Irish Maternity Indicator System

National Report 2020

National Women and Infants Health Programme

June 2021

HSE

National Women & Infants Health Programme

OBSTETRICS AND GYNAECOLOGY

Contents

Introduction

This Irish Maternity Indicator System (IMIS) National Report 2020 shows data from the 19 maternity hospitals/units in Ireland from January through December 2020.

It encompasses 41 metrics across a range of domains, including demographics, deliveries, obstetric risks and complications, neonatal care, breastfeeding, laboratory metrics, and hospital activities. The full list of metrics is presented in Appendix 2.

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

IMIS reports are prepared by the Office of the National Women and Infants Health Programme (NWIHP). The data presented in IMIS reports are provided by the 19 maternity hospitals and are entirely the hospitals' own. They are deemed correct at the time of submission, but some figures may be subject to change subsequently as new information comes to light.

The IMIS management instrument serves several functions, including monthly and annual data tracking and comparative analysis across all maternity units nationally. To our knowledge, Ireland is the only country with a standardised data-driven system that operates for maternity services on a nationwide basis.

The IMIS data collection and processing systems have been continually improving since their inception in 2014. Based on scrutiny of the IMIS 2019 data, the NWIHP identified six areas of concern: Neonatal encephalopathy, postpartum haemorrhage, obstetric blood transfusions, uterine rupture, general anaesthetic for Caesarean sections, breastfeeding, and perinatal deaths. The IMIS data informed hospital-level reviews and recommendations to the HSE Executive Management Team (EMT) for improvements in these areas at several sites.

The past year has been problematic due to the COVID-19 pandemic and the HSE cyber security incident in May 2021. In spite of the difficulties, the IMIS data for 2020 were collected and returned to the NWIHP by mid year. The publication of the National Report is testament to the dedication and hard work of individual staff members at the 19 maternity hospitals/units (Appendix 1).

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June 2021

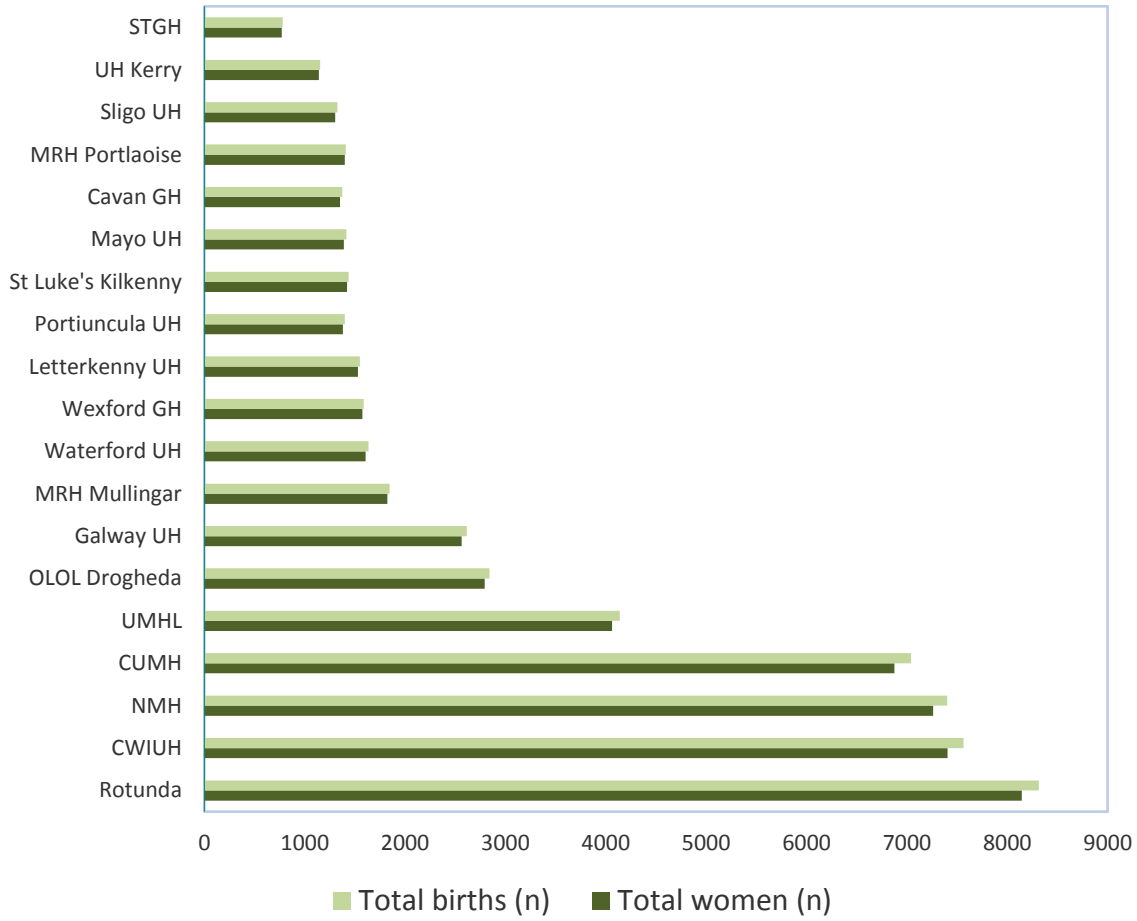
Demographics

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

Definitions

Total births: Number of live births and stillbirths weighing ≥ 500g.

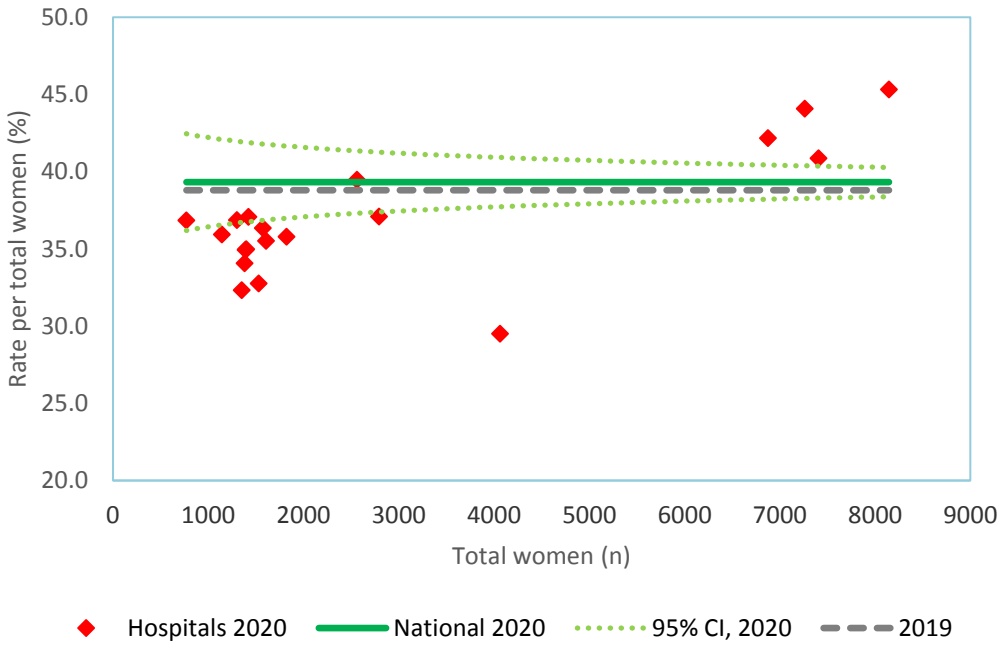
Total women delivered: Number of women delivering a baby weighing ≥ 500g.



	Total births		Total women	
	2019	2020	2019	2020
National (n)	59,352	56,835	58,272	55,799
Mean (S.D.)	3,124 (2,642)	2,991 (2,554)	3,067 (2,585)	2,937 (2,497)
Range	885–8,410	782-8,315	875–8,262	771-8,416

Total nulliparas (#2)

Definition Number of deliveries (≥500g) to women who have never had a previous pregnancy resulting in a live birth or stillbirth.



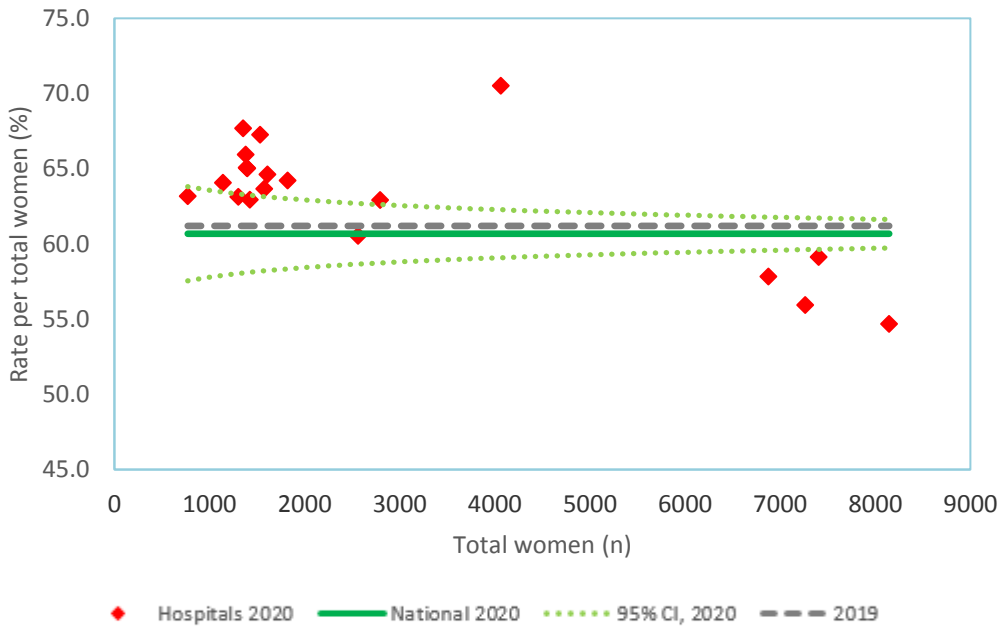
	2019	2020
Rate *(% total women delivered)*	38.8%	39.3%
95% Confidence interval (CI)	38.4%–39.2%	38.9%–39.7%
Range	30.4%–43.7%	29.5%–45.3%
Total nulliparas (n)	22,591	21,943
Total women delivered (n)	58,272	55,799

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)

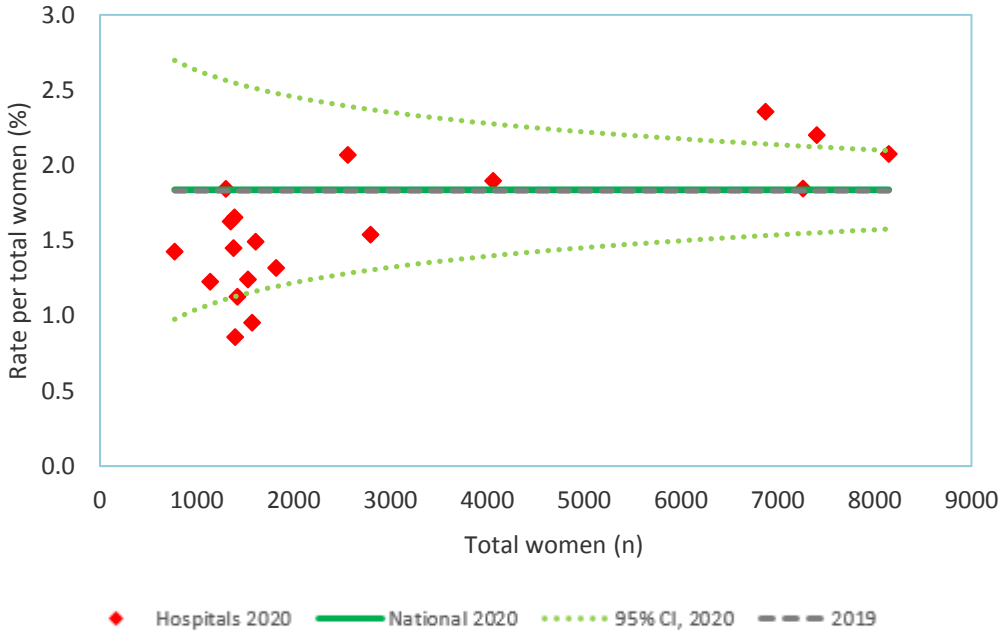
Definition Number of deliveries (≥500g) to women who have had at least one previous pregnancy resulting in a live birth or stillbirth.



	2019	2020
Rate *(% total women delivered)*	61.2%	60.7%
95% CI	60.8%–61.6%	60.3%–61.1%
Range	56.3%–69.6%	54.7%–70.5%
Total multiparas (n)	35,681	33,858
Total women delivered (n)	58,272	55,799

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.



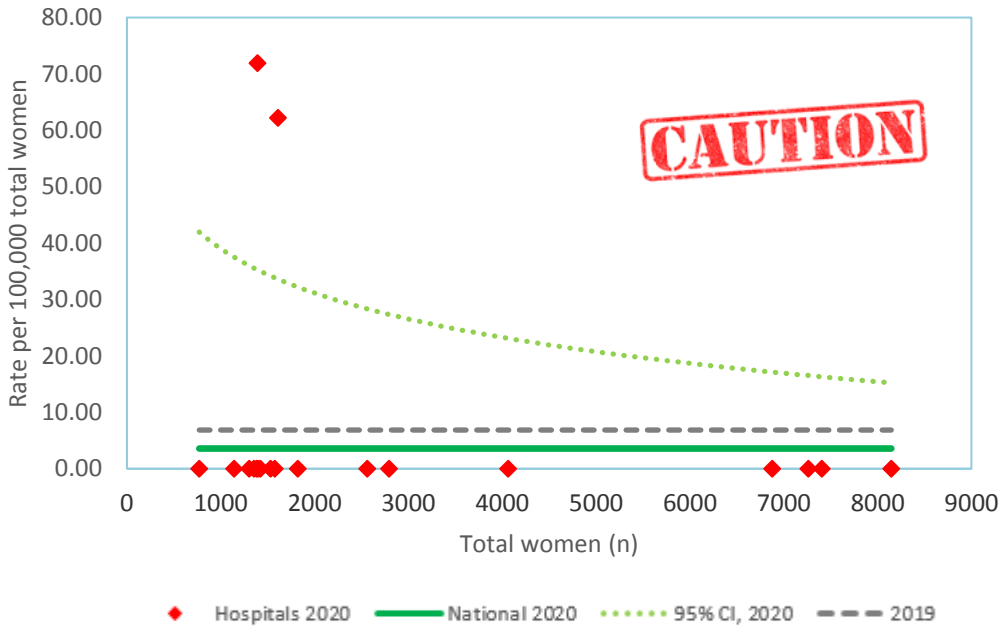
	2019	2020
Rate *(per total women delivered, %)*	1.8%	1.8%
95% CI	1.7%–1.9%	1.7%–2.0%
Range	0.9%–2.5%	0.9%–2.4%
Total multiple births (n)	1,068	1,025
Total women delivered (n)	58,272	55,799

Note:

Higher rates of multiple deliveries at some 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 mangement but not from accidental or incidental causes occurring during the current month.



	2019	2020
Rate *(per 100,000 women delivered)*	6.86	3.58
95% CI	0.00–13.59	0.00–8.55
Total maternal deaths (n)	4	2
Total women delivered (n)	58,272	55,799

Note:

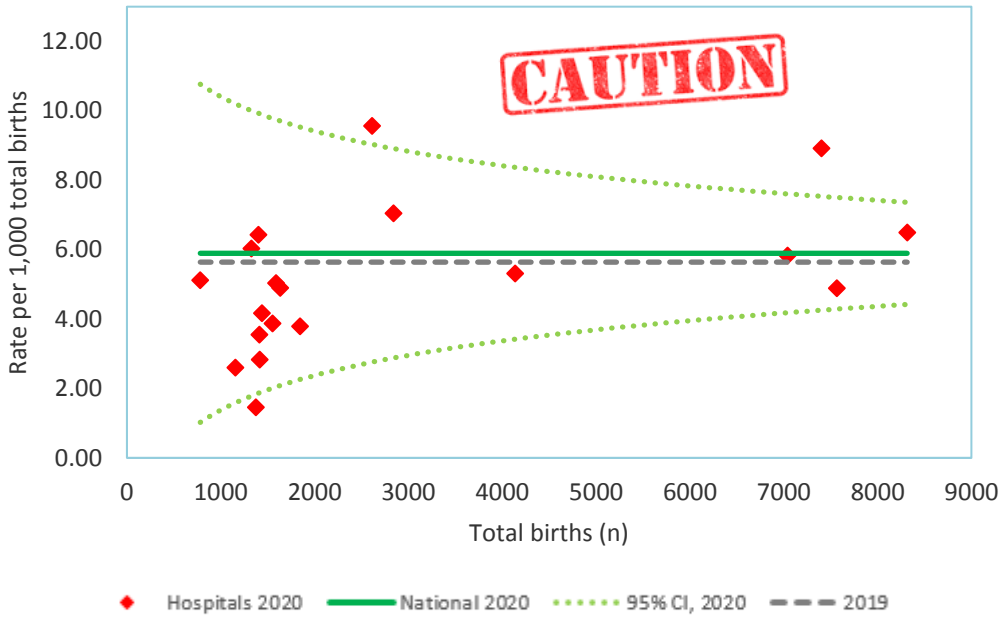
While maternal death in a single year is not considered a robust indicator of quality of clinical care in a maternity setting, lessons can be learned from the management of individual cases. The Maternal Death Enquiry Ireland reported a maternal death rate of 6.5 per 100,000 over three years 2013-15 (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' 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 ≥500g, 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.



