and stillbirths, occurring during the current month.



| | NPRS | | | | | | IMIS | | | | | |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Births | 75587 | 76023 | 75600 | 74377 | 71986 | 69267 | 67263 | 65680 | 63964 | 61902 | 61084 | 59352 |
| Women | 72574 | 73373 | 73032 | 71705 | 69263 | 66574 | 65987 | 64435 | 62736 | 60744 | 59981 | 58272 |

Sources: NPRS Annual Report 2013, IMIS 2014-2019

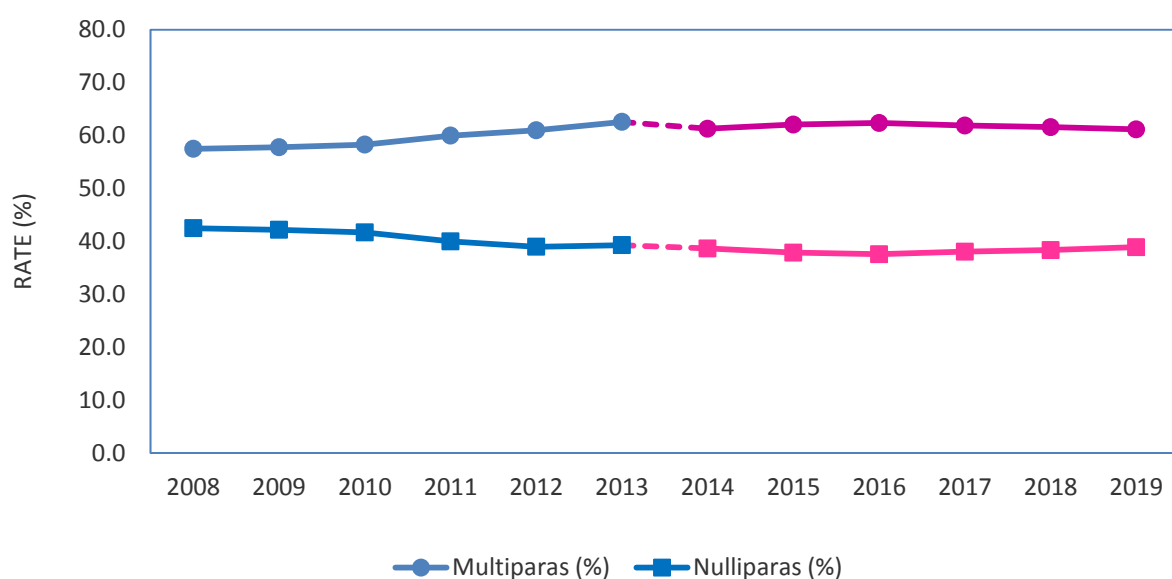
% changes (compared with national birth rates (Source: CSO)

| | Total women (Sig.) | Total births (Sig.) |
|--------------------------|-----------------------|-----------------------|
| 2008 vs 2019 (NPRS/IMIS) | -19.7% ($p < 0.05$) | -19.7% ($p < 0.05$) |
| 2014 vs 2019 (IMIS) | -11.7% ($p < 0.05$) | -11.8% ($p < 0.05$) |
| 2018 vs 2019 (IMIS) | -2.8% ($p < 0.05$) | -2.8% ($p < 0.05$) |

2. Total nulliparas and Total multiparas

Nulliparas: Number of women delivering a baby $\geq 500\text{g}$ who have never had a previous pregnancy resulting in a live birth or stillbirth.

Multiparas: Number of women delivering a baby $\geq 500\text{g}$ who have had at least one previous pregnancy resulting in a live birth or stillbirth.



| | NPRS | | | | | | IMIS | | | | | |
|------------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Multiparas | 57.5 | 57.8 | 58.3 | 60.0 | 61.0 | 62.6 | 61.3 | 62.1 | 62.4 | 61.9 | 61.6 | 61.2 |
| Nulliparas | 42.5 | 42.2 | 41.7 | 40.0 | 39.0 | 39.3 | 38.7 | 37.9 | 37.6 | 38.1 | 38.4 | 38.8 |

