

## Background

- Neonatal encephalopathy (NE) is a complex syndrome characterised by depressed or abnormal neurological function, often caused by experiencing reduced oxygen or blood supply to the infant's brain before or during birth (hypoxic-ischaemic encephalopathy – HIE).
- Therapeutic Hypothermia (TH) is considered the standard treatment for term infants with NE. TH is a therapy during which the infant is cooled within six hours of birth to a targeted core body temperature of between 33°C to 34°C for a duration of 72 hours.
- Following the 72 hour period, the infant is rewarmed to normal body temperature over a 6-12 hour period.
- TH is regarded as the greatest single advance in Neonatology over the last 25 years as research has demonstrated it reduces the rate of death, severe disability and lifelong cerebral palsy reduction for these infants.

## Purpose

- The purpose of the National Neonatal Therapeutic Hypothermia audit is to describe the epidemiology, antecedent obstetric, and intrapartum factors leading to NE, as well as the immediate and subsequent neonatal management and outcomes of the infants diagnosed with NE.
- To date five years of data has been collected contributing to important knowledge in the area of NE in the Republic of Ireland (2016 to 2020).

## Methods

- In Ireland, TH is administered in four tertiary maternity hospitals. All infants born in other hospitals requiring this treatment are transferred to one of these four tertiary hospitals.
- Data were collected on all cases of neonatal therapeutic hypothermia from 2016 to 2020 by taking an active case ascertainment approach. Pseudonymised data were collected on site in the 19 maternity units/hospitals and neonatal intensive care units or special care baby units (NICU/SCBU) in the Republic of Ireland.

- A total of 76 cases of mothers and their infants who required TH following a diagnosis of NE in Ireland were reported for 2020 (Figure 1). The incidence of TH in 2020 was of 1.4 per 1,000 births.

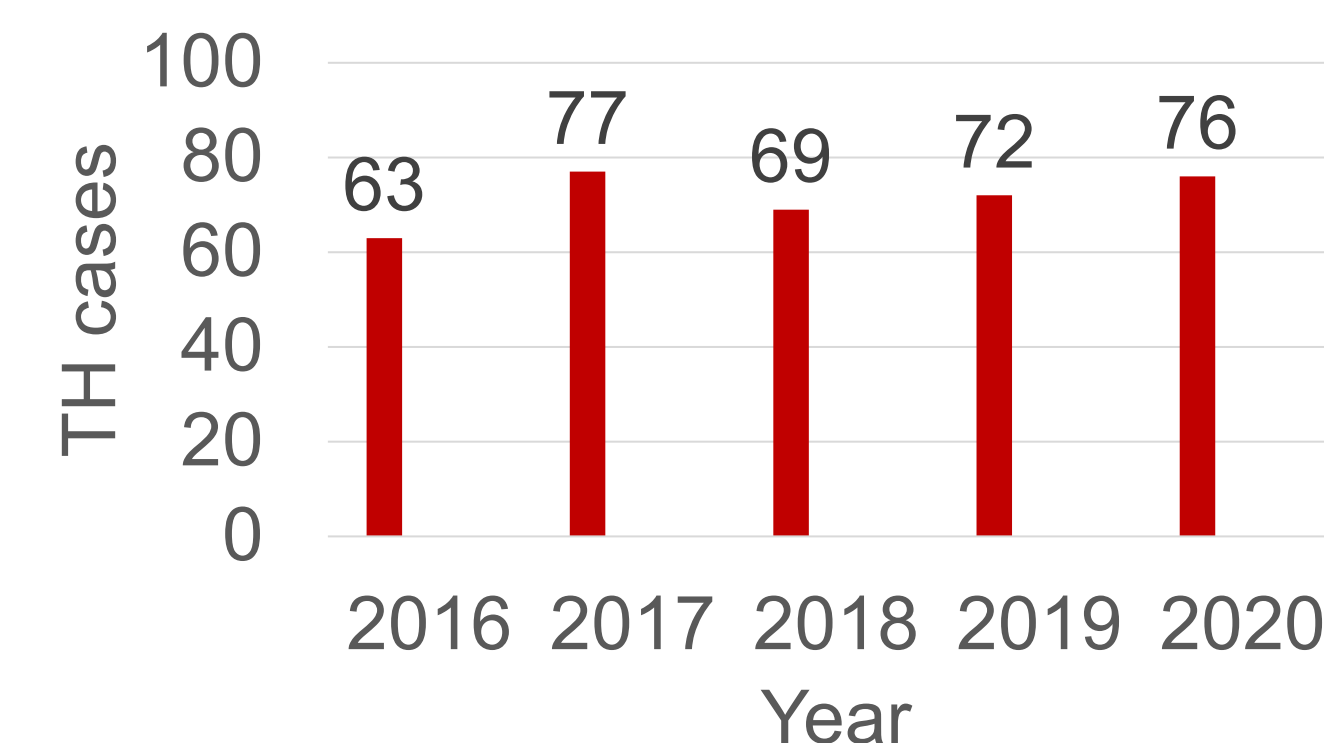
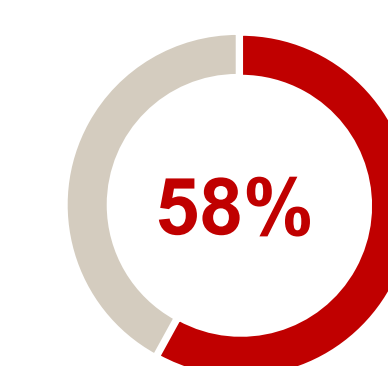