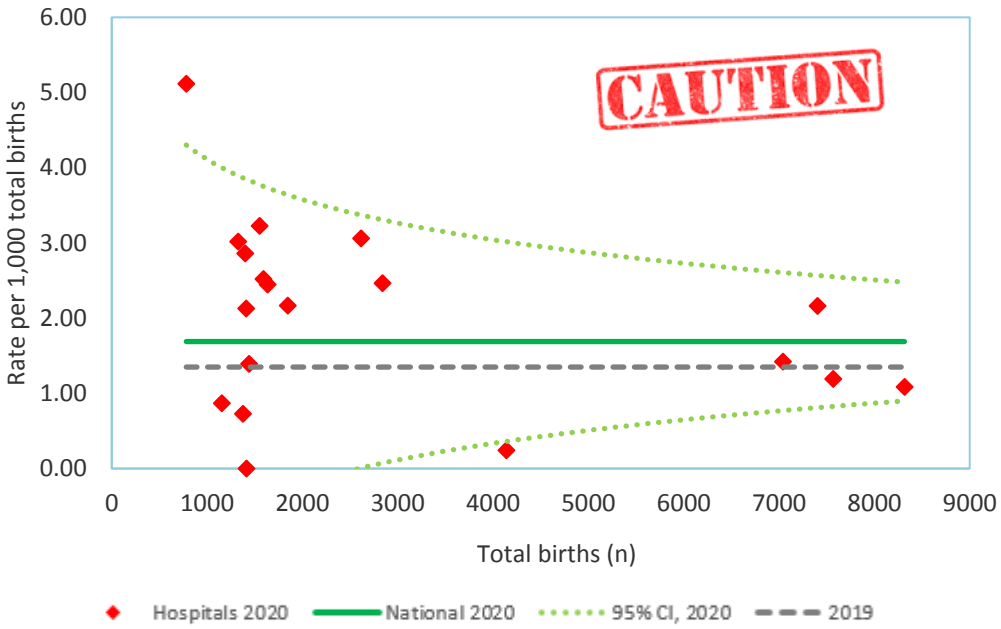
	2019	2020
Rate *(per 1,000 total births)*	5.64	5.89
95% CI	5.04–6.25	5.26–6.52
Range	1.38–7.61	1.46–9.56
Total perinatal deaths (n)	335	335
Total births (n)	59,352	56,835

Note:
There has been a downward trend in total perinatal deaths since 2008. However, in recent years, this has begun to change and increasing rates have been observed since 2018. In 2019, there was a 16.9% increase on the previous year and, again in 2020, there was a further 4.4% increase on the previous year.

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.



	2019	2020
Rate *(per 1,000 total births)*	1.35	1.69
95% CI	1.05–1.64	1.35–2.03
Range	0.00–4.52	0.00–5.12
Adjusted perinatal deaths (n)	80	96
Total births (n)	59,352	56,835

Note:

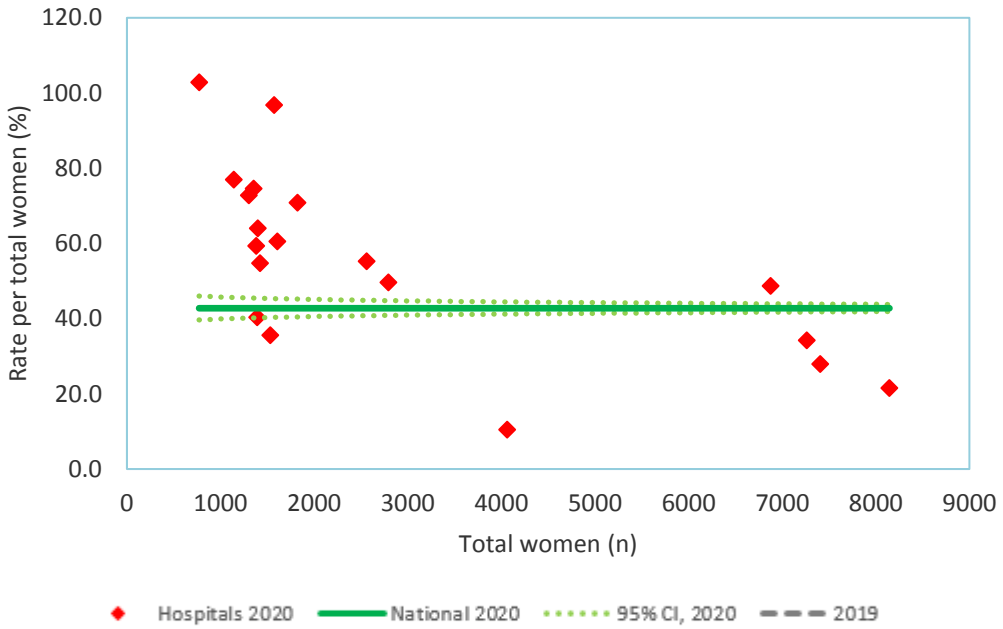
There was an increase in the rate of adjusted perinatal deaths from 1.35 per 1,000 total births in 2019 to 1.69 in 2020. There were four cases in the outlying small maternity unit.

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).



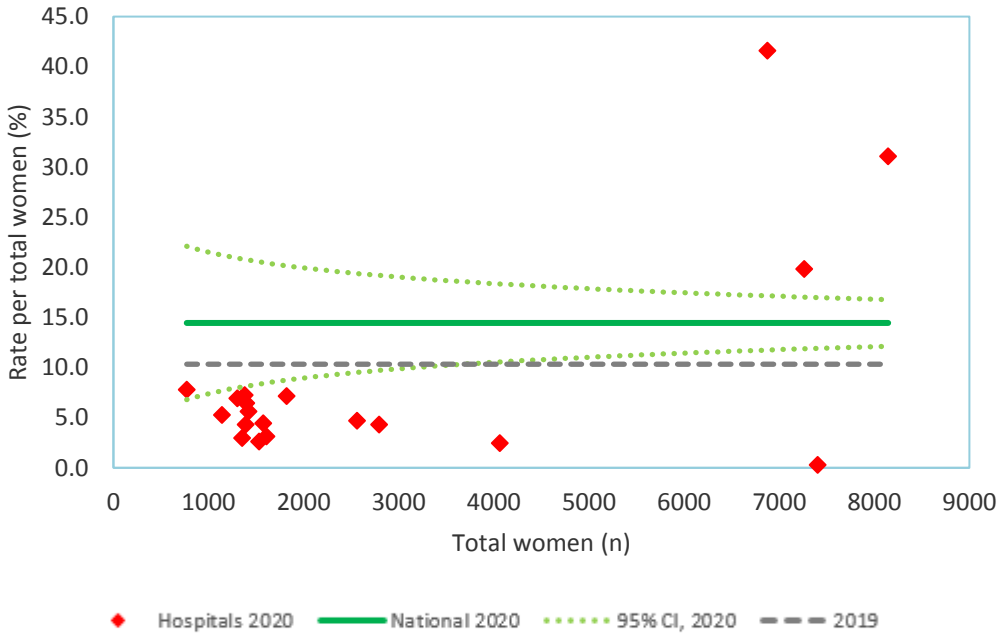
	2019	2020
Rate *(% of total women delivered)*	42.8%	42.8%
95% CI	42.4%–43.2%	42.4%–43.2%
Total EPAU first visits (n)	24,915	23,898
Total women delivered (n)	58,272	55,799

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.



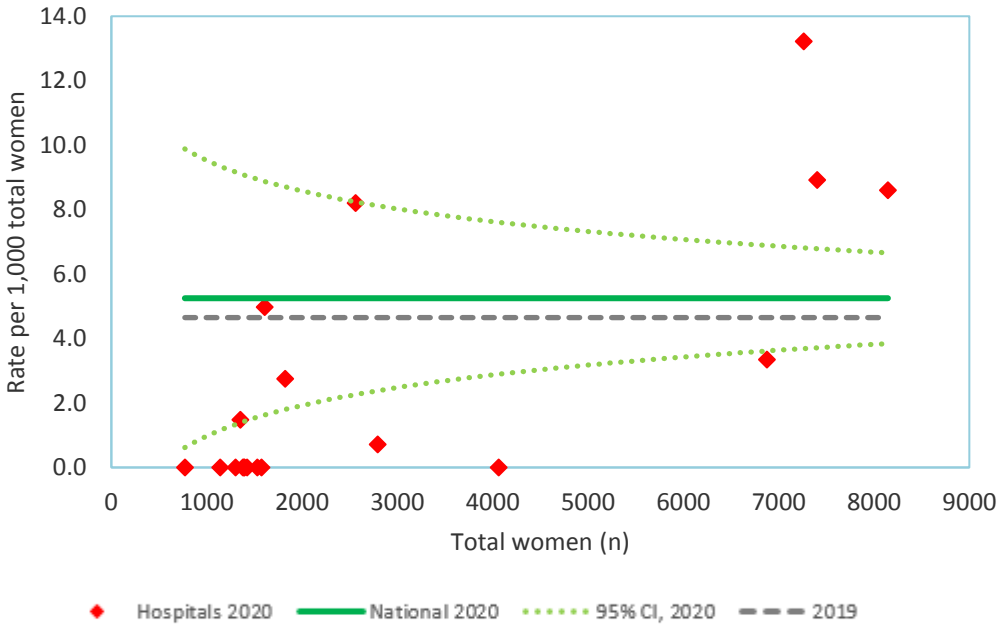
	2019	2020
Rate *(per 1,000 women delivered)*	10.3	14.4
95% CI	9.5–11.2	13.5–15.4
Total maternal transfers (n)	602	806
Total women delivered (n)	58,272	55,799

Note:

This metric is based on individual hospital activity, which differs in all units (for example, large maternity hospitals with their own HDU may manage critical care patients in different ways). Thus, 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 three of the 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.



	2019	2020
Rate *(per 1,000 women delivered)*	4.7	5.3
95% CI	4.1–5.2	4.7–5.9
In-utero transfers admitted (n)	271	293
Total women delivered (n)	58,272	55,799

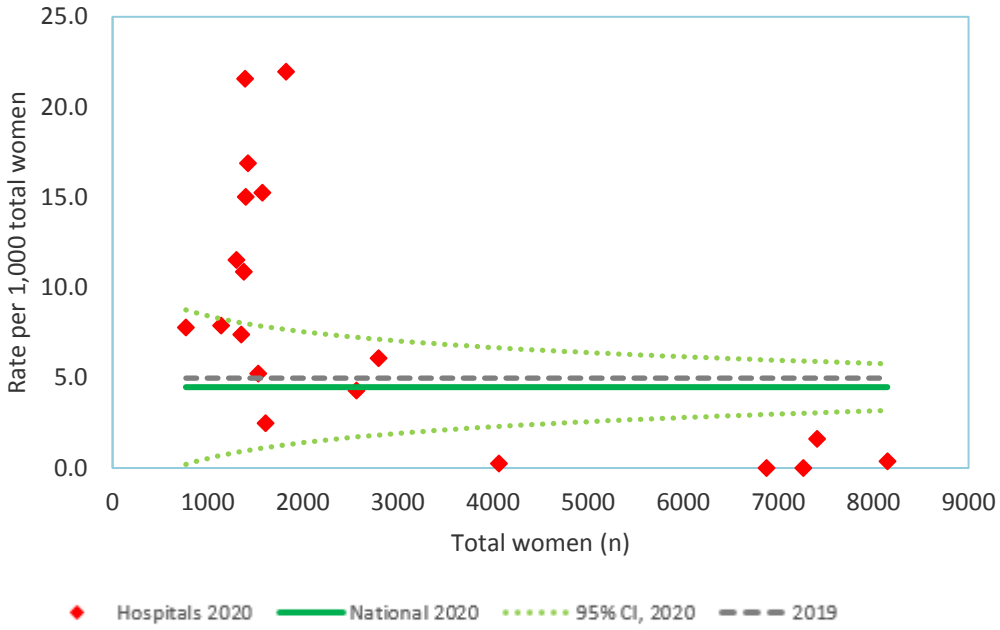
Note:

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.

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.)

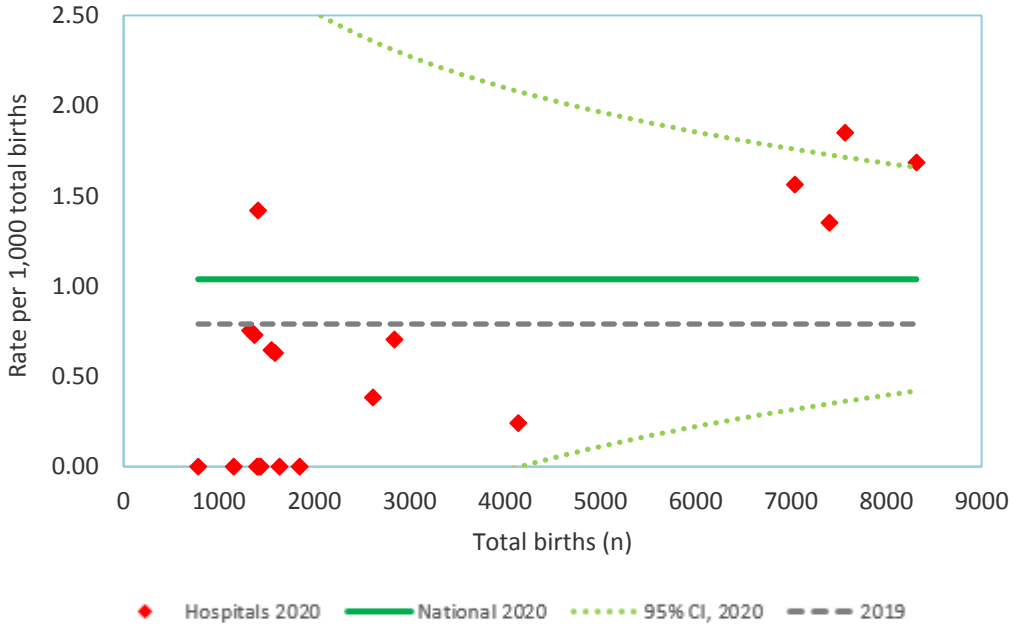


	2019	2020
Rate *(per 1,000 women delivered)*	5.0	4.5
95% CI	4.4–5.6	3.9–5.0
In-utero transfers sent out (n)	290	250
Total women delivered (n)	58,272	55,799

Neonatal care

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.



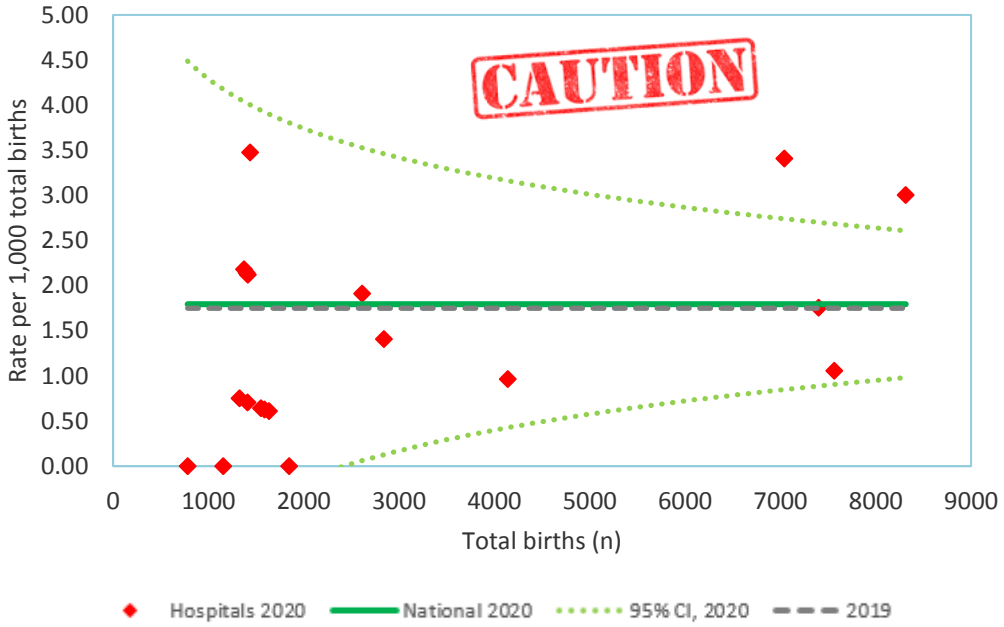
	2019	2020
Rate *(per 1,000 total births)*	0.79	1.04
95% CI	0.57–1.01	0.77–1.30
Total BPP (n)	47	59
Total births (n)	59,352	56,835

Note:
The rate of BPP was higher in 2020 than in the previous year, with 12 more cases nationally. The rate reported by maternity units in Ireland is lower than might be expected, based on international research that finds 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 automonic 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.



	2019	2020
Rate *(per 1,000 total births)*	1.75	1.79
95% CI	1.42–2.09	1.45–2.14
Total NE (n)	104	102
Total births (n)	59,352	56,835

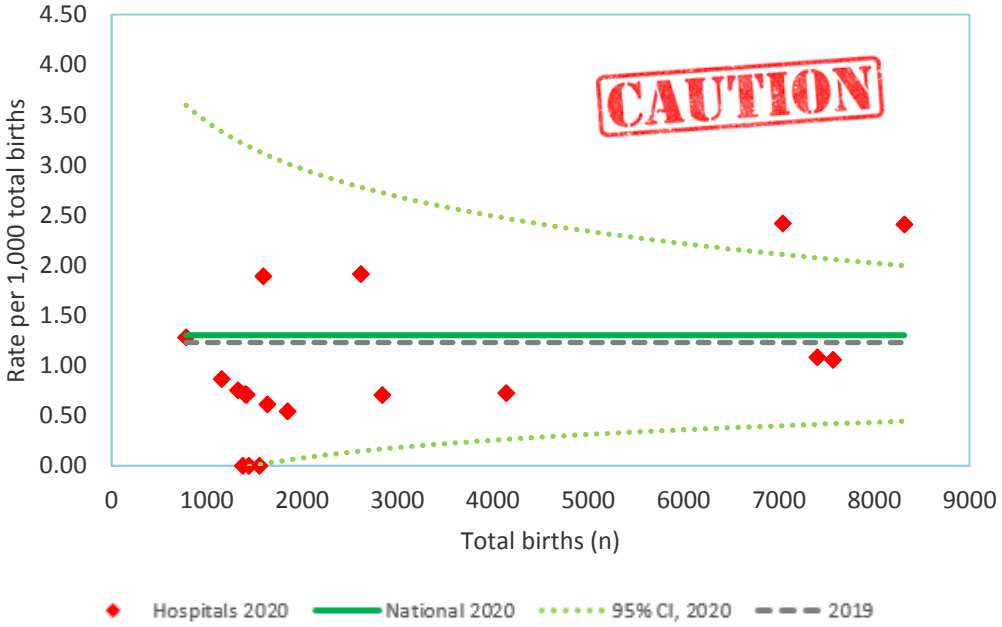
Note:

The Neonatal Therapeutic Hypothermia in Ireland Annual Report 2019 (2021) estimated the incidence of NE was 3.0 per 1,000 live births.[4] Caution is advised when dealing with small values.

4 Meaney S, McGinley J, Corcoran P, McKenna P, Filan P, Greene RA, Murphy J on behalf of Neonatal Therapeutic Hypothermia Working Group. Neonatal Therapeutic Hypothermia in Ireland, Annual Report 2019. Cork: National Perinatal Epidemiology Centre, 2021.

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.