Sources: NPRS Annual Report 2013, IMIS 2014-2019

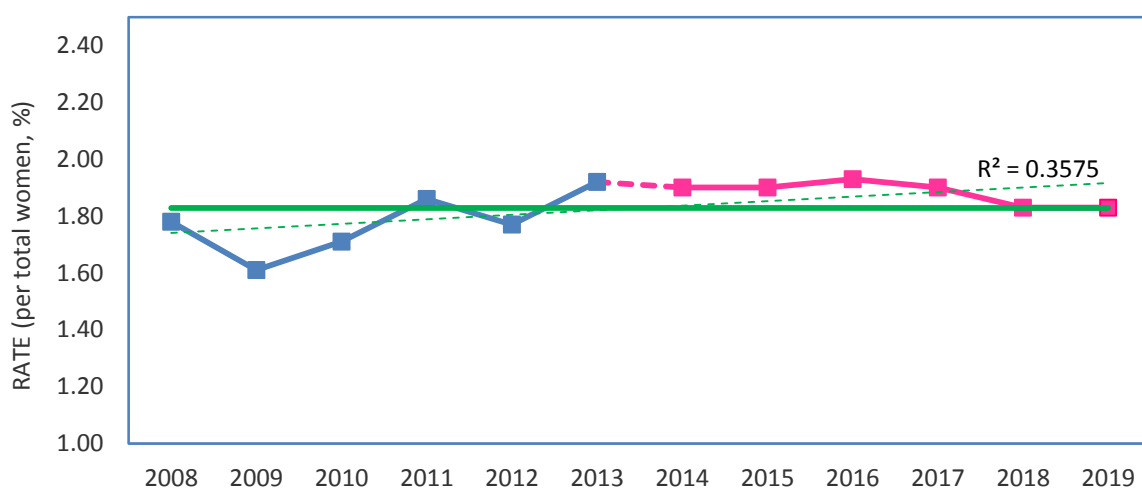
% changes (Sig.)

| | Multiparas | Nulliparas |
|--------------------------|---------------------|----------------------|
| 2008 vs 2019 (NPRS/IMIS) | 6.5% ($p < 0.05$) | -8.8% ($p < 0.05$) |
| 2014 vs 2019 (IMIS) | -0.1% (<i>ns</i>) | 0.2% (<i>ns</i>) |
| 2018 vs 2019 (IMIS) | -0.6% (<i>ns</i>) | 0.9% (<i>ns</i>) |

3. Multiple births

Definition:

Number of multiple births, based on the number of women with multiple births (not the number of babies delivered by women with multiple pregnancies) occurring during the current month. A multiple birth results when more than one baby is born from a single pregnancy.



| | NPRS | | | | | | IMIS | | | | | |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Multiple births (%) | 1.78 | 1.61 | 1.71 | 1.86 | 1.77 | 1.92 | 1.93 | 1.90 | 1.93 | 1.90 | 1.83 | 1.83 |

Sources: NPRS Annual Report 2013, IMIS 2014-2019

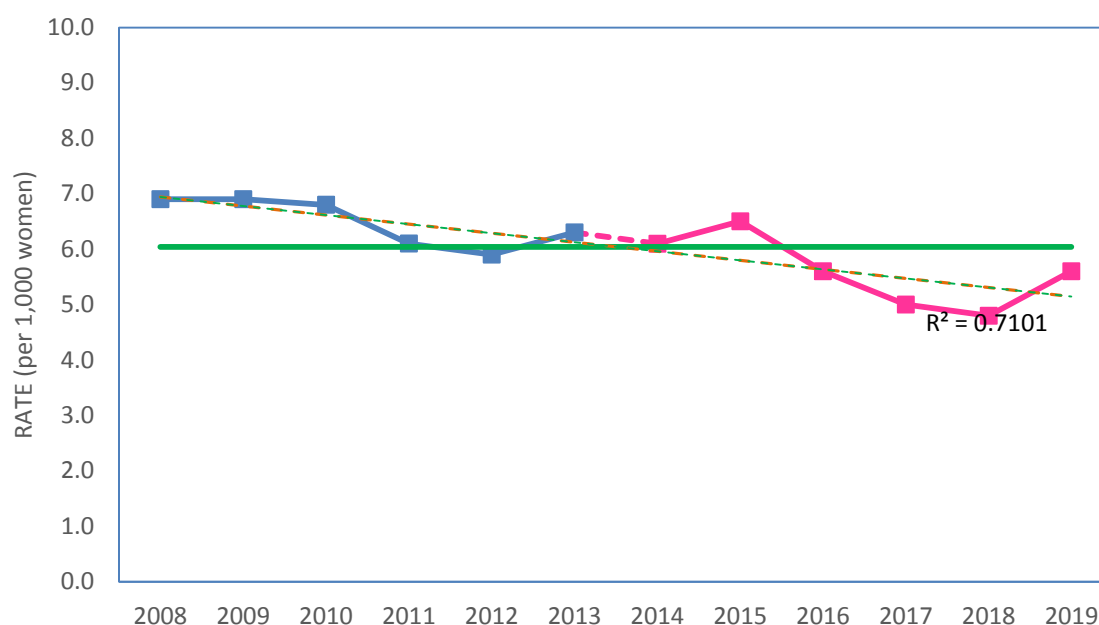
| | % changes (Sig.) |
|---------------------------|------------------|
| 2008 vs 2019 (NPRS/IMIS): | 3.03% (ns) |
| 2014 vs 2019 (IMIS): | -3.64% (ns) |
| 2018 vs 2019 (IMIS): | 0.03% (ns) |