Figure 1: Number of infants who underwent TH by year, 2016-2020

- A total of 357 infants underwent TH in the five-year period where there were 301,940 infants born in Ireland equating to an incidence rate of TH of 1.2 per 1,000 births.

- As with previous, TH is strongly associated with nulliparous mothers, Table 1



Mothers in their first pregnancy accounted for 58% of the TH cohort in 2016-2020 (Table 1).

Table 1: Distribution of parity, 2016-2020

Parity	TH cases N=357 2016-2020	All births 2016-2020 (%) N=303,135	Rate (95% CI)	Rate ratio (95% CI)	p-value
Nulliparous	210	117822	1.78(1.55-2.04)	2.78(1.94-4.0)	<0.001
Para 1	84	105561	0.80(0.63-0.99)	1.24(0.83-1.85)	0.285
Para 2	34	53087	0.64(0.44-0.89)	1.00 (ref.)	
Para 3+	29	26665	1.09(0.73-1.56)	1.7(1.03-2.79)	0.036

- The survival rate was 84.2% in 2020 (n=12 of 76) and 79.2% in 2019 (n=15 of 72, Table 2).

Table 2: Perinatal and infant mortality for infants who underwent TH in 2016-2019 versus 2020

	2016-2019 N=38	2020 N=12	2016-2020 N=50
Early neonatal death (Within 7 completed days of birth)	19(50)	11(91.7)	30(60.0)
Late neonatal death (after the 7 <sup>th</sup> day and within 28 completed days of birth)	12(31.6)	1(8.3)	13(26)
Infant death (after the 28 <sup>th</sup> completed day of birth)	7(18.4)	0(0)	7(14)

- Delivery of infants requiring TH by means of Caesarean section is over-represented at 44% (n=33) when compared to the national figure of 34%
- Of the pre-labour caesarean sections (n=17, 22% of all babies requiring TH in 2020) the most common reason for presentation to hospital of birth was a maternal complaint of reduced fetal movement (n=7), and second was an antepartum haemorrhage (n=2) (Table 3).

## Results

Table 3: Mode of delivery

	2016-2019 N=281	2020 N=76		All births 2016-2019 N(%)
Spontaneous Vaginal Cephalic	67(23.8)	20(26.3)	Vaginal birth+	151936 (51.4)
Spontaneous Vaginal Breech	2(0.7)	1(1.3)	Caesarean section++	99483 (33.6)
Pre-labour Caesarean Section	60(21.4)	17(22.4)		
Caesarean Section (after onset of labour)	62(22.1)	16(21.1)		
Assisted breech	0(0)	0(0)	Assisted breech	327 (0.1)
Ventouse	82(29.2)	19(25)	Ventouse	33116 (11.2)
Forceps	39(13.9)	5(6.6)	Forceps	10891 (3.7)

- In 2020, 45% of the women who laboured spontaneously had their labour induced.
- In 2020, more than a quarter of women whose infants underwent TH experienced a sentinel event.
- The aggregated 2016-2020 data yielded that shoulder dystocia was associated with almost 12% (n=42 of 357, 11.8%) of births whose infants required TH intervention.
- However, the percentage of shoulder dystocia in 2020 was the lowest compared to previous years (7.9% compared to 16.5%).