	2019	2020
Rate *(per 1,000 total births)*	1.23	1.30
95% CI	0.95–1.51	1.01–1.60
Total WBNC of inborn babies (n)	73	74
Total births (n)	59,352	56,835

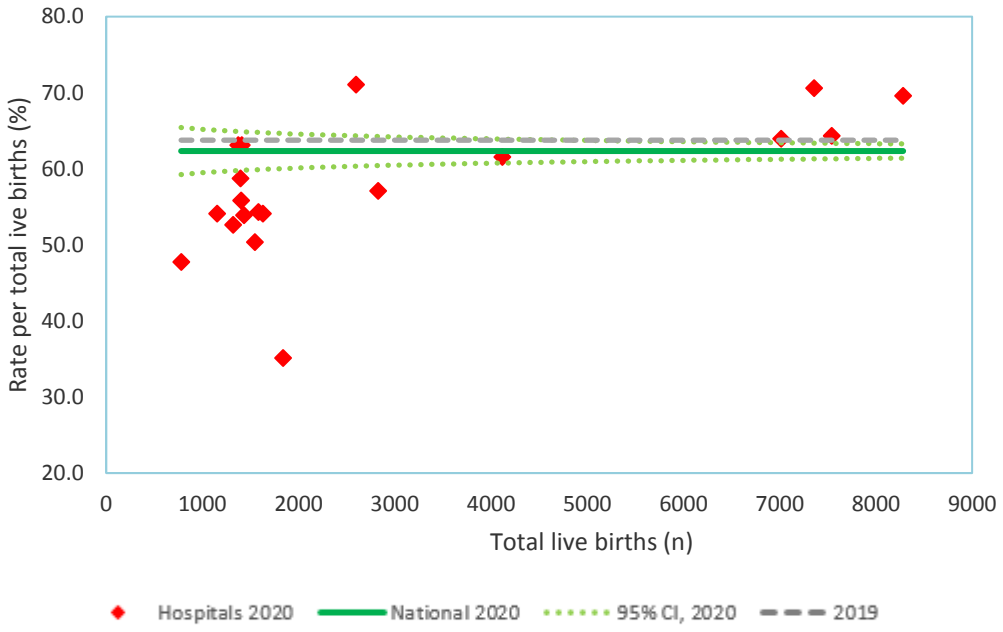
Note:
The chart depicts rates of babies cooled based on the hospital where they were born. Almost three-quarters of babies cooled were born at the four large maternity hospitals (71.6%), as would be expected. This compares with the National Therapeutic Hypothermia in Ireland Annual Report 2019 (2021), which found, in 2019, 64% of babies requiring TH were born in a maternity unit with a tertiary Neonatal Intensive Care Unit (NICU), while 36% were transferred from a smaller peripheral unit to the tertiary centre for ongoing neonatal care and assessment.[5]

5 Meaney S, McGinley J, Corcoran P, McKenna P, Filan P, Greene RA, Murphy J on behalf of Neonatal Therapeutic Hypothermia Working Group. Neonatal Therapeutic Hypothermia in Ireland, Annual Report 2019. Cork: National Perinatal Epidemiology Centre, 2021.

Breastfeeding

Breastfeeding initiated (#17)

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



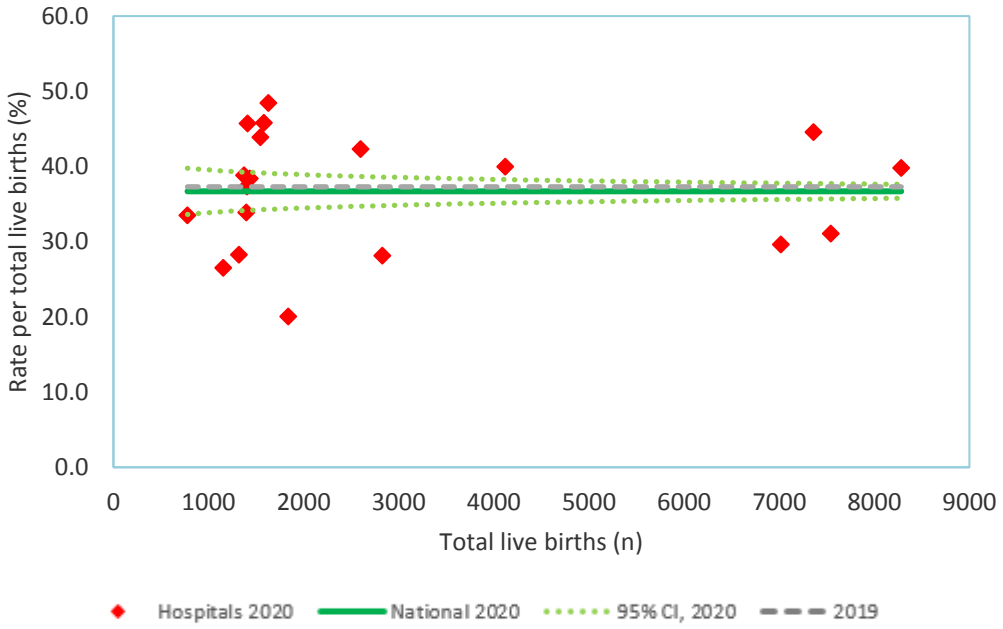
	2019	2020
Rate *(per total live births)*	63.8%	62.3%
95% CI	63.4%–64.2%	61.9%–62.7%
Range	32.8%–75.9%	35.1%–71.1%
Breastfeeding (BF) initiated (n)	37,696	35,284
Total live births (n)	59,123	56,607

Note:

There is variation across the maternity hospitals on each of the three breastfeeding metrics. The breastfeeding initiation rate of 62.3% 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.



	2019*	2020
Rate *(per total live births)*	37.3%	36.7%
95% CI	36.9%–37.7%	36.3%-37.1%
Range	18.4%–50.4%	20.1%-48.5%
BF exclusively on discharge (n)	19,076	20,773
Total live births (n)	51,152	56,607

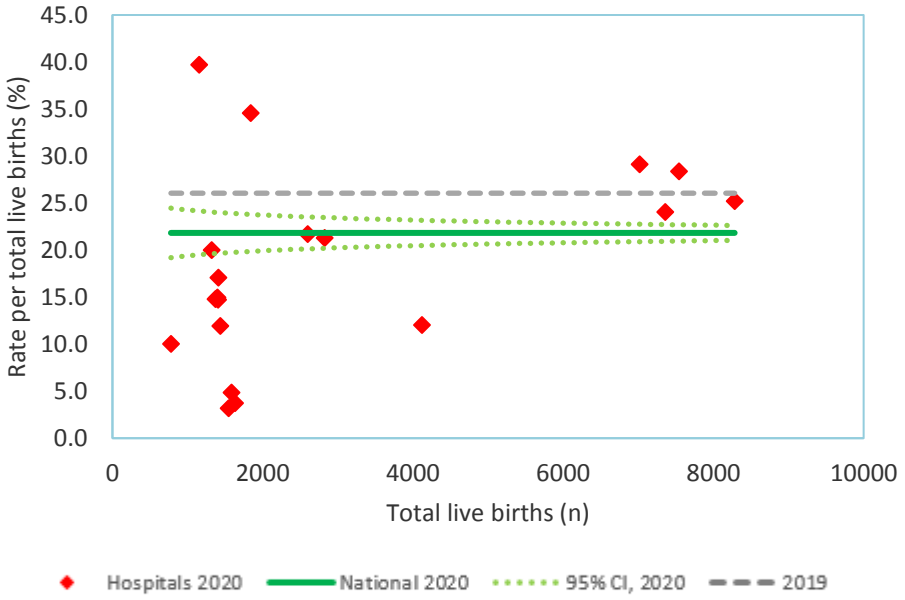
**Missing in 2019=NMH*

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.



	2019*†	2020
Rate *(per total live births)*	19.0%	21.8%
95% CI	18.7%-19.3%	21.5%–22.2%
Range	2.7%–28.2%	3.2%–39.7%
BF non-exclusively on discharge(n)	9,719	12,356
Total live births (n)	51,152	56,607

**Missing in 2019: NMH*

Note:

Together, this metric and Metric #18 suggest a rate of 58.5% for 'any' breastfeeding (exclusive and non-exclusive) on discharge from hospital. This compares with 63.3% in 2019. We can surmise that the drop in the breastfeeding rate in 2020 may be due to COVID-19 and necessary changes in post-natal behaviours in maternity units, but we are unable to draw such conclusions from the IMIS data.

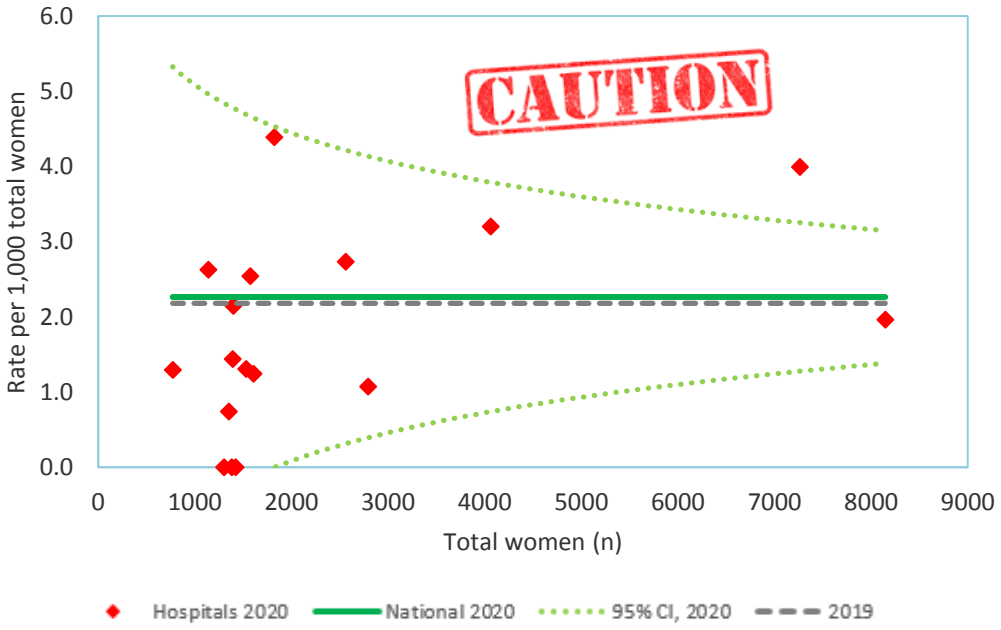
Other national data derived from the Birth Notification Form in 2017 indicated 60% of mothers recorded any breastfeeding (NPRS 2020). The HSE Breastfeeding Action Plan 2016–2021 sets out an overall target of an annual 2% increase in breastfeeding rates between 2016 and 2021.[6]

6 (https://www.hse.ie/eng/about/who/healthwellbeing/our-priority-programmes/child-health-and-wellbeing/breastfeeding-healthy-childhood-programme/policies-and-guidelines-breastfeeding/breastfeeding-in-a-healthy-ireland-report.pdf)

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.



	2019*	2020*
Rate *(per 1,000 women delivered)*	2.2	2.3
95% CI	1.8–2.6	1.8–2.7
Total maternal bacteraemia (n)	95	94
Total women delivered (n)	43,502	41,518

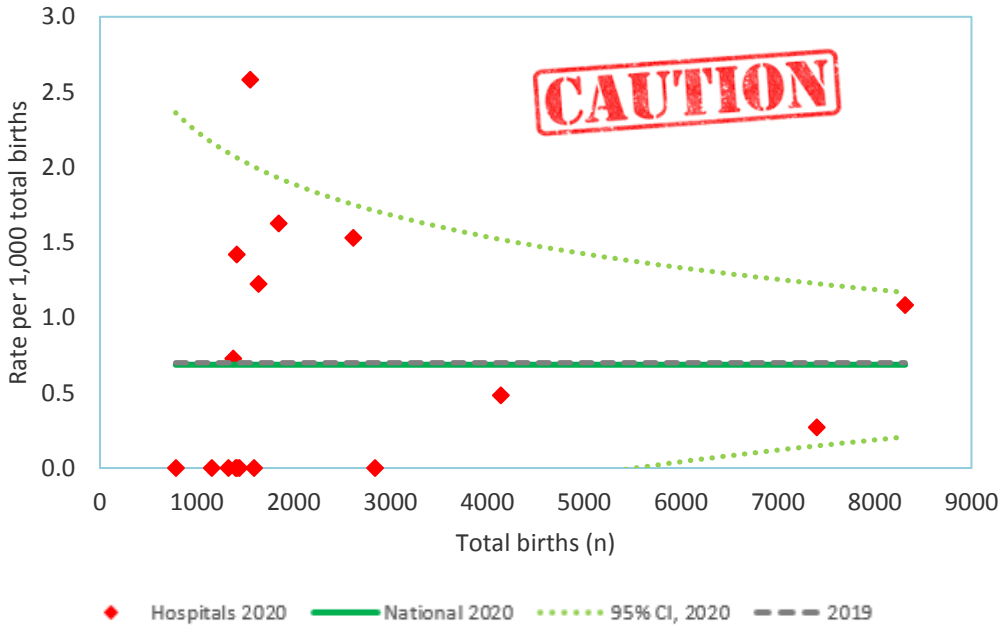
** Missing=CUMH and CWIUH*

Note:

The large amount of missing data on this metric from two tertiary maternity hospitals 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).



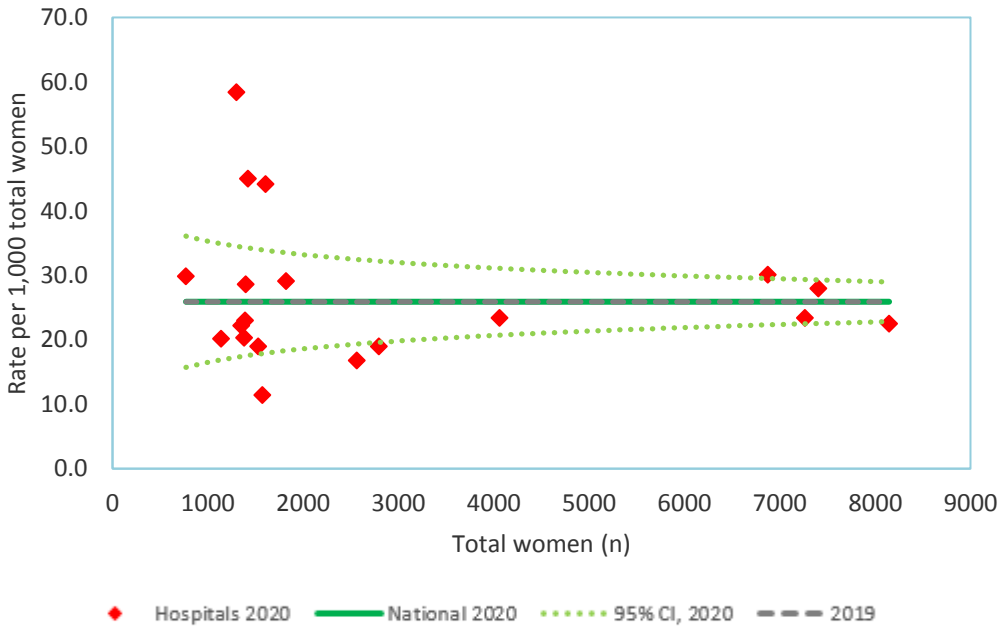
	2019*	2020*
Rate *(per 1,000 total births)*	0.7	0.7
95% CI	0.5–1.0	0.4–0.9
Total early-onset neonatal bacteraemia (n)	31	29
Total births (n)	44,218	42,229

**Missing=CUMH and CWIUH*

The large amount of missing data on this metric from two tertiary maternity hospitals 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).



	2019	2020
Rate *(per 1,000 women delivered)*	25.9	25.9
95% CI	24.6–27.2	24.6–27.2
Range	13.2–47.6	11.4–58.4
Total OBT (n)	1,508	1,445
Total women delivered (n)	58,272	55,799

Note:

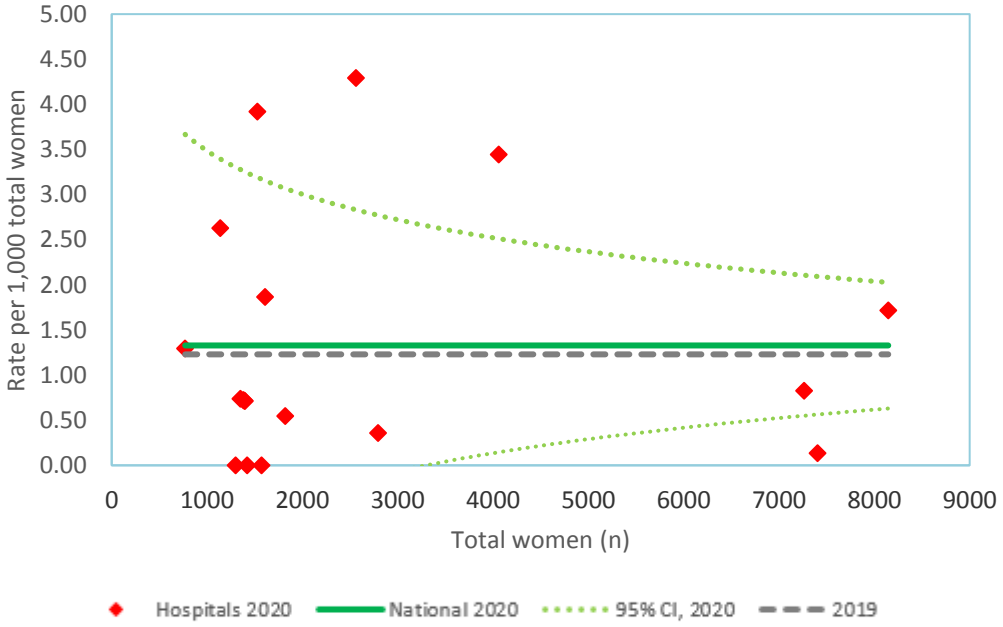
There is considerable variation across hospitals on this metric, with rates of OBT ranging from 11.4 to 58.4 per 1,000 women delivered. This metric should be viewed in conjunction with Metrics #30 and #31, Primary postpartum haemorrhage with vaginal deliveries and CS (see pages 35-6).

Obstetric risks and 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.