4. Total perinatal death rate (IMIS) and Perinatal mortality rate (NPRS)

Definitions

IMIS: Number of deaths, including stillbirths and early neonatal deaths from delivery to six completed days occurring during the current month. A stillbirth in this report refers to the death of a fetus weighing $\geq 500\text{g}$, irrespective of duration of pregnancy; an early neonatal death refers to the death of a live born infant during the first seven days of life. This metric is not adjusted to exclude congenital anomalies.

NPRS: Perinatal deaths include stillbirths and early neonatal deaths. Fetal death is defined as death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy. An early neonatal death refers to the death of a live born infant during the first week of life.



| | NPRS | | | | | | IMIS | | | | | |
|----------------------------|---|------|------|------|------|------|--|------|------|------|------|------|
| Rate calculations: | (Number of Stillbirths + Early Neonatal Deaths/ Total Live Births and Stillbirths) x 1,000. | | | | | | (Number of stillbirths + early neonatal deaths/Total births) x 1000. | | | | | |
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| PMR / Perinatal death rate | 6.9 | 6.9 | 6.8 | 6.1 | 5.9 | 6.3 | 6.1 | 6.5 | 5.6 | 5.0 | 4.8 | 5.6 |

Sources: NPRS Annual Report 2013, IMIS 2014-2019

% changes (Sig.)

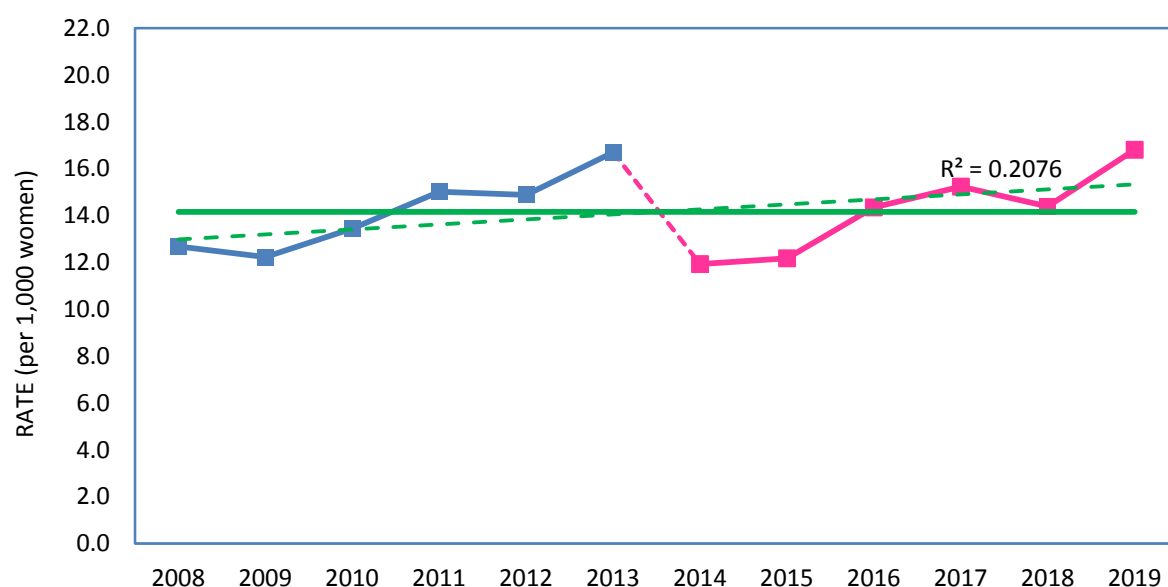
2008 vs 2019 (NPRS/IMIS): - 18.3% ($p < 0.05$)

2014 vs 2019 (IMIS): - 6.8% (*ns*)

2018 vs 2019: 16.8% (*ns*)