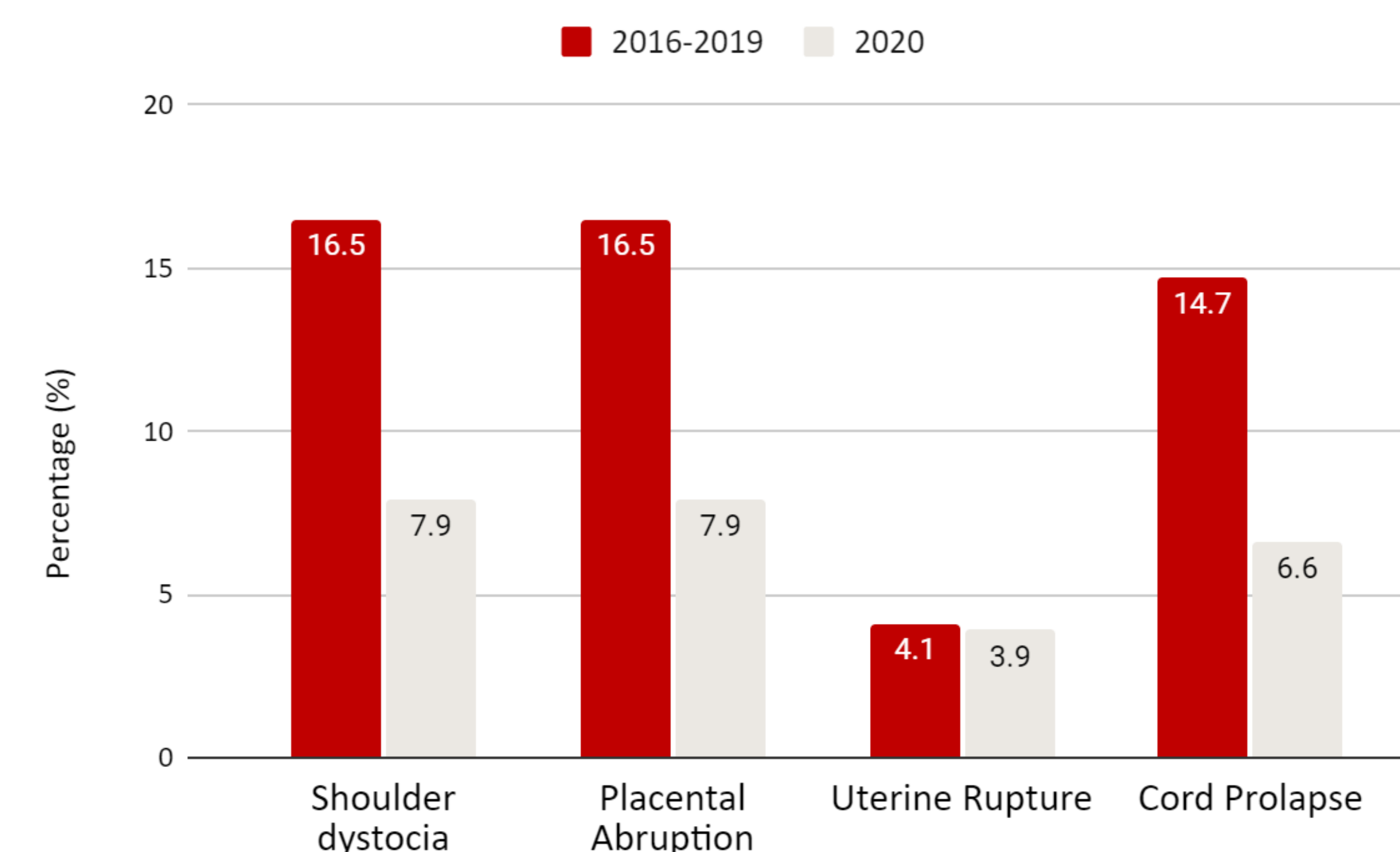


Figure 2: Sentinel events

- Other recurring factors that might develop during labour and which are relevant for our cohort are maternal pyrexia, prolonged rupture of membranes and meconium aspiration.