	2019*	2020**
Rate *(per 1,000 women delivered)**	1.23	1.33
95% CI	0.93–1.52	1.01–1.65
Range	0.00–5.30	0.00–4.29
Maternal sepsis (n)	68	65
Total women delivered (n)	55,477	48,923

**Missing in 2019=UHK, LUH; **Missing in 2020=CUMH*

Note:

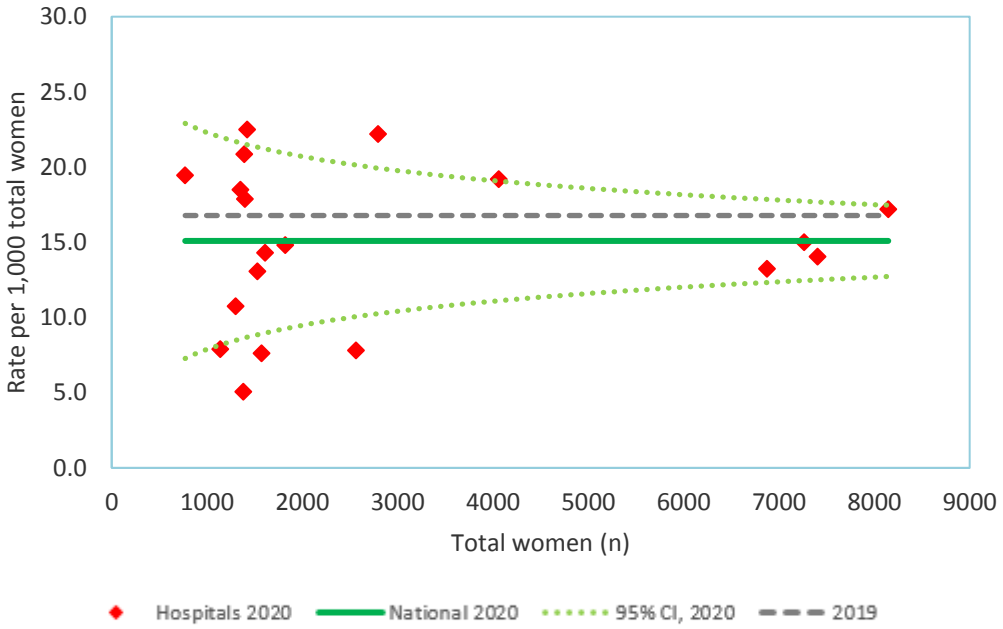
Introduced on the IMIS in 2019, this was the first time data were collected in Ireland using the new WHO definition. Despite major advances in the past century, maternal sepsis remains a common and potentially preventable cause of direct maternal death globally (Turner 2019).[7] In addition to maternal concerns, the fetus is at increased risk of miscarriage, stillbirth, preterm birth, and infection.

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.

7 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.



	2019	2020
Rate *(per 1,000 women delivered)**	16.8	15.1
95% CI	15.7–17.8	14.1–16.1
Range	6.9–25.7	5.1–22.5
Total ectopic pregnancies (n)	978	842
Total women delivered (n)	58,272	55,799

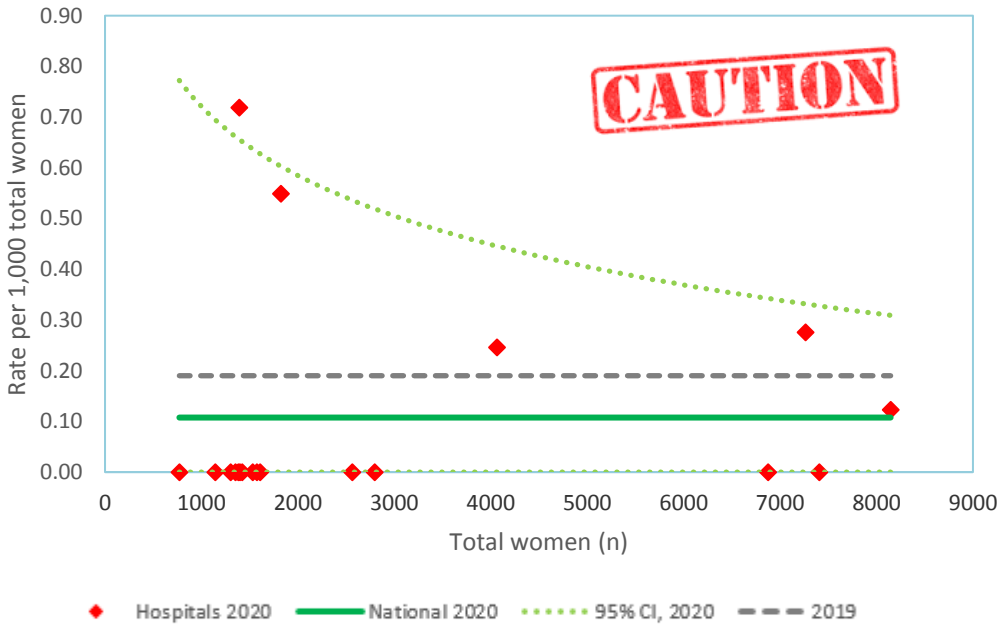
**Note: Rates are calculated using total women as a proxy denominator, since total number of pregnant women is unavailable.*

Note:

The drop in the rate of ectopic pregnancy in 2020, while welcome, runs counter to the rising trend in recent years in Ireland and internationally.

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.



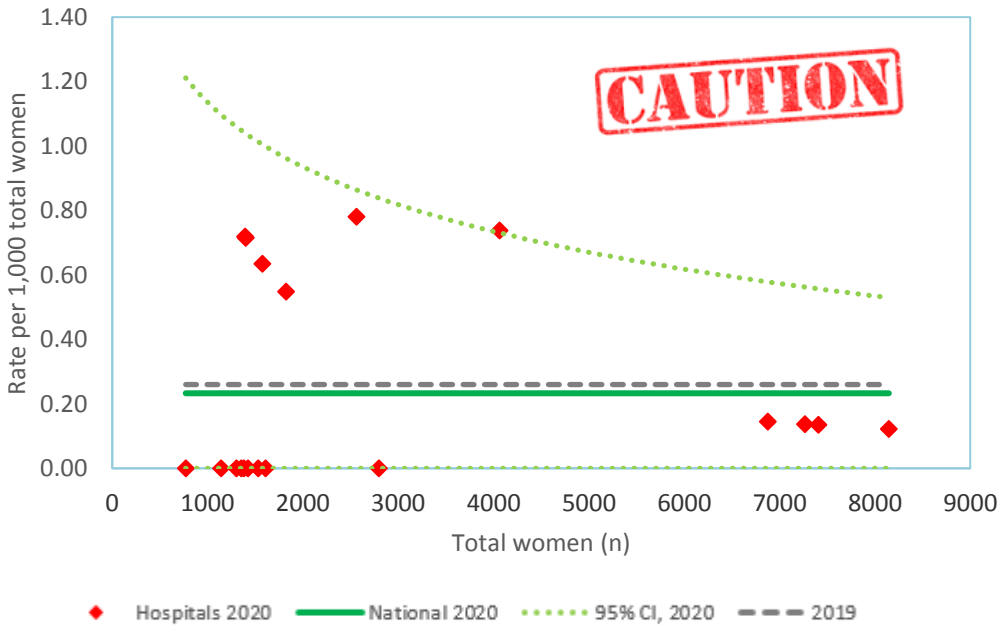
	2019	2020
Rates *(per 1,000 women delivered)*	0.19	0.11
95% CI	0.08–0.30	0.02–0.19
Total eclampsia (n)	11	6
Total women delivered (n)	58,272	55,799

Note:

The national rate of eclampsia continued to fall in 2020. 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.



	2019	2020
Rates *(per 1,000 women delivered)*	0.26	0.23
95% CI	0.13–0.39	0.11–0.36
Total uterine rupture (n)	15	13
Total women delivered (n)	58,272	55,799

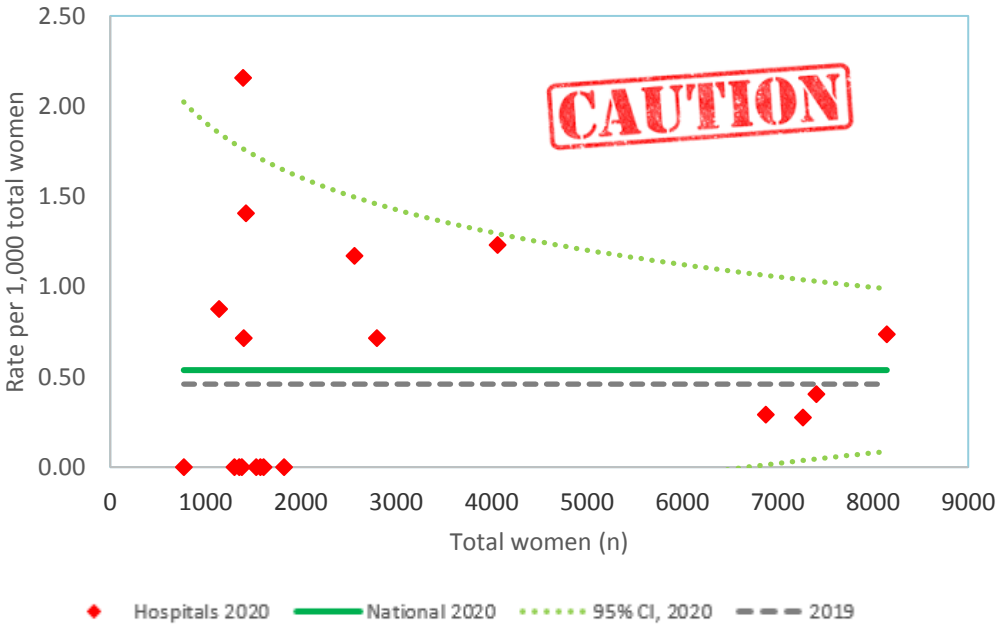
Note:

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.

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.



	2019	2020
Rates *(per 1,000 women delivered)*	0.46	0.54
95% CI	0.29–0.64	0.35–0.73
Total peripartum hysterectomy (n)	27	30
Total women delivered (n)	58,272	55,799

Note:
Peripartum hysterectomy is rare in modern obstetrics. It can cause significant morbidity and mortality and is usually only performed in emergency situations. Events may be associated with maternal age, Caesarean sections, and placenta praevia/accreta (Huque et al 2018).[8]

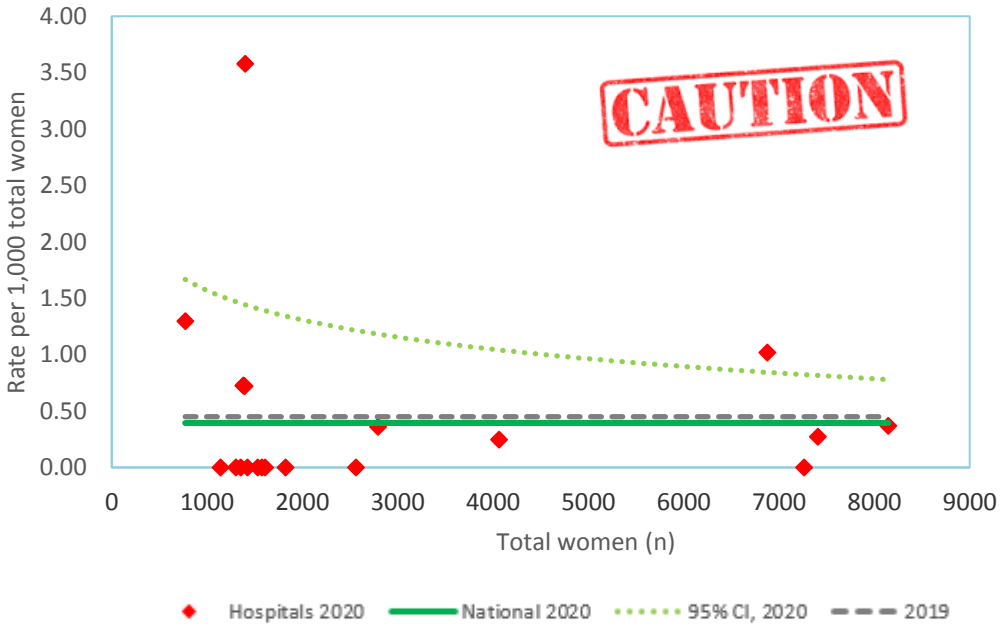
The outlying maternity unit had three cases of Peripartum hysterectomy.

Caution is advised when dealing with small numbers.

8 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.



	2019	2020
Rates *(per 1,000 women delivered)*	0.45	0.39
95% CI	0.27–0.62	0.23–0.56
Total pulmonary embolism (n)	26	22
Total women delivered (n)	58,272	55,799

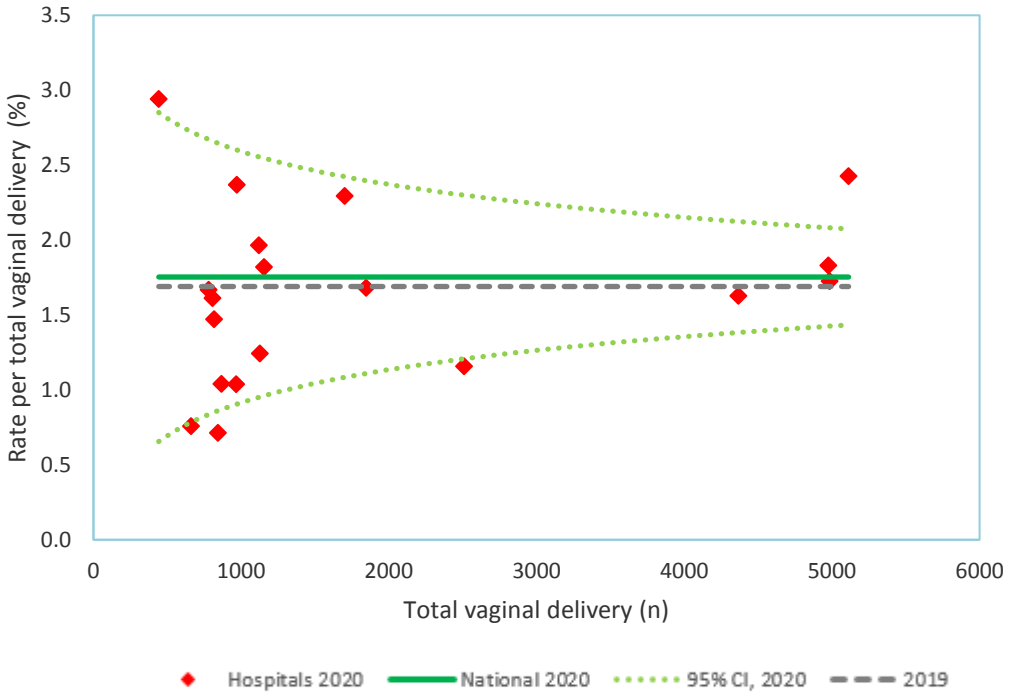
Note:

Pulmonary embolism is a leading cause of maternity mortality in developed countries. The outlying maternity unit saw five cases of PE in 2020.

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.



	2019	2020
Rates *(% total vaginal delivery)*	1.7%	1.8%
95% CI	1.6%–1.8%	1.6%–1.9%
Range	0.9%–2.8%	0.7%–2.9%
Total perineal tears (n)	648	632
Total vaginal delivery (n)	38,266	36,044

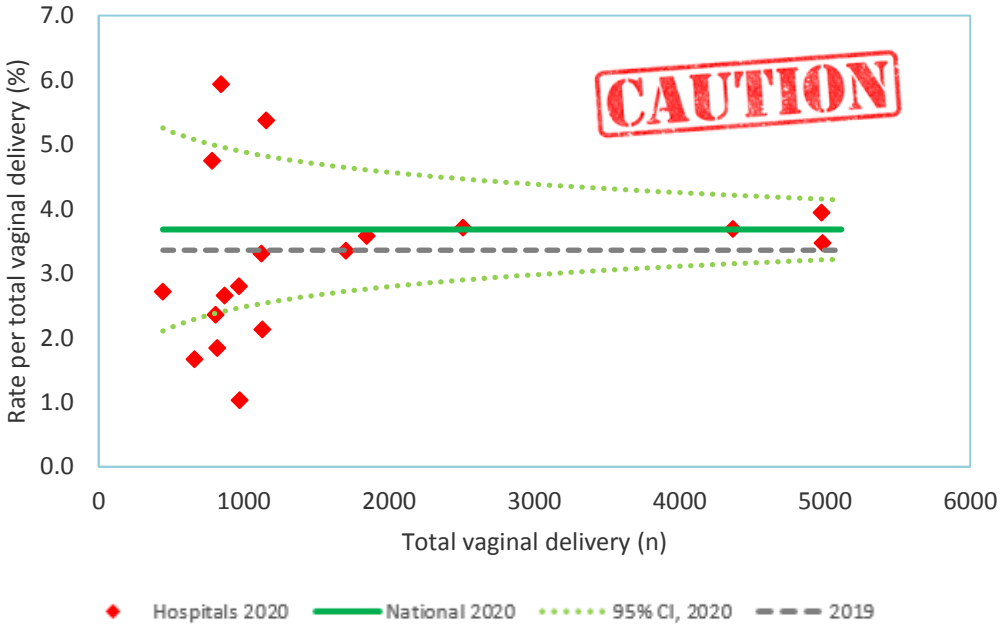
Note:
The data on this metric are widely dispersed. In 2020, the rate of severe perineal tears across the 19 maternity units ranged from 0.7% to 2.9%. Similar variation exists across European countries (e.g., 0.1% in Romania, 4.9% in Iceland[9]).

9 Blondel B, Alexander S, Bjarnadóttir RI, 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 ≥1,000mL 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.



	2019	2020
Rates *(% total vaginal delivery)*	3.4%	3.7%
95% CI	3.2%–3.5%	3.5%–3.9%
Range	1.3%–6.7%	1.0%–5.9%
PPH per total vaginal delivery (n)	1,285	1,327
Total vaginal delivery (n)	38,266	36,044

Note:

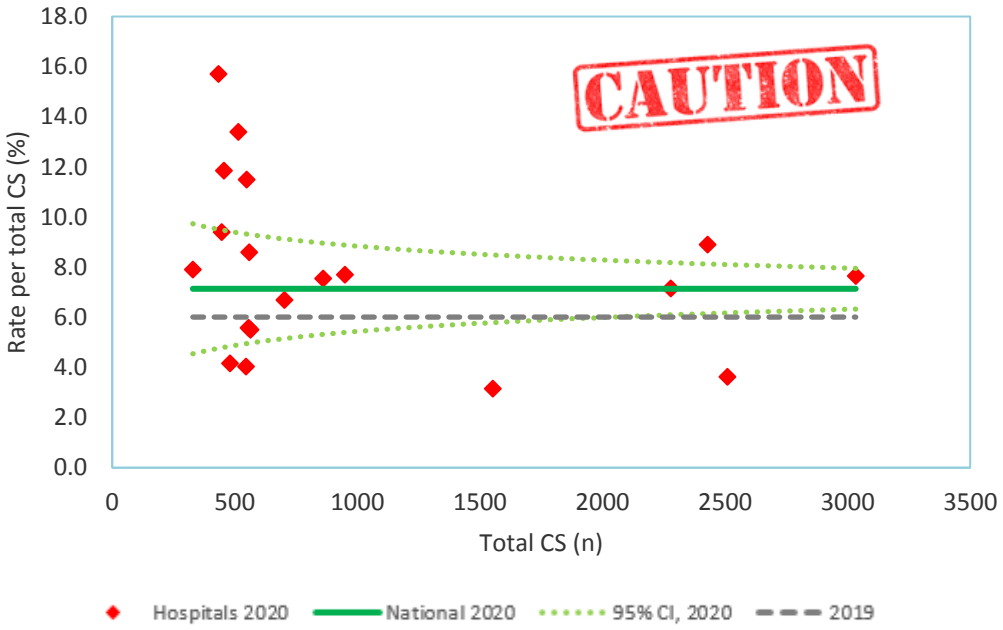
The rate of PPH among women giving birth vaginally ranged from 1%-6% in 2020 across all 19 maternity units. International research finds rates of PPH range from to 1.9% (Sosa et al 2011) to 5.1% (Calvert et al) to 8.7% (Fukami et al 2019).[10]

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

PPH Caesarean section (#31)

Definition

Number of women with one episode of blood loss of ≥1,000mL 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.