5. Ectopic pregnancy

Definition: Number of women diagnosed during the current month with an ectopic pregnancy, including abdominal pregnancy, tubal pregnancy, ovarian pregnancy, and other/unspecified pregnancy. Do not source data on ectopic pregnancies from the HIPE.



| | NPRS | | | | | | IMIS | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Rate* | 12.7 | 12.2 | 13.5 | 15.0 | 14.9 | 16.7 | 11.9 | 12.2 | 14.3 | 15.2 | 14.4 | 16.8 |

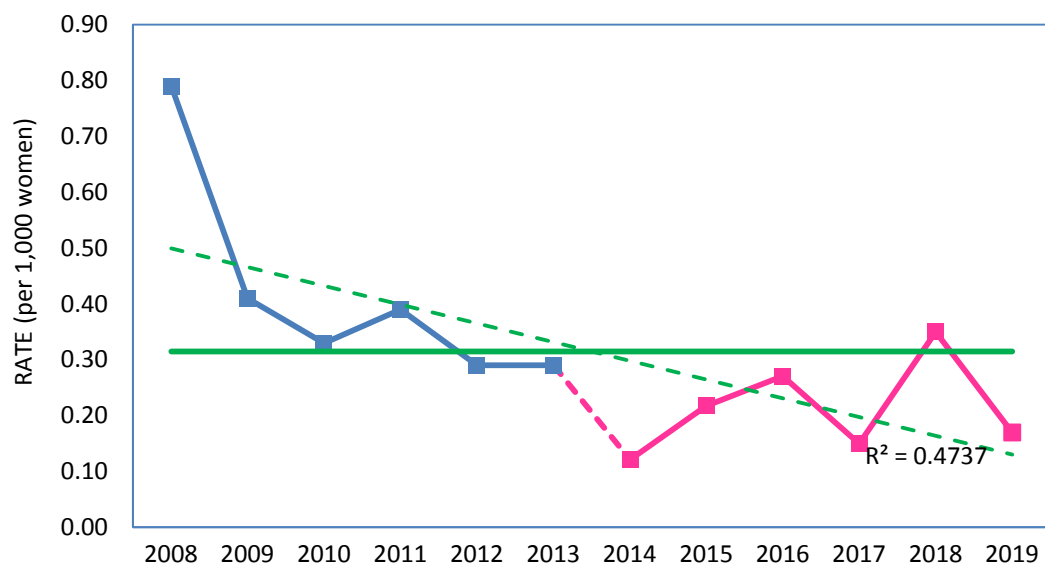
*Per 1,000 women delivered

Sources: HIPE (closed national files for 2008-2013); NPRS 2008-2013; IMIS 2014-2019

| | % changes (Sig.) |
|---------------------------------|----------------------|
| 2008 vs 2019 (HIPE/NPRS, IMIS): | 32.3% ($p < 0.05$) |
| 2014 vs 2019 (IMIS): | 41.2% ($p < 0.05$) |
| 2018 vs 2019 (IMIS): | 16.7% ($p < 0.05$) |

6. Eclampsia

Definition Number of women diagnosed during the current month with eclampsia during any antenatal hospital event or at delivery, including eclampsia in pregnancy, in labour, in the puerperium, and eclampsia unspecified as to time period. Does not include severe pre-eclampsia.



| | NPRS | | | | | | IMIS | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Rate* | 0.79 | 0.41 | 0.33 | 0.39 | 0.29 | 0.29 | 0.12 | 0.22 | 0.27 | 0.15 | 0.35 | 0.19 |