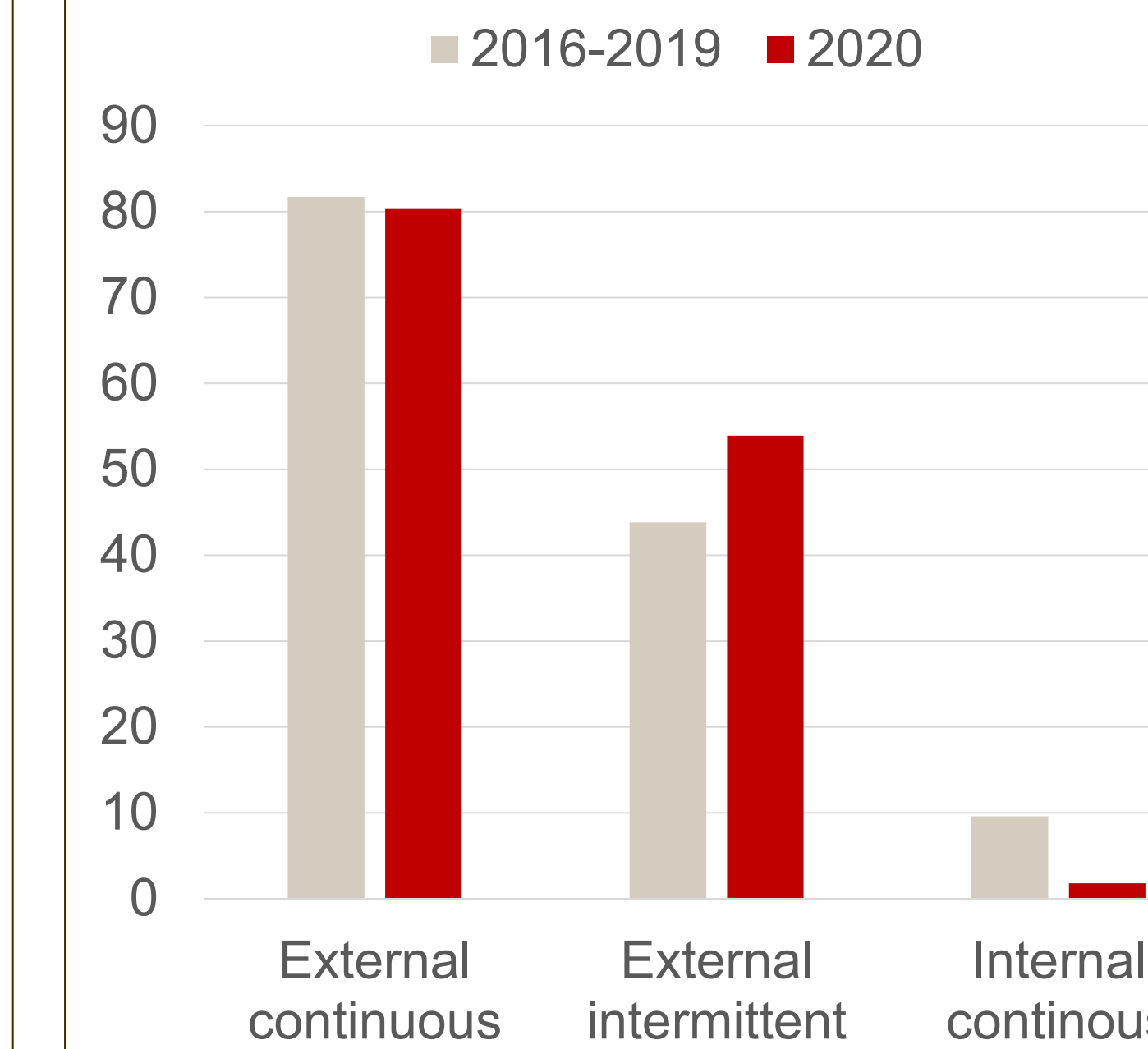


Figure 3: Methods of fetal heart monitoring

Table 4: Birthweight centiles, 2016-2020

Centiles	2020 N=75	2016-2020 N=356	Rate (95% CI)	Rate ratio (95% CI)	P-value
<3rd	8(10.7)	23(6.5)	2.54 (1.61-3.81)	2.81 (1.79-4.41)	<0.001
3rd to 9th	6(8)	40(11.2)	1.89 (1.35-2.58)	2.1 (1.46-3.01)	<0.001
10-49th	30(40)	142(39.9)	1.18 (0.99-1.39)	1.3 (1.02-1.67)	0.028
50-89th	19(25.3)	109(30.6)	0.9 (0.74-1.09)	1.00 (ref.)	
>90th	12(16)	42(11.8)	1.39 (1-1.88)	1.54 (1.08-2.2)	0.017

## Recommendations

- Increasing awareness of the important risk factors for NE (first time mothers, intrauterine growth restriction (IUGR) etc.) through standardisation of care pathways and multi-disciplinary training among front line staff
- Assuring a National standardised assessment for the diagnosis of fetal growth restriction (FGR), including multi-disciplinary training

## Next Steps

- A future aspiration is the reduction of the condition that necessitates TH and any information that signposts the way to avoid such outcomes is to be welcomed.
- This report serves as a platform to continue the national review process in order to attain valuable data which can influence clinical practice in a constructive way.