	2019	2020
Rates *(% total Caesarean section (CS))*	6.0%	7.1%
95% CI	5.7%–6.3%	6.8%–7.5%
Range	1.5%–14.2%	3.2%–15.7%
PPH per total CS (n)	1,203	1,410
Total CS (n)	20,006	19,750

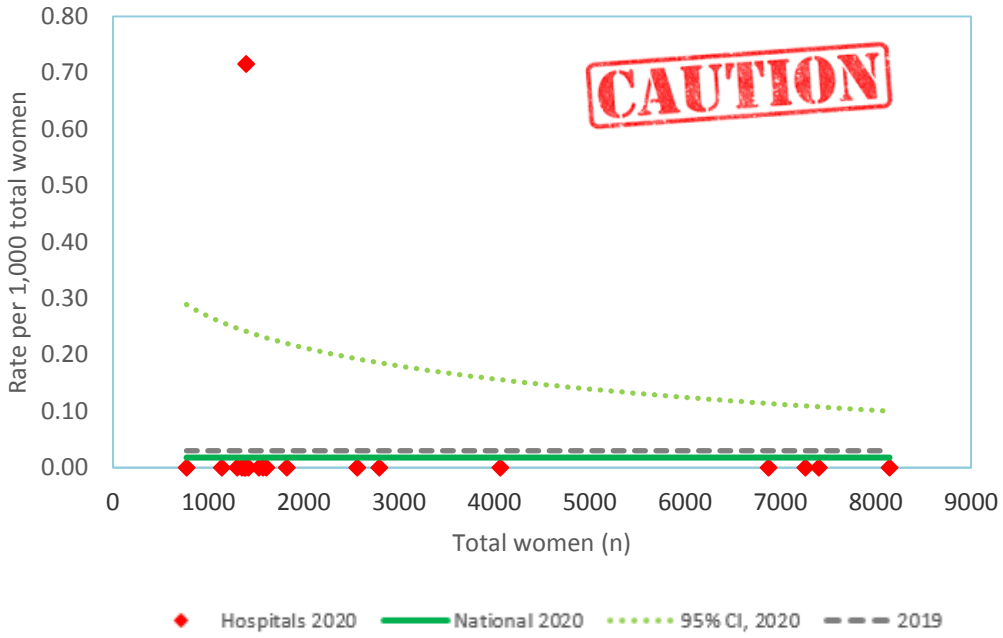
Note:

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).[11] There may be an association between this metric and GA for CS (see Metric #35, page 41), as well as rates of OBT.

11 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.



	2019	2020
Rates *(per 1,000 women delivered)*	0.03	0.02
95% CI	0.00–0.08	0.00–0.05
Total miscarriage misdiagnosis (n)	2	1
Total women delivered (n)	58,272	55,799

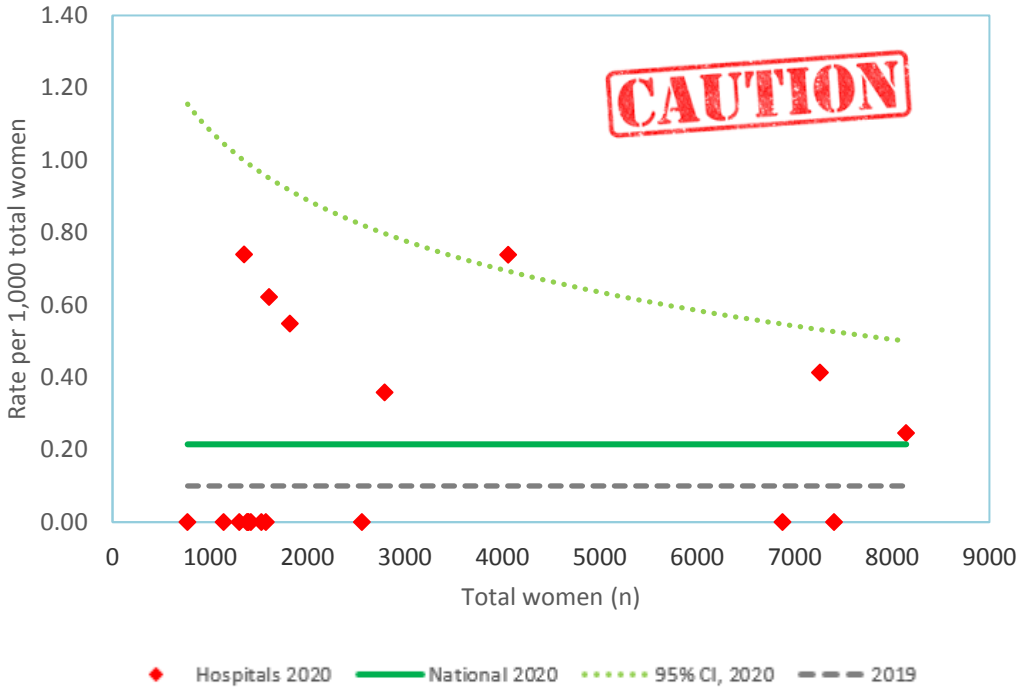
Note:

One case of miscarriage misdiagnosis in 2020 and two cases per annum have been reported since 2017. These figures are 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.



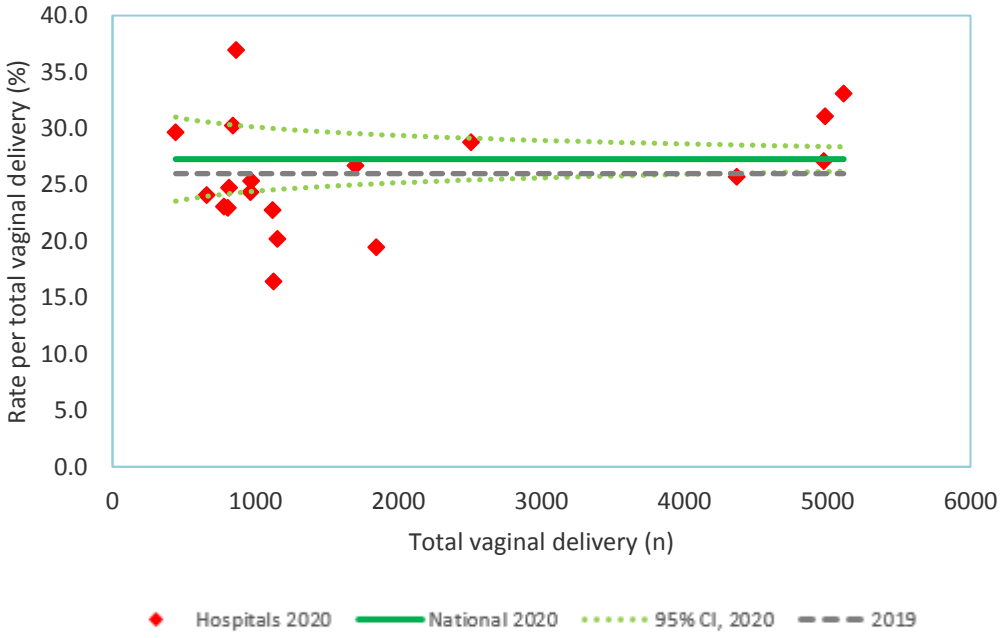
	2019	2020
Rates *(per 1,000 women delivered)*	0.10	0.22
95% CI	0.02–0.19	0.09–0.34
Total retained swabs (n)	6	12
Total women delivered (n)	58,272	55,799

Note:
The increased incidence of retained swabs in 2020 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.



	2019	2020
Rates *(per total vaginal delivery)*	26.0%	27.3%
95% CI	25.6%–26.5%	26.8%–27.7%
Range	17.7%–31.0%	16.4%–37.0%
Total episiotomy (n)	9,945	9,831
Total vaginal delivery (n)	38,266	36,044

Note:

The rate of episiotomy in 2020 varied across the 19 maternity units from 16% to 37% 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).[12]

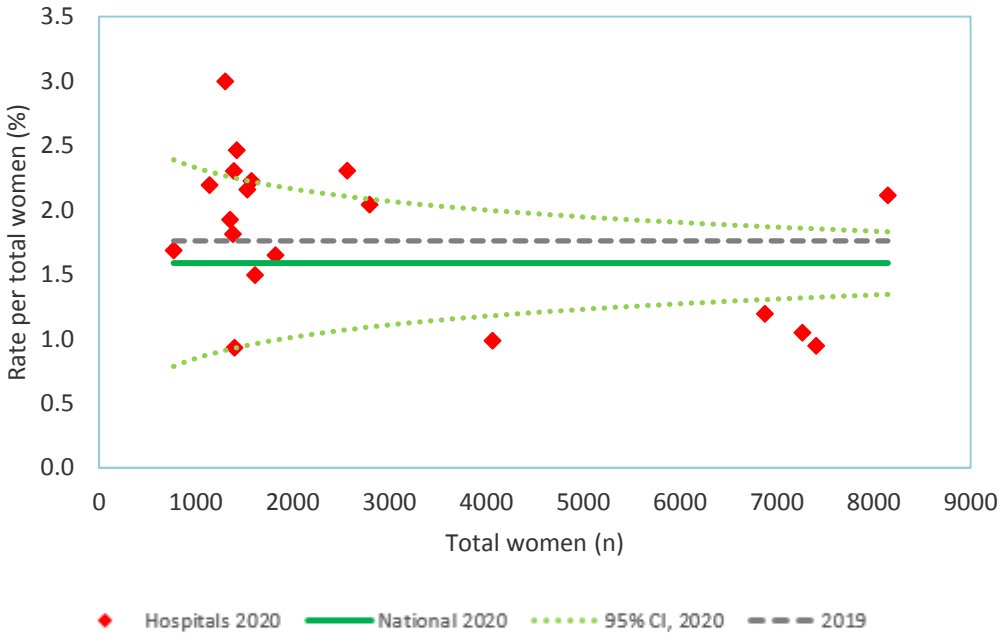
12 Graham ID, Carroli G, Davies C, Medves JM. Episiotomy rates around the world: an update. Birth. 2005;32(3):219–23.

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).



	2019	2020
Rates *(% total women delivered)*	1.8%	1.6%
95% CI	1.7%–1.9%	1.5%–1.7%
Range	1.0%–4.3%	0.9%–3.0%
Total GA for CS (n)	1,026	886
Total women delivered (n)	58,272	55,799

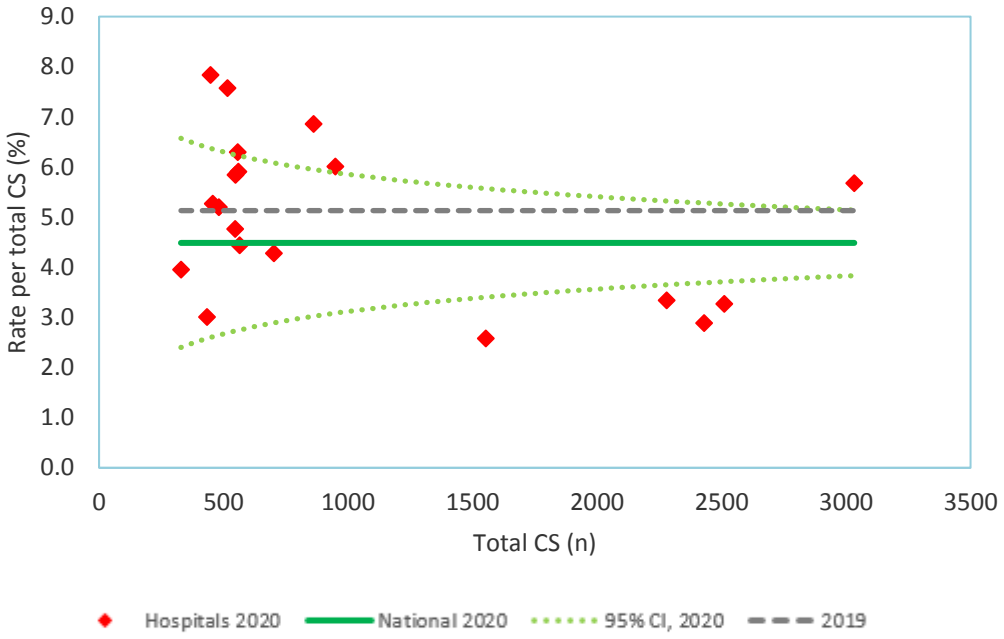
Note:

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

General anaesthetic for Caesarean section (#35)

(Per total Caesarean sections (CS))

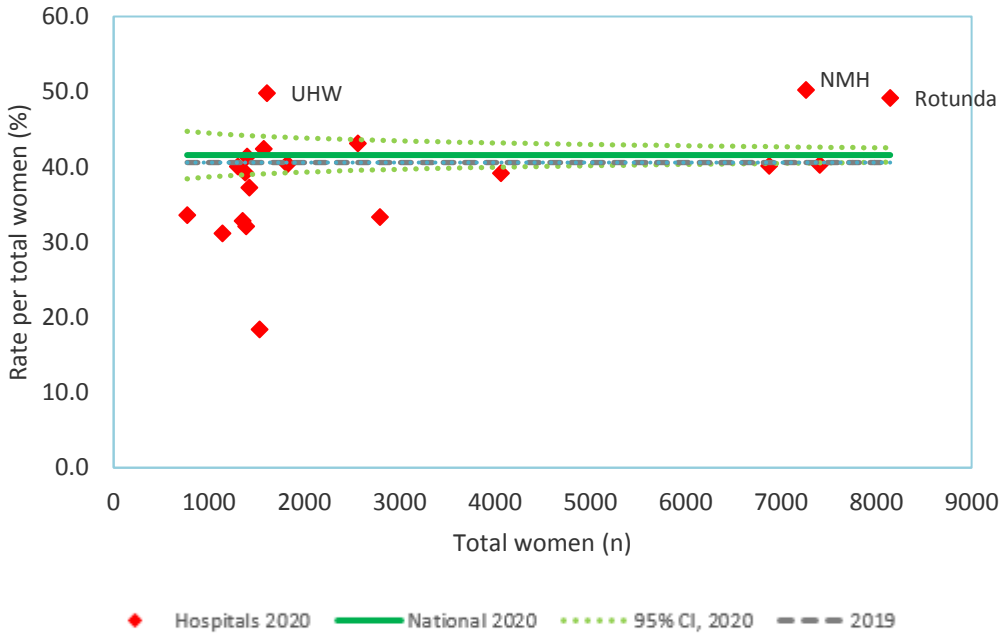
Definition Number of women during the current month who underwent a Caesarean section and were administered a general anaesthetic (GA), including primary GA and also conversion to GA from regional anaesthetic (epidural or spinal).



	2019	2020
Rates *(% total CS)*	5.1%	4.5%
95% CI	4.8%–5.4%	4.2%–4.8%
Range	2.9%–11.7%	2.6%–7.8%
Total GA for CS (n)	1,026	886
Total CS (n)	20,006	19,750

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.



	2019	2020
Rates *(% total women delivered)**	40.6%	41.6%
95% CI	40.2%–41.0%	41.2%–42.0%
Range	18.4%–47.9%	18.4%–50.3%
Total labour epidural (n)	23,645	23,198
Total women delivered (n)	58,272	55,799

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

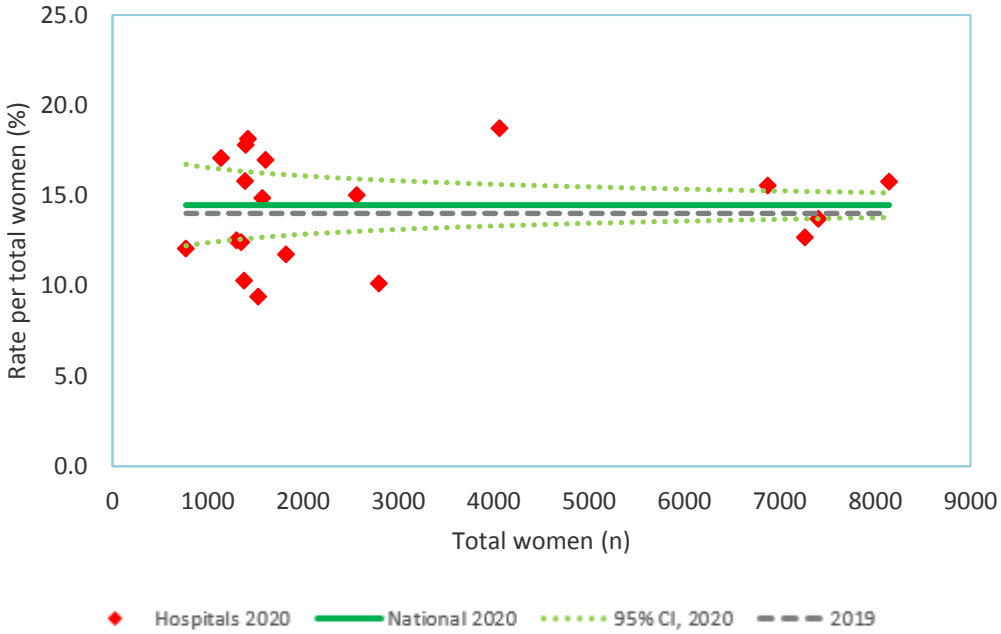
Note:

There is over-dispersion in the funnel chart (i.e., most of the maternity units lie beyond the 95% thresholds), with rates in 2020 ranging from 18.4% to 50.3%.

Higher rates of epidural may be related to higher rates of nulliparae. 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.