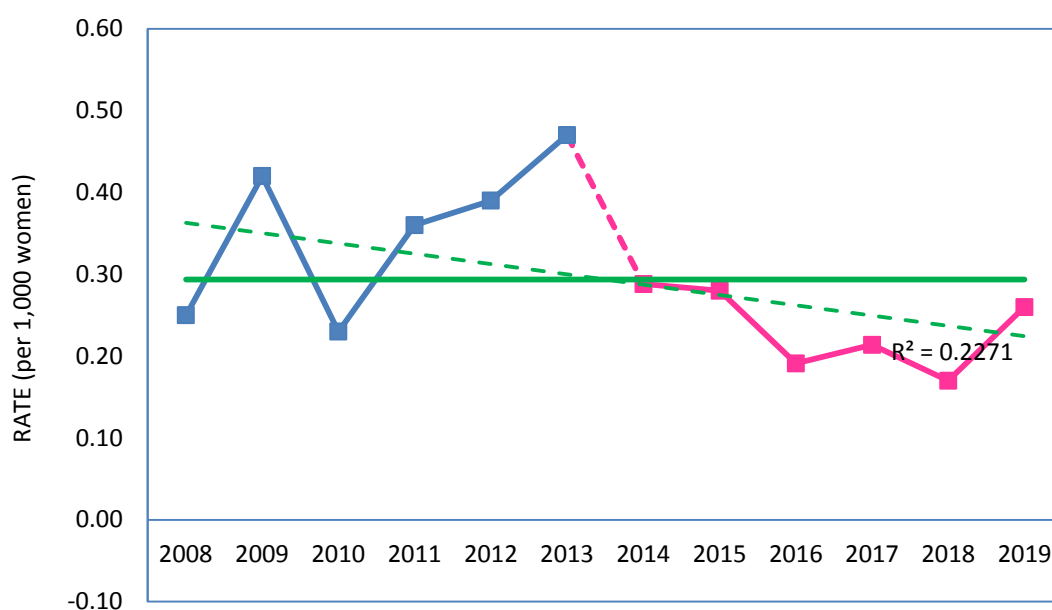
*Per 1,000 women delivered

Sources: HIPE (closed national files for 2008-2013); IMIS 2014-2019

| | % changes (Sig.) |
|---------------------------------|-----------------------|
| 2008 vs 2019 (HIPE/NPRS, IMIS): | -76.0% ($p < 0.05$) |
| 2014 vs 2019 (IMIS): | 58.3% (<i>ns</i>) |
| 2018 vs 2019 (IMIS): | -45.7% (<i>ns</i>) |

7. Uterine rupture

Definition Number of women diagnosed during the current month with rupture of uterus before onset of labour or during labour, including cases that may not be diagnosed until after delivery. The IMIS definition of uterine rupture refers to complete rupture.



| | NPRS | | | | | | IMIS | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Rate* | 0.25 | 0.42 | 0.23 | 0.36 | 0.39 | 0.47 | 0.29 | 0.28 | 0.19 | 0.21 | 0.17 | 0.26 |

*Per 1,000 women delivered

Sources: HIPE (closed national files for 2008-2013); IMIS 2014-2019

% changes (Sig.)

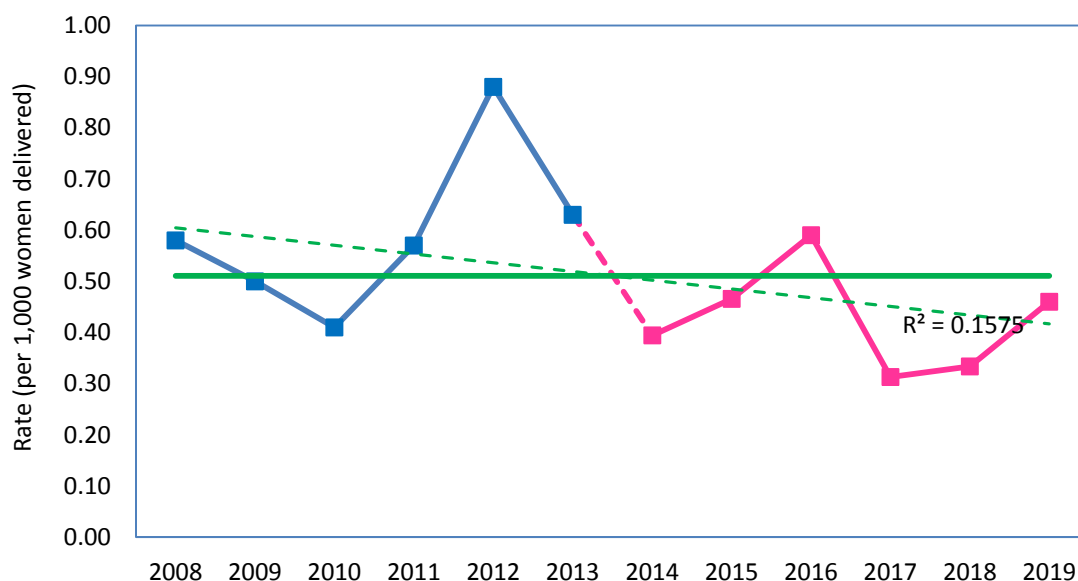
2008 vs 2019 (HIPE/NPRS, IMIS): 4.0% (ns)

2014 vs 2019 (IMIS): -10.3% (ns)

2018 vs 2019 (IMIS): 52.9% (ns)

8. Pulmonary embolism

Definition Number of women diagnosed during the current month with obstetric pulmonary emboli in pregnancy and/or the puerperium and excludes embolism complicating abortion or ectopic or molar pregnancy.