	2019	2020
Rates *(% total women delivered)*	14.0%	14.5%
95% CI	13.7%–14.3%	14.2%–14.8%
Range	11.1%–18.3%	9.1%–18.7%
Total OVD (n)	8,162	8,074
Total women delivered (n)	58,272	55,799

Note:

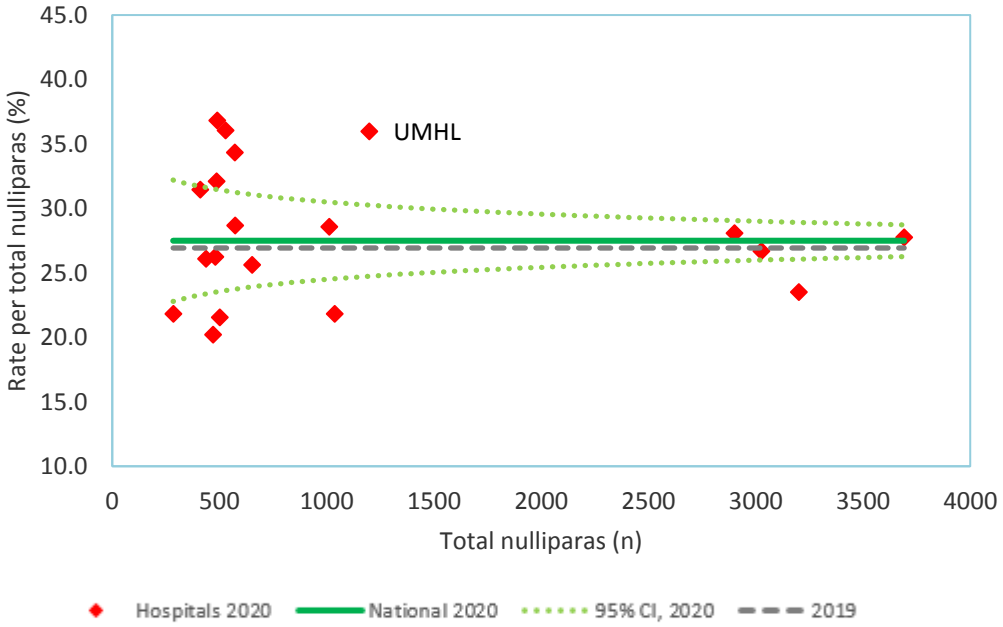
The broad variation in OVD rates across hospitals nationally, from 9.1% to 18.7%, is reflected in international research (Appendix 11).[13]

Declining and diverse usage of OVD procedures, as well as variations in the instruments of choice by obstetricians, have serious implications for obstetric training.

13 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)

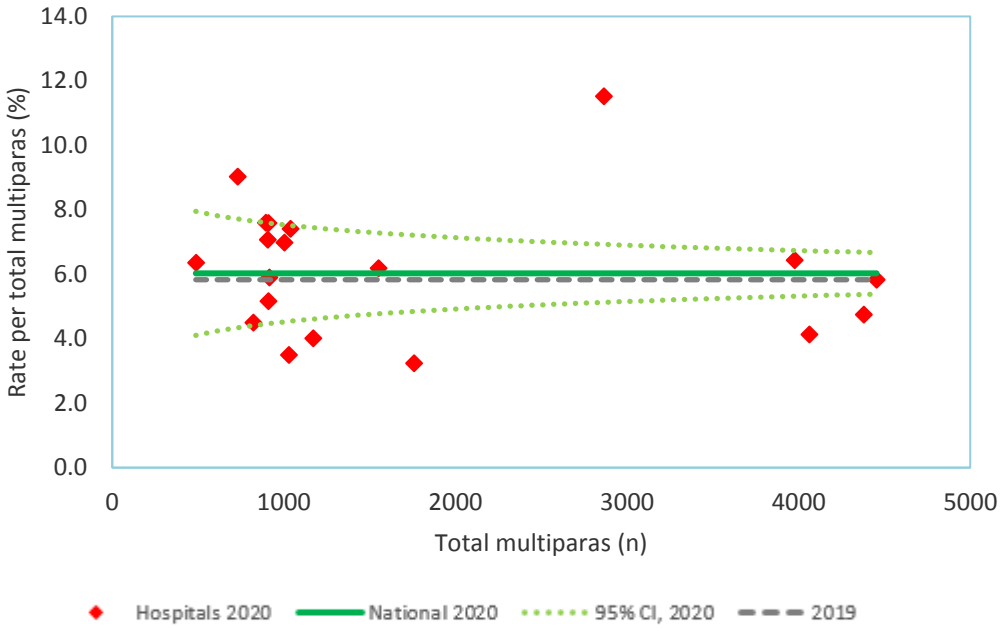
Definitions as before



	2019	2020
Rates *(% nulliparas)*	26.9%	27.5%
95% CI	26.4%–27.5%	26.9%–28.1%
Range	23.6%–33.0%	20.2%–36.8%
OVD among nulliparas (n)	6,083	6,033
Total nulliparas (n)	22,591	21,943

OVD among multiparas (#37b)

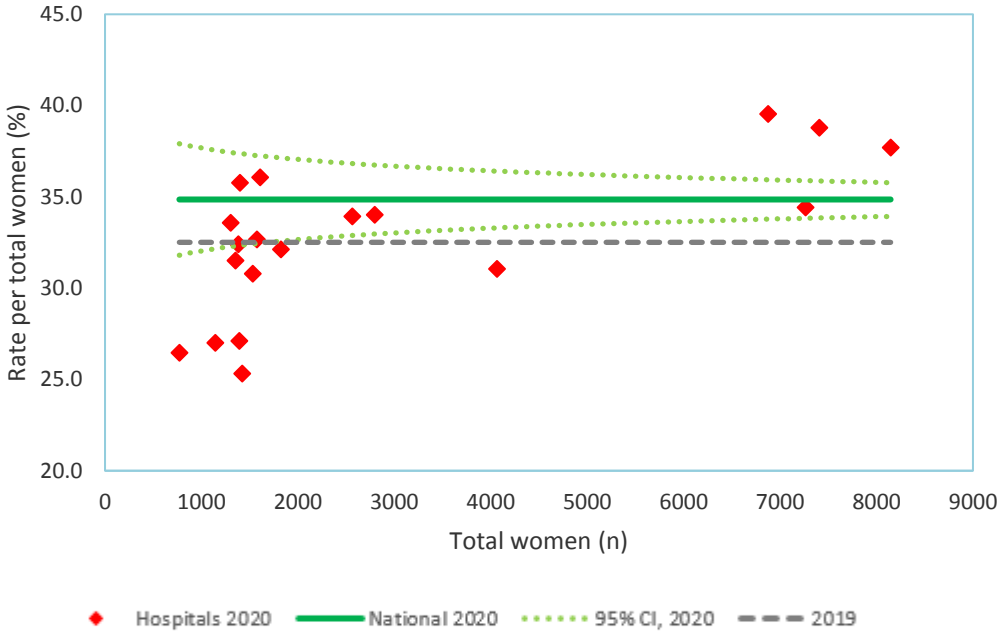
Definitions as before



	2019	2020
Rates *(% multiparas)*	5.8%	6.0%
95% CI	5.6%–6.1%	5.8%–6.3%
Range	3.1%–11.8%	3.2%–11.5%
OVD among multiparas (n)	2,079	2,041
Total multiparas (n)	35,681	33,858

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.



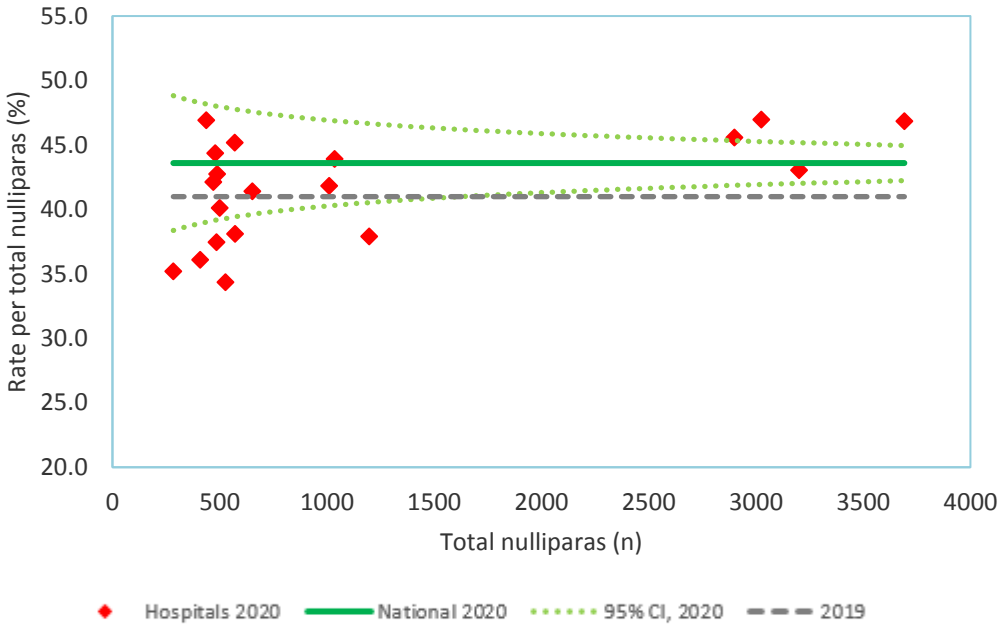
	2019	2020
Rates *(% total women delivered)*	32.5%	34.9%
95% CI	32.1%–32.9%	34.5%–35.3%
Range	22.9%–38.2%	25.3%–39.5%
Total IOL (n)	18,947	19,450
Total women delivered (n)	58,272	55,799

Note:
The increase in the rate of IOL in 2020 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 in 2020 across hospitals, from approximately 25% to 40%. Similar variation is reflected in research (Sinnott et al., 2016)[14]. The IMIS does not explore reasons for variations, but explanations probably include clinical factors, sociodemographic trends, and organisational behaviour and practices.

14 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)

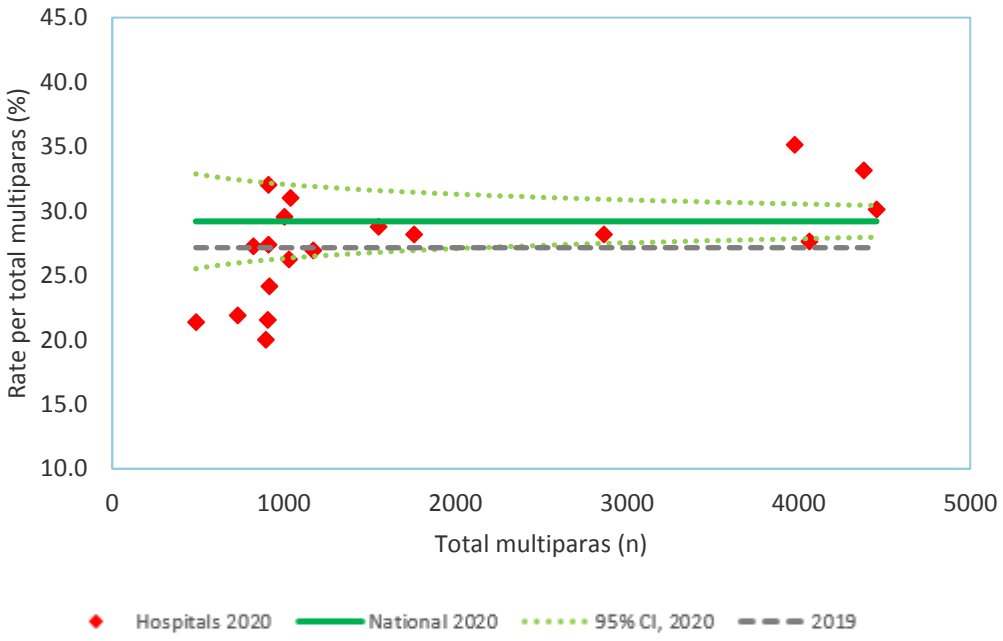
Definitions as before



	2019	2020
Rate *(% nulliparas)*	41.0%	43.6%
95% CI	40.4%–41.6%	42.9%–44.3%
Range	26.7%–46.2%	34.4%–47.0%
IOL among nulliparas (n)	9,261	9,566
Total nulliparas (n)	22,591	21,943

IOL among multiparas (#38b)

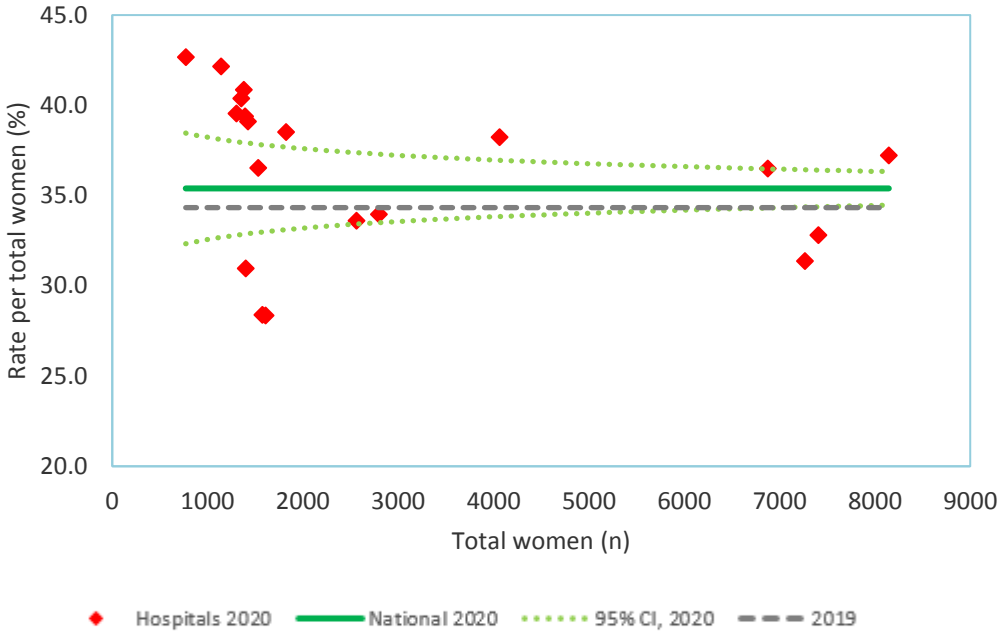
Definitions as before



	2019	2020
Rate *(% multiparas)*	27.2%	29.2%
95% CI	26.7%–27.6%	28.7%–29.7%
Range	17.8%–32.7%	20.0%–35.1%
IOL among multiparas (n)	9,686	9,884
Total multiparas (n)	35,681	33,858

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.



	2019	2020
Rate *(% total women delivered)*	34.3%	35.4%
95% CI	34.0%–34.7%	35.0%–35.8%
Range	27.2%–41.4%	28.4%–42.7%
Total CS (n)	20,006	19,750
Total women delivered (n)	58,272	55,799

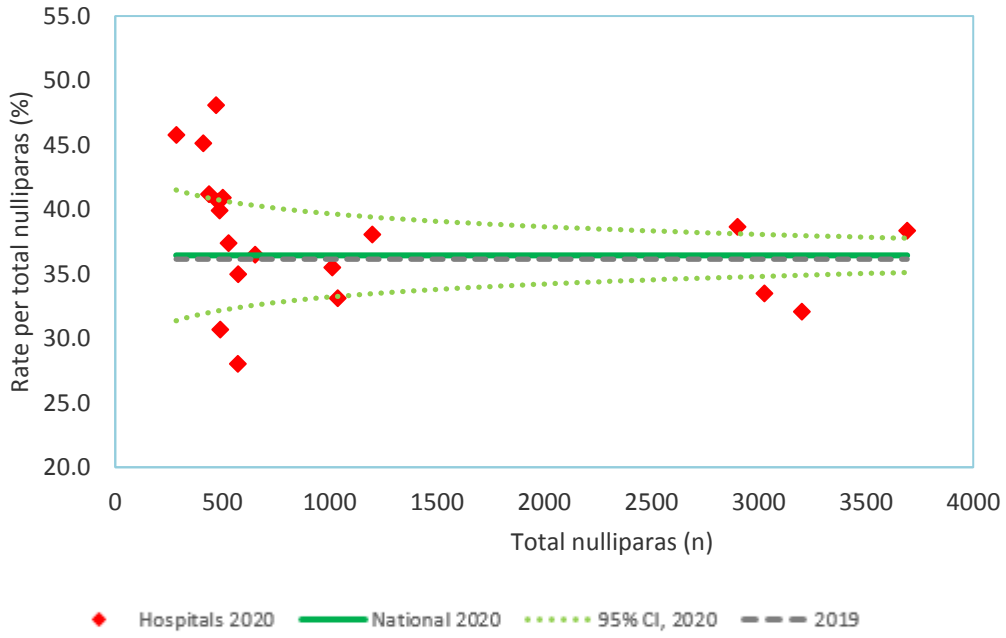
Note:

There was considerable variation in CS rates across maternity units in 2020, ranging from approximately 28% to 43%. The rising trend of CS rates continued in 2020 (see Appendix 11). In terms of the increasing rates and variation across hospitals, research indicates Ireland is largely similar to other jurisdictions.[15]

15 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)

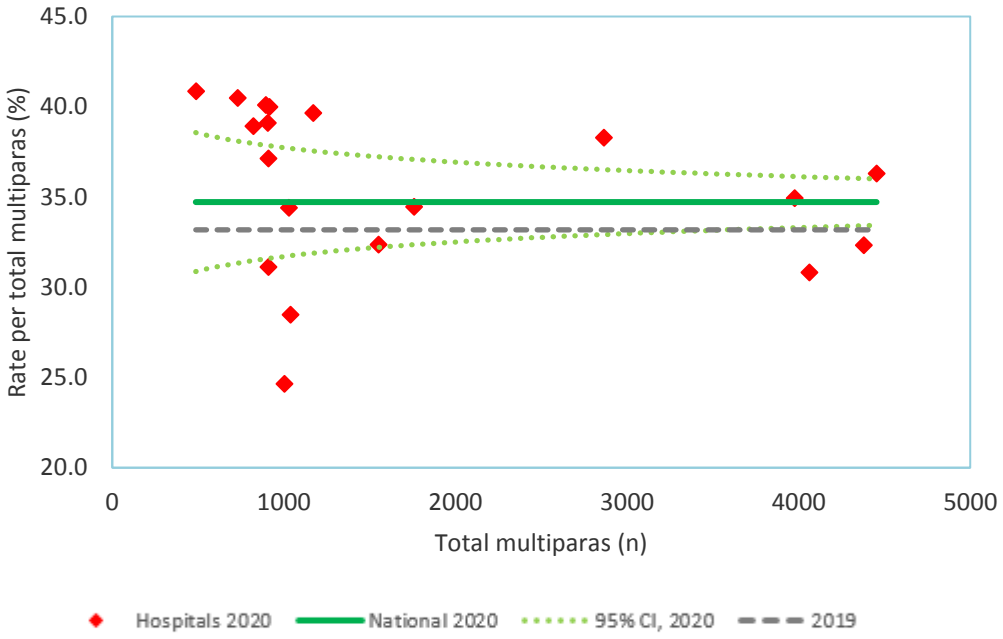
Definitions as before



	2019	2020
Rate *(% nulliparas)*	36.1%	36.4%
95% CI	35.5%–36.8%	35.8%–37.1%
Range	27.6%–50.8%	28.0%–48.1%
CS among nulliparas (n)	8,165	7,995
Total nulliparas (n)	22,591	21,943

CS among multiparas (#39b)

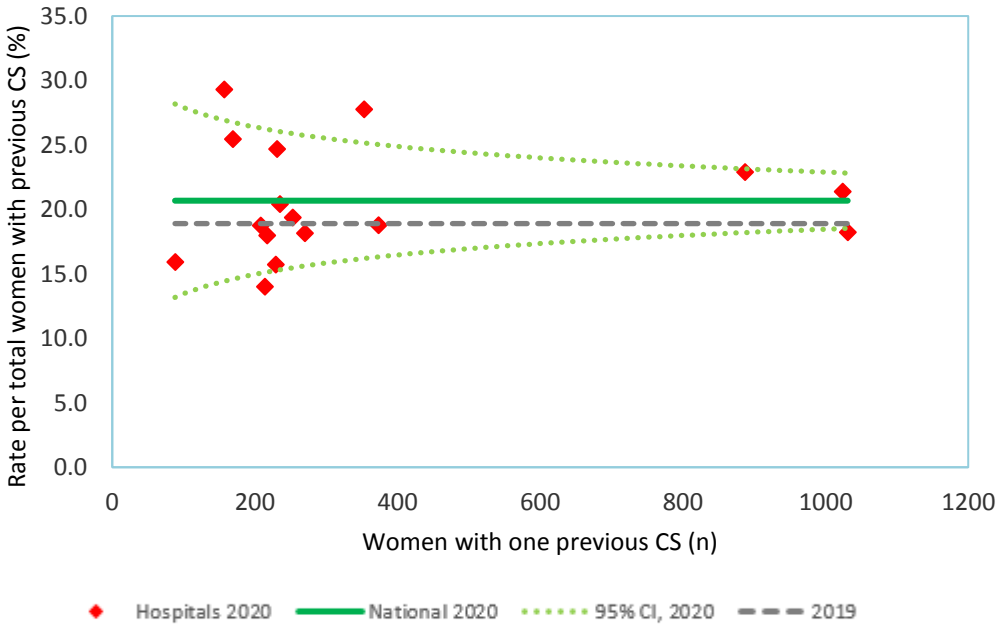
Definitions as before



	2019	2020
Rate *(% multiparas)*	33.2%	34.7%
95% CI	32.7%–33.7%	34.2%–35.2%
Range	25.3%–39.4%	24.7%–40.9%
CS among multiparas (n)	11,840	11,755
Total multiparas (n)	35,681	33,858

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.