| | NPRS | | | | | | IMIS | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Rate* | 0.58 | 0.50 | 0.41 | 0.57 | 0.88 | 0.63 | 0.39 | 0.47 | 0.59 | 0.31 | 0.33 | 0.45 |

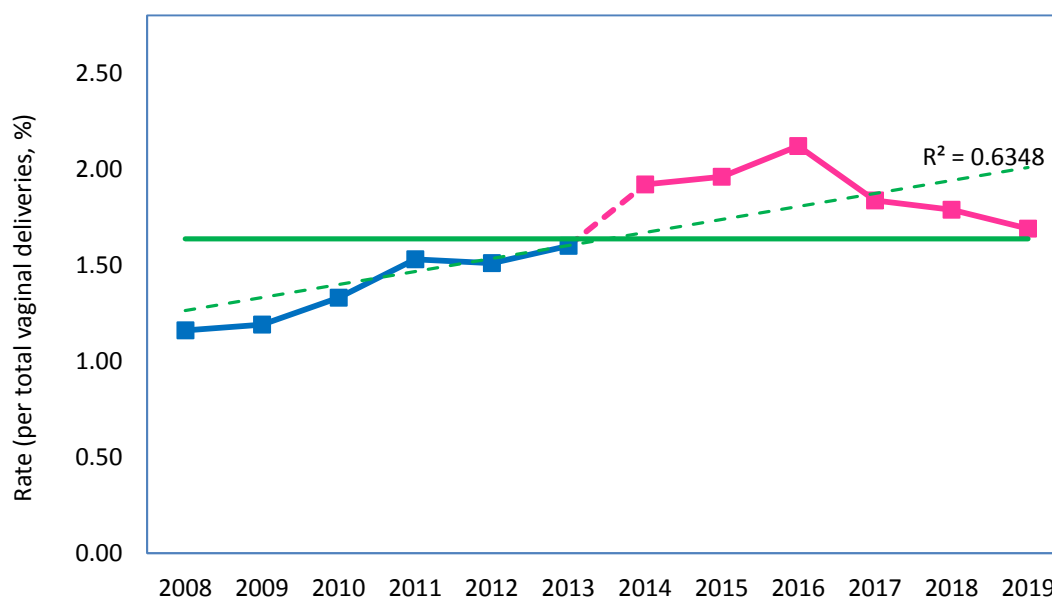
*Per 1,000 women delivered

Sources: HIPE (closed national files for 2008-2013); IMIS 2014-2019

| | % changes (Sig.) |
|---------------------------------|------------------|
| 2008 vs 2019 (HIPE/NPRS, IMIS): | -55.0% (ns) |
| 2014 vs 2019 (IMIS): | 15.4% (ns) |
| 2018 vs 2019 (IMIS): | 36.4% (ns) |

9. Perineal tears (third-degree and/or fourth-degree tears)

Definition Number of third-degree and/or fourth-degree perineal lacerations diagnosed during the current month, including tears in the vaginal tissue, perineal skin, and perineal muscles that extend into the anal sphincter and/or go through the anal sphincter and the tissue underneath it.



| | NPRS | | | | | | IMIS | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Rate* | 1.16 | 1.19 | 1.33 | 1.53 | 1.51 | 1.60 | 1.92 | 1.96 | 2.12 | 1.84 | 1.79 | 1.69 |

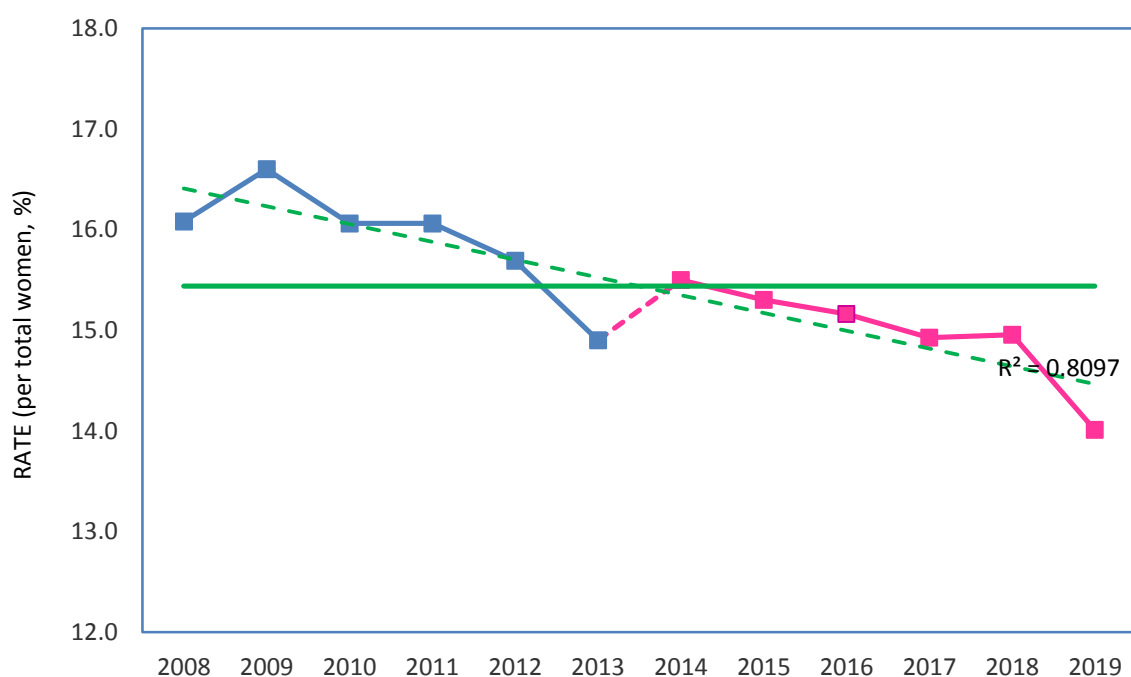
*Per total vaginal delivery (%)

Sources: HIPE (closed national files for 2008-2013); NPRS 2008-2013; IMIS 2014-2019

| | % changes (Sig.) |
|----------------------------------|-----------------------|
| 2008 vs 2019: (HIPE/NPRS, IMIS): | 45.7% ($p < 0.05$) |
| 2014 vs 2019 (IMIS): | -12.0% ($p < 0.05$) |
| 2018 vs 2019 (IMIS): | -5.6% (ns) |

10. Operative vaginal deliveries (total)

Definition Number of women undergoing operative vaginal delivery, or instrumental delivery. This includes forceps delivery and vacuum extraction, assisted breech delivery with forceps to after-coming head and breech extraction with forceps to after-coming head. Excludes failed forceps and failed vacuum extraction.



| | NPRS | | | | | | IMIS | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Rate* | 16.1 | 16.6 | 16.1 | 15.7 | 15.7 | 14.9 | 15.5 | 15.3 | 15.2 | 14.9 | 15.0 | 14.0 |

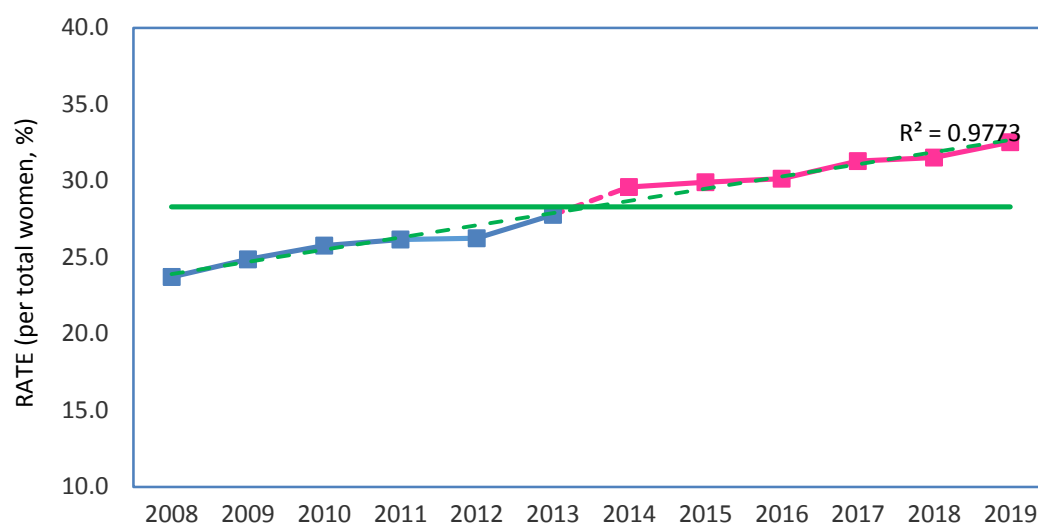
*Per total women delivered (%)