	2019*	2020**
Rate *(% women with one previous CS)*	18.9%	20.7%
95% CI	17.7%–20.1%	19.7%–21.7%
VBAC (n)	733	1,228
Total women with previous CS (n)	3,878	5,939

**Missing data in 2019 from 11 maternity hospitals/units*

***Missing cases in 2020: CUMH, UMHL, Portlaoise*

Note:

There is considerable missing data on this metric and/or on the denominator (i.e., women with previous CS).

Appendices

Appendix 1. IMIS Officers/Teams in the 19 maternity hospitals/units and Advisory Subgroup

Cavan General Hospital Ms Karen Malocca, CNM2 MN-CMS; Dr Rukhsana Majeed; Ms Ann Arnott, Clinical Midwife Manager; Ms Margaret Mulvany, Assistant Director Women & Children's Services

Cork University Maternity Hospital Ms Claire Everard, Quality and Risk Manager

Coombe Women and Infants University Hospital Ms Julie Sloane, Data Analyst, Ms Emma McNamee, IT Systems Manager

Our Lady of Lourdes Hospital, Drogheda Ms Claire Shannon, CMM3 - MNCMS

Galway University Hospital Ms Anne-Marie Grealish, ADOM; Ms Claire Greaney, CMM2 IT & Data Management

University Hospital Kerry Ms Mary Stack-Courtney, CNM3; Ms Mairéad Griffin, MNCMS-Local Project Support; Ms Sandra O'Connor, Director of Midwifery

St Luke's Hospital, Kilkenny Ms Fiona Dalton, Ms Paula Power, Director of Midwifery

Letterkenny University Hospital Ms Evelyn Smith, Director of Midwifery; Ms Marion Doogan, ADOM, Ms Mary Lynch, CMM3

University Maternity Hospital Limerick Mr Stephen Culligan, Senior Maternity Data Analyst

Mayo General Hospital Ms Andrea McGrail, Director of Nursing & Midwifery

Midland Regional Hospital, Mullingar Ms Marie Corbett, Director of Midwifery

National Maternity Hospital, Dublin Ms Fionnuala Byrne, Information Officer

Portiuncula University Hospital Ms Priscilla Neilan, QPS Project Manager; Ms Sheila Melvin, IT Midwife

Midland Regional Hospital, Portlaoise Ms Ita Kinsella, ADOM

Rotunda Hospital, Dublin Ms Kathy Conway, Clinical Activity Reporting Manager

Sligo University Hospital Ms Juliana Henry, Director of Midwifery; Niamh McGarvey, ADOM, Colette Kivlehan, QI and Patient Safety Midwife

South Tipperary General Hospital Ms Sinéad Heaney, Director of Midwifery; Ms Maura Clooney, Secretary to DOM

University Hospital Waterford Ms Paula Curtin, Director of Midwifery

Wexford General Hospital Helen McLoughlin, Director of Midwifery

Advisory Subgroup:

Ms June Boulger, HSE
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 form (2020)

IMIS 2020			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)				
	41.	One previous CS (n)				

Appendix 3. IMIS Implementation Guidelines

1. The IMIS is designed to capture and measure clinicial 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 National 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 personnel 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),[16] obtained from the HSE, and the Hospital In-Patient Enquiry system (HIPE).[17]

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).[18] This overdispersion is not an unusual phenomenon in health data and, in fact, can be useful in model specification (Birkmeyer 2001).[19] 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 analysis presented in this report, it is likely that these are the underlying reasons for much of the

16 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.

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

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

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

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:

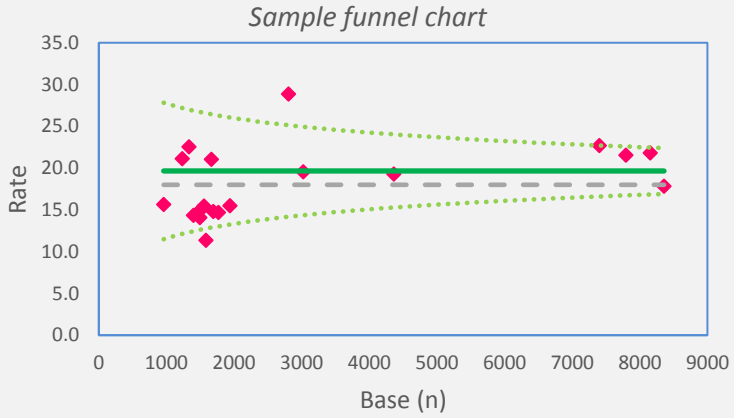
Diamond-shaped markers represent the 19 maternity hospitals/units.

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 6. Maternity hospitals/units in Republic of Ireland (n=19)

Appendix 7. HSE Maternity Networks

Ireland East	National Maternity Hospital, Dublin (NMH) Midland Regional Hospital Mullingar (MRHM) St Luke's General Hospital, Kilkenny (SLHK) Wexford General Hospital
RCSI	Rotunda Hospital, Dublin Cavan General Hospital Our Lady of Lourdes Hospital, Drogheda (OLOL)
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 8. 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 9. Glossary and Abbreviations

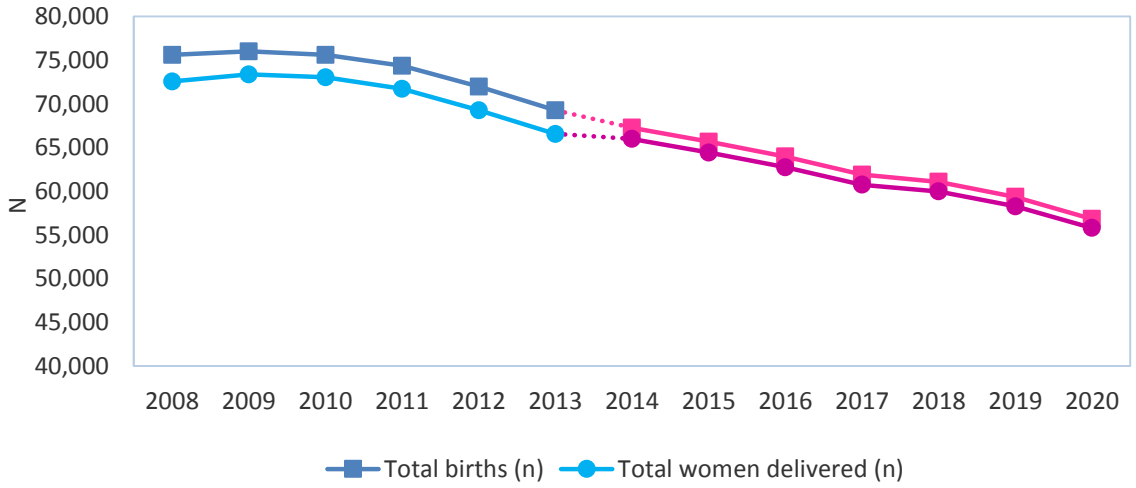
ACHI	Australian Classification of Health Interventions
BPP	Brachial plexus palsy
CA	Congenital anomaly
CS	Caesarean section
ECDC	European Centre for Disease Prevention and Control
EPAU	Early Pregnancy Assessment Units
GA	General anaesthetic
HIE	Hypoxic ischaemic encephalopathy
HIPE	Hospital In-Patient 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
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 10. National longitudinal trends, 2008-2020

1. Total women delivered and Total births

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

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	2020
Births	75587	76023	75600	74377	71986	69267	67263	65680	63964	61902	61084	59352	56833
Women	72574	73373	73032	71705	69263	66574	65987	64435	62736	60744	59981	58272	55799

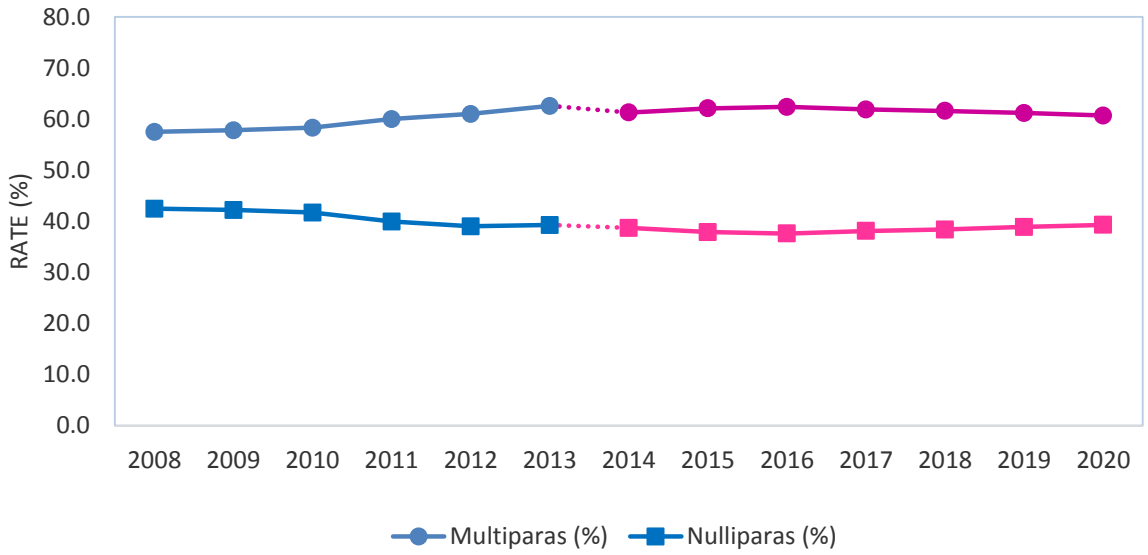
Sources: NPRS Annual Report 2013, IMIS 2014-2020

	% changes	
	Total women	Total births
2008 vs 2020 (NPRS/IMIS)	-23.1%	-23.1%
2014 vs 2020 (IMIS)	-15.4%	-15.5%
2019 vs 2020 (IMIS)	-4.2%	-4.2%

2. Total nulliparas and Total multiparas

Nulliparas: Number of women delivering a baby ≥500g who have never had a previous pregnancy resulting in a live birth or stillbirth.

Multiparas: Number of women delivering a baby ≥500g 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**	**2020**
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	60.7
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	39.3

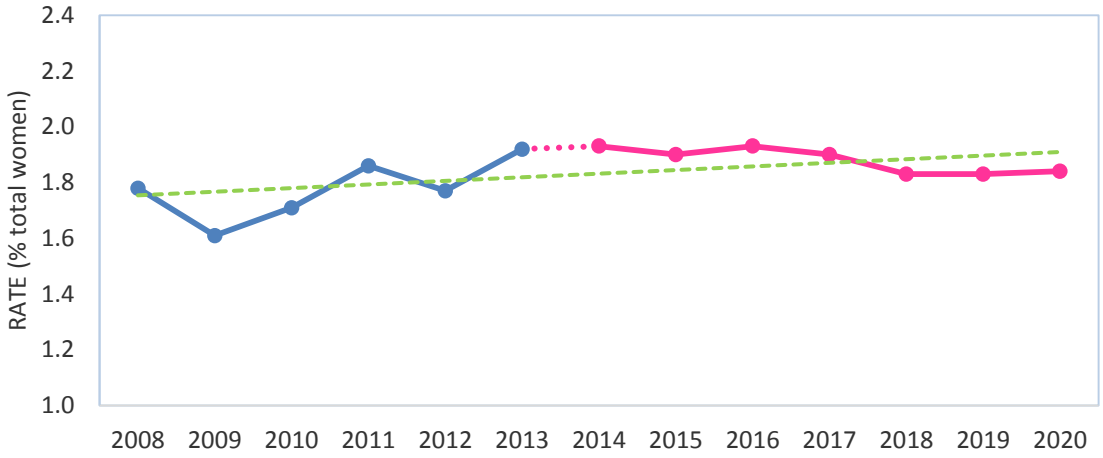
Sources: NPRS Annual Report 2013, IMIS 2014-2020

	% changes	
	Multiparas	Nulliparas
2008 vs 2020 (NPRS/IMIS)	+5.3% (p≤0.05)	-7.5% (p≤0.05)
2014 vs 2020 (IMIS)	-1.0% (p≤0.05)	+1.6% (p≤0.05)
2019 vs 2020 (IMIS)	-0.8% (ns)	+1.3% (ns)

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**	**2020**
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	1.84

Sources: NPRS Annual Report 2013, IMIS 2014-2020

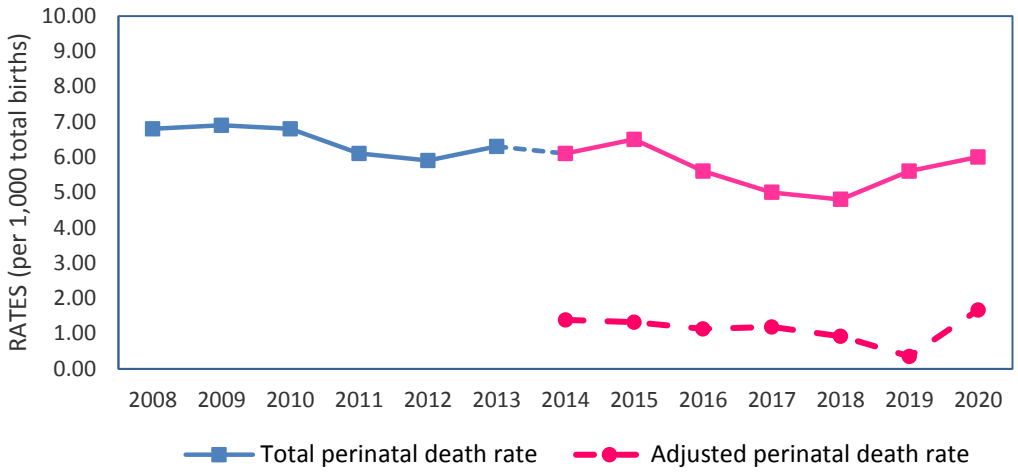
	% changes
2008 vs 2020 (NPRS/IMIS):	+3.6% (ns)
2014 vs 2020 (IMIS):	-3.0% (ns)
2019 vs 2020 (IMIS):	+0.5% (ns)

4. Total perinatal death rate and Adjusted perinatal death rate

Definitions

Total perinatal deaths: 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 ≥500g, 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.

Adjusted perinatal deaths: 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.



	NPRS*						IMIS						
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
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	6.0
Adjusted per death rate	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	1.4	1.3	1.1	1.2	0.9	1.4	1.7

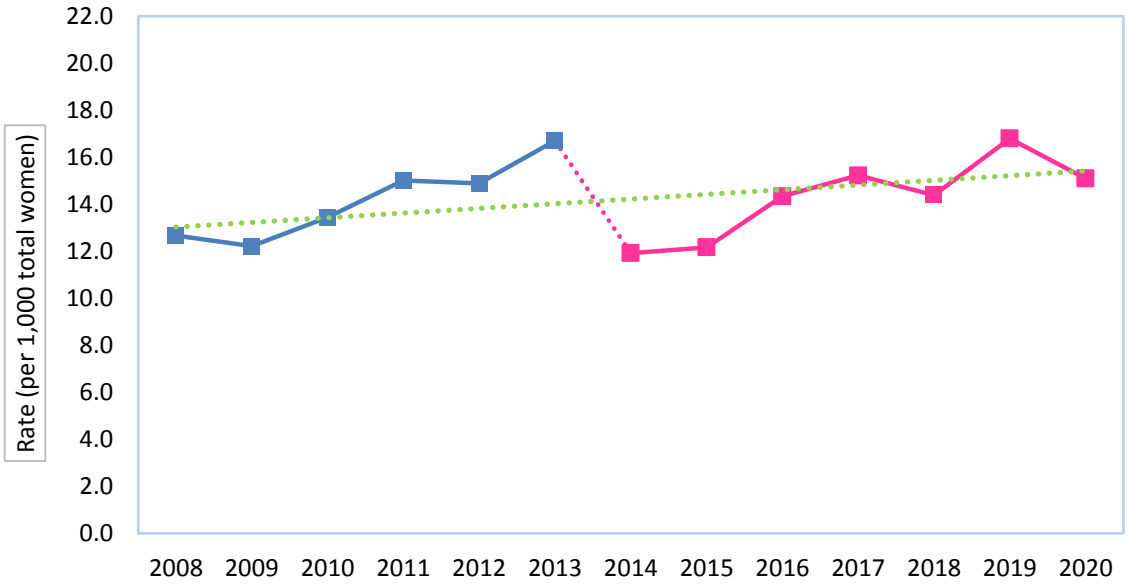
Sources: NPRS Annual Report 2013, IMIS 2014-2020

* The NPRS definition of perinatal deaths includes 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. Rate calculation: (Number of stillbirths + early neonatal deaths/Total live births and stillbirths) x 1,000.