Sources: HIPE (closed national files for 2008-2013); NPRS 2008-2013; IMIS 2014-2019

| | % changes (Sig.) |
|---------------------------------|---------------------|
| 2008 vs 2019 (HIPE/NPRS, IMIS): | -15.0% ($p<0.05$) |
| 2014 vs 2019 (IMIS): | -10.7% ($p<0.05$) |
| 2018 vs 2019 (IMIS): | - 7.1% ($p<0.05$) |

11. Induction of labour (IOL) (total)

Definition Number of women during the current month undergoing induction of labour, including medical induction of labour, oxytocin; medical induction of labour, prostaglandin; other medical induction of labour. Include surgical induction of labour by artificial rupture of membranes; other surgical induction of labour; and synchronous medical and surgical induction of labour.



| | NPRS | | | | | | IMIS | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Rate* | 23.7 | 24.9 | 25.8 | 26.2 | 26.2 | 27.8 | 29.6 | 29.9 | 30.1 | 31.3 | 31.5 | 32.5 |

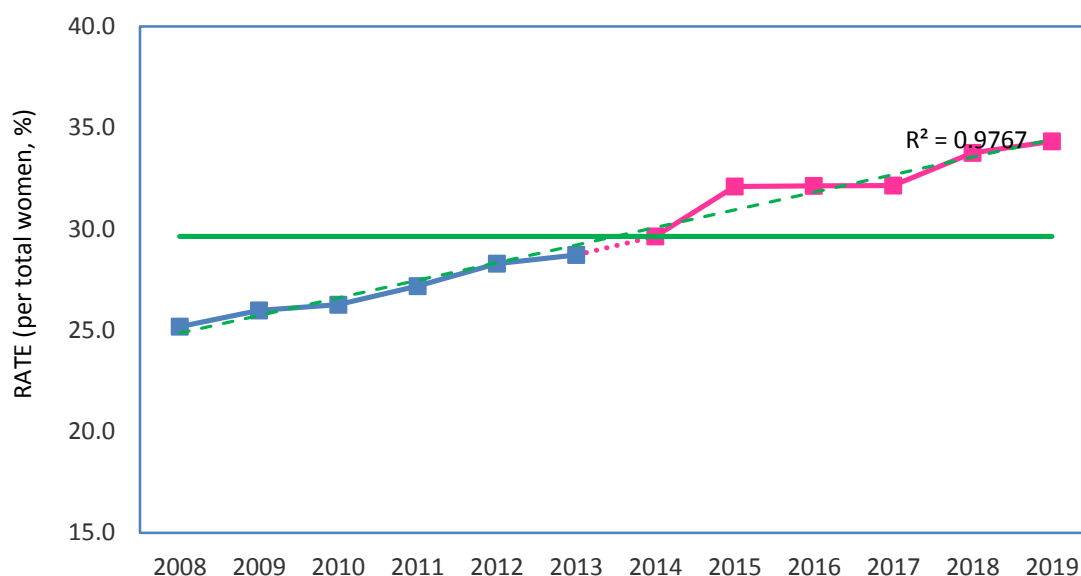
*Per total women delivered (%)

Sources: HIPE (closed national files for 2008-2013); NPRS 2008-2013; IMIS 2014-2019

| | % changes (Sig.) |
|---------------------------------|----------------------|
| 2008 vs 2019 (HIPE/NPRS, IMIS): | 36.1% ($p < 0.05$) |
| 2014 vs 2019 (IMIS): | 15.8% ($p < 0.05$) |
| 2018 vs 2019 (IMIS): | 1.5% (<i>ns</i>) |

12. Caesarean section (total)

Definition Number of women during the current month giving birth by Caesarean section, including elective classical Caesarean section, emergency classical Caesarean section, elective lower segment Caesarean section, and emergency lower segment Caesarean section.



| | NPRS | | | | | | IMIS | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Rate* | 25.2 | 26.0 | 26.3 | 27.2 | 28.3 | 28.7 | 29.6 | 30.9 | 32.1 | 32.1 | 33.8 | 34.3 |

*Per 100 women delivered (%)

Sources: HIPE (closed national files for 2008-2013); NPRS 2008-2013; IMIS 2014-2019

| | % changes (Sig.) |
|---------------------------------|----------------------|
| 2008 vs 2019 (HIPE/NPRS, IMIS): | 36.1% ($p < 0.05$) |
| 2014 vs 2019 (IMIS): | 15.9% ($p < 0.05$) |
| 2018 vs 2019 (IMIS): | 1.5% ($p < 0.05$) |



Irish Maternity Indicator System (IMIS)

National Report 2019_v1

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Clinical Programme in Obstetrics and Gynaecology**

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