	% changes	
	Total per death rate	Adjusted per death rate
2008 vs 2020 (NPRS/IMIS):	-12.5% (ns)	*n/a*
2014 vs 2020 (IMIS):	-0.2% (ns)	+21.4% (ns)
2019 vs 2020:	+6.9% (ns)	+21.4% (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.



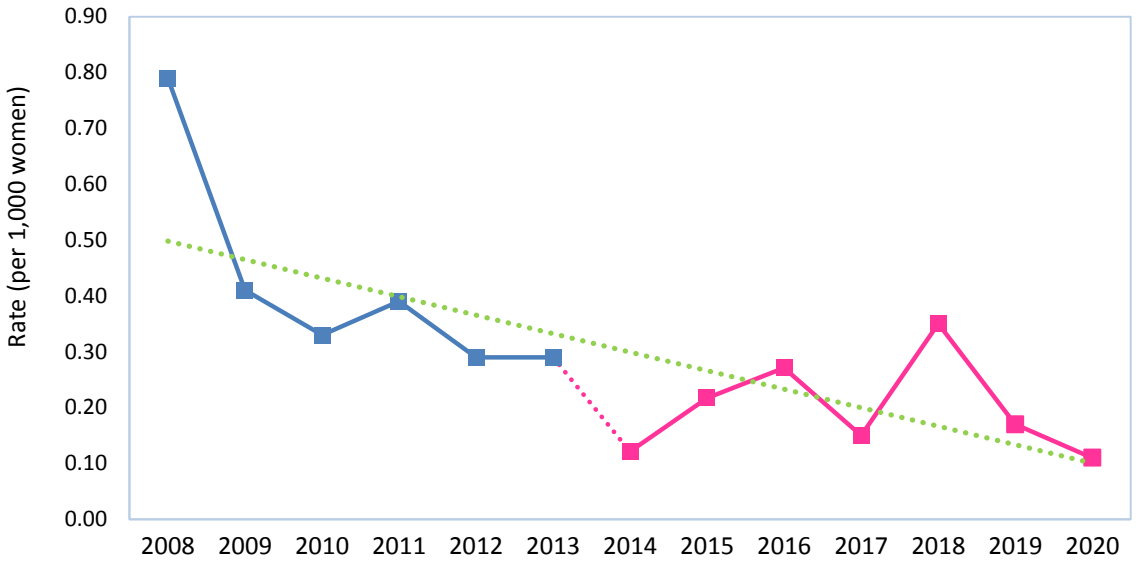
	NPRS						IMIS						
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Rate*	12.7	12.2	13.5	15.0	14.9	16.7	11.9	12.2	14.3	15.2	14.4	16.8	15.1

**Per 1,000 women delivered. Sources: HIPE (closed national files for 2008-2013); NPRS 2008-2013; IMIS 2014-2020*

	% changes
2008 vs 2020 (HIPE/NPRS, IMIS):	+19.1% (p≤0.05)
2014 vs 2020 (IMIS):	+26.6% (p≤0.05)
2019 vs 2020 (IMIS):	-10.1% (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**	**2020**
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	0.11

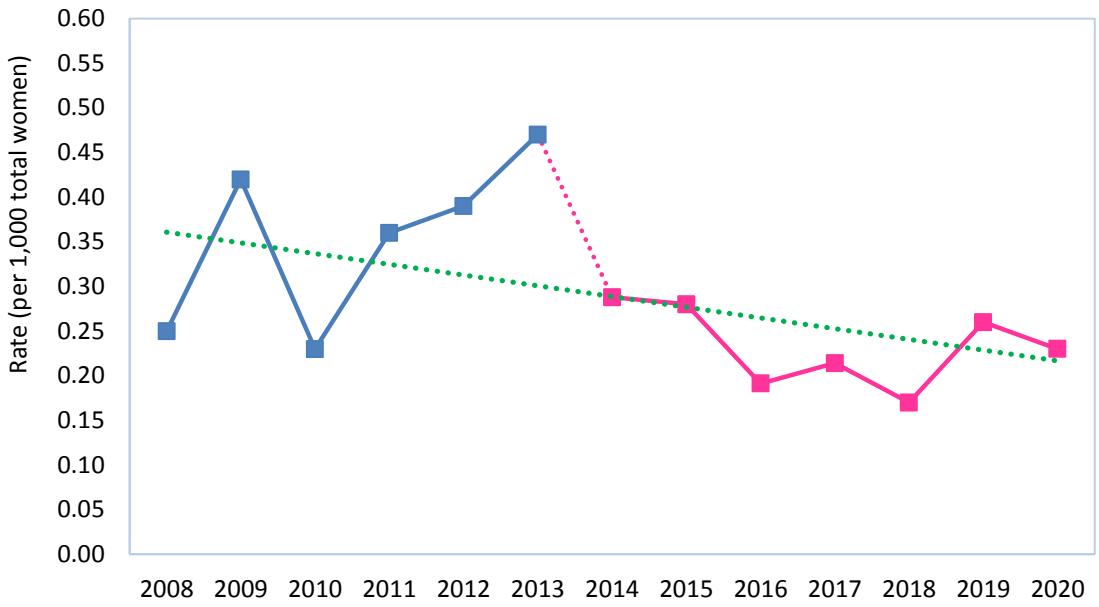
**Per 1,000 women delivered*

Sources: HIPE (closed national files for 2008-2013); IMIS 2014-2020

	% changes
2008 vs 2020 (HIPE/NPRS, IMIS):	-86.1% (p≤0.05)
2014 vs 2020 (IMIS):	-9.3% (ns)
2019 vs 2020 (IMIS):	-35.3% (ns)

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**	**2020**
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	0.23

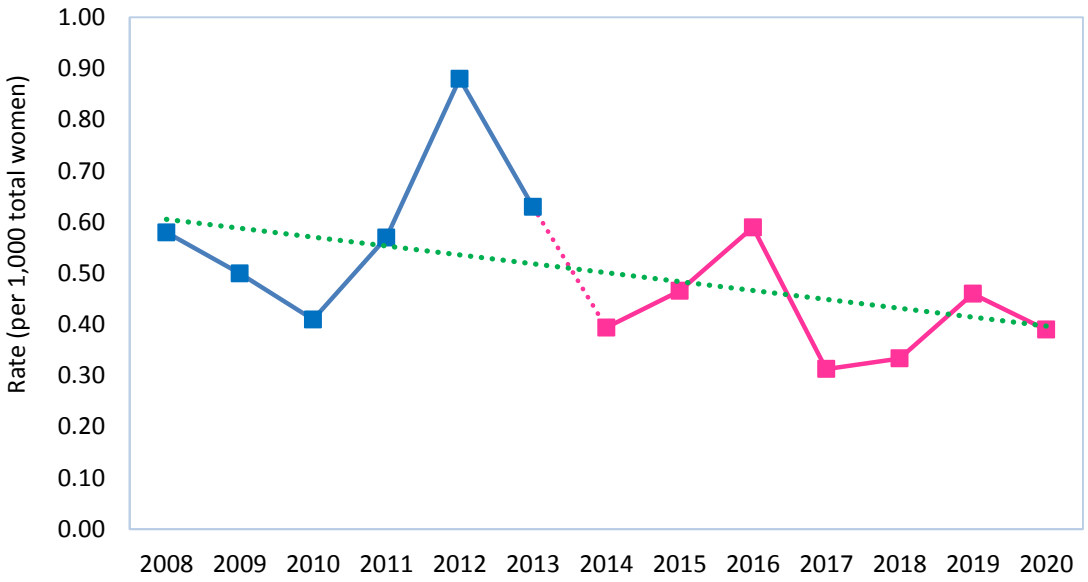
**Per 1,000 women delivered*

Sources: HIPE (closed national files for 2008-2013); IMIS 2014-2020

	% changes
2008 vs 2020 (HIPE/NPRS, IMIS):	-8.0% (ns)
2014 vs 2020 (IMIS):	-20.1% (ns)
2019 vs 2020 (IMIS):	-11.5% (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**	**2020**
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	0.39

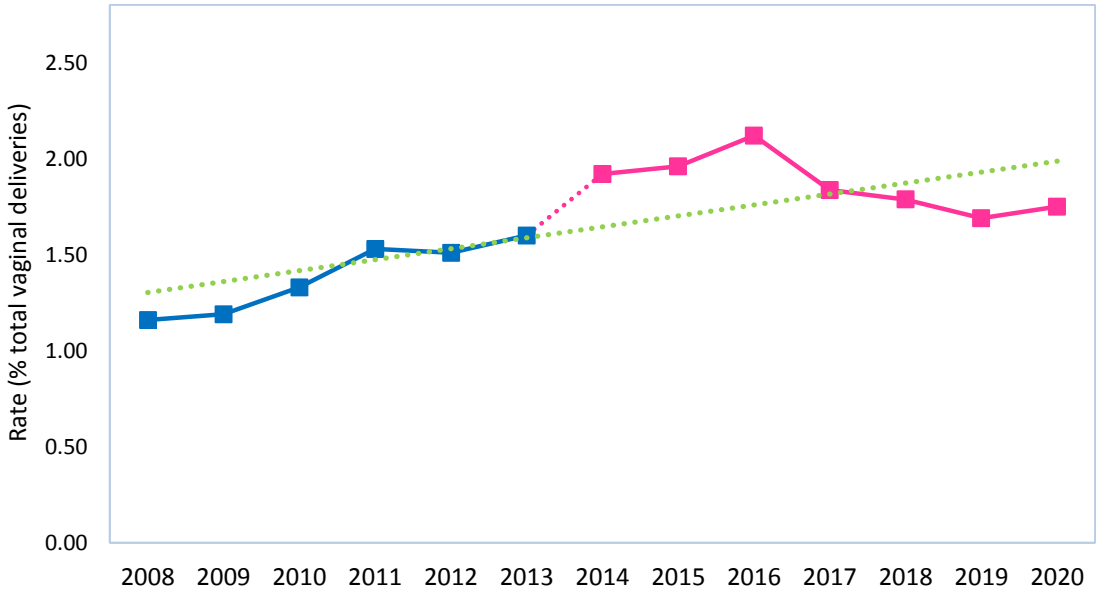
**Per 1,000 women delivered*

Sources: HIPE (closed national files for 2008-2013); IMIS 2014-2020

	% changes
2008 vs 2020 (HIPE/NPRS, IMIS):	-32.8% (ns)
2014 vs 2020 (IMIS):	-38.1% (ns)
2019 vs 2020 (IMIS):	-15.2% (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**	**2020**
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	1.75

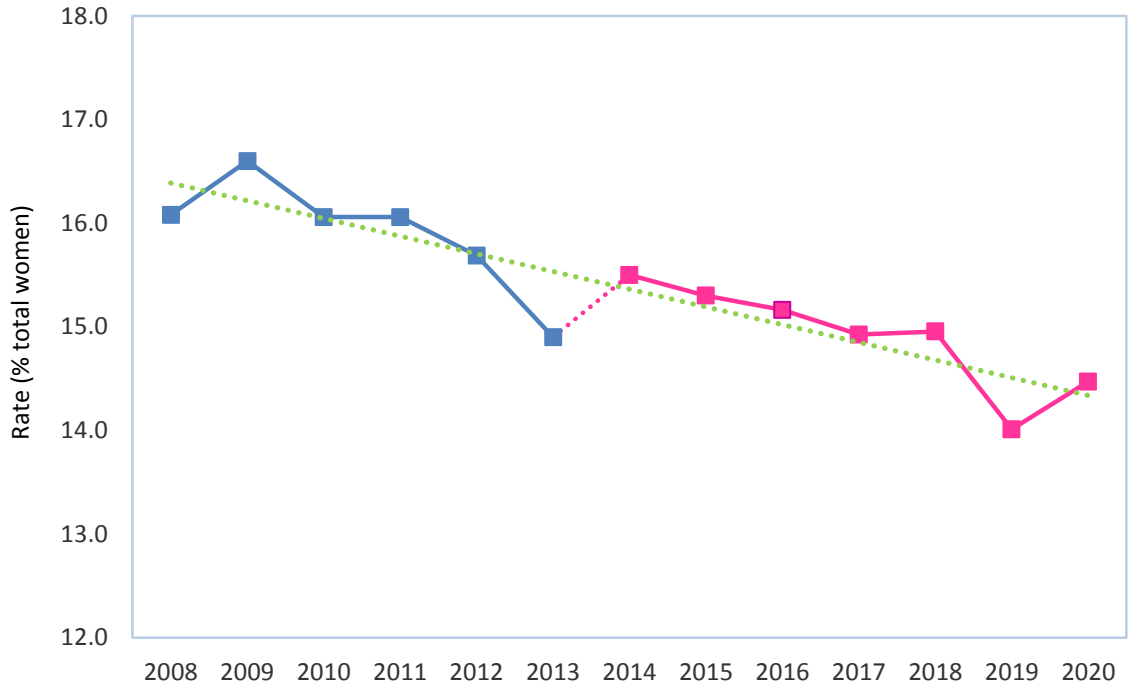
**Per total vaginal delivery (%)*

Sources: HIPE (closed national files for 2008-2013); NPRS 2008-2013; IMIS 2014-2020

	% changes
2008 vs 2020: (HIPE/NPRS, IMIS):	+50.9% (p≤0.05)
2014 vs 2020 (IMIS):	-8.9% (ns)
2019 vs 2020 (IMIS):	+3.5% (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**	**2020**
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	14.5

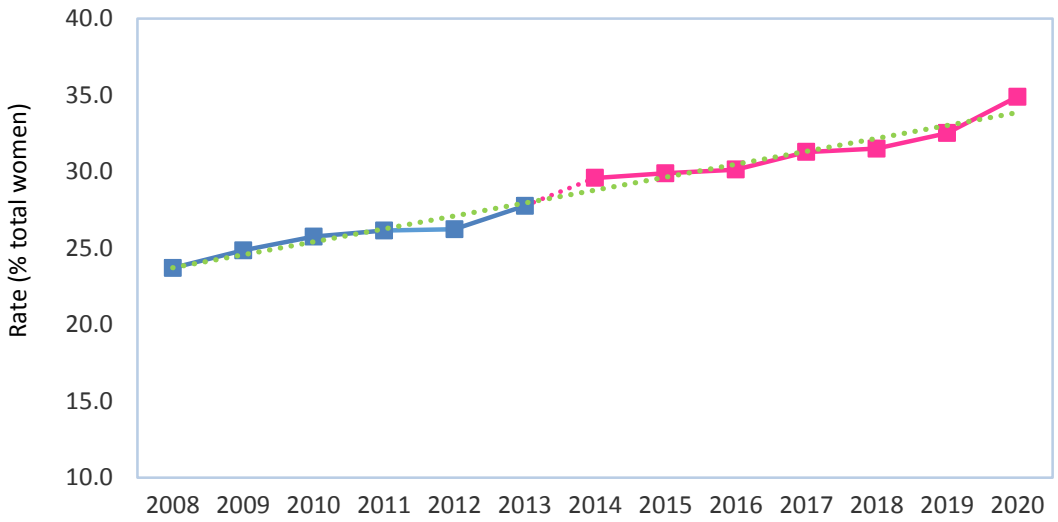
**Per total women delivered (%)*

Sources: HIPE (closed national files for 2008-2013); NPRS 2008-2013; IMIS 2014-2020

	% changes
2008 vs 2020 (HIPE/NPRS, IMIS):	-10.0% (p≤0.05)
2014 vs 2020 (IMIS):	-6.6% (p≤0.05)
2019 vs 2020(IMIS):	+3.3% (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**	**2020**
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	34.9

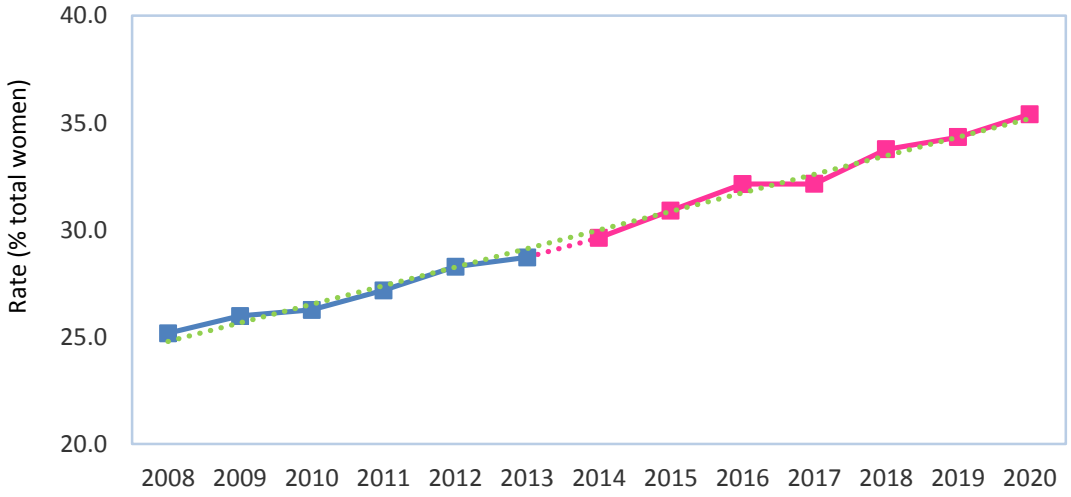
**Per total women delivered (%)*

Sources: HIPE (closed national files for 2008-2013); NPRS 2008-2013; IMIS 2014-2020

	% changes
2008 vs 2020 (HIPE/NPRS, IMIS):	+47.2% (p≤0.05)
2014 vs 2020 (IMIS):	-17.9% (p≤0.05)
2019 vs 2020 (IMIS):	+0.6% (p≤0.05)

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**	**2020**
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	35.4

**Per 100 women delivered (%)*

Sources: HIPE (closed national files for 2008-2013); NPRS 2008-2013; IMIS 2014-2020

	% changes
2008 vs 2020 (HIPE/NPRS, IMIS):	+40.6% (p≤0.05)
2014 vs 2020 (IMIS):	+19.5% (p≤0.05)
2019 vs 2020 (IMIS):	+3.1% (p≤0.05)

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