

**24 Use of outcomes data to determine fetal growth standards**

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**OBJECTIVE:** Extremes of fetal growth are universally recognized as determinants of perinatal morbidity, and screening for aberrant fetal growth is a standard component of routine obstetric practice. Nonetheless, criteria for discerning normal from abnormal growth are crude and arbitrary. By convention, SGA or LGA thresholds are set at the 10th and 90th centile in a population distribution of birthweight, and are not determined by clinical risk thresholds or outcome data. Fractional polynomial regression permits estimates of risk along all values of continuous predictor variables, without assumptions of linearity or constant slope. We sought to examine changes in the risk of neonatal death along the continuum of birthweight centiles, and to use these findings to generate outcome-driven fetal growth standards. **STUDY DESIGN:** We determined birthweight centile for gestational age in 87,184 liveborn, non-anomalous, singleton neonates delivered at Magee-Womens Hospital. Using fractional polynomial logistic regression, we used gestational age at delivery and birthweight centile to predict neonatal death.

**RESULTS:** The probability of neonatal death as determined by birthweight centile and gestational age is shown in the Figure. The risk of neonatal death declines with decreasing gestational age, nadirs at the 55th centile of birthweight, and increases incrementally with excursions from the 55th centile. A fetal growth standard, listing weight thresholds which correspond to a 3-fold increase in risk of neonatal death over the gestational age-specific nadir (9.2% in birthweight distribution for SGA, 98.1% for LGA), is shown in the Table.

**CONCLUSION:** Standards of normal fetal growth can be determined by clinically relevant absolute or relative risk thresholds of important perinatal outcomes (e.g., neonatal death, stillbirth or NICU admission). To our knowledge, this is the first instance in which thresholds of normal fetal growth have been determined by perinatal outcome data.

**Fetal growth standard**

Gestational Age (wks)	SGA threshold (gm)	LGA threshold (gm)
24	550	970
25	507	982
26	537	1185
27	683	1495
28	775	1618
29	920	1845
30	1044	2243
31	1182	2295
32	1376	2486
33	1575	2897
34	1780	3271
35	2047	3612
36	2251	3977
37	2490	4072
38	2702	4241
39	2885	4402
40	3003	4479
41	3100	4578
42	3135	4640

SGA threshold = 9.2%, LGA threshold = 98.1%.

**25 Does having an EFW less than the 10th centile really matter? Results of the National Multicenter Prospective PORTO trial**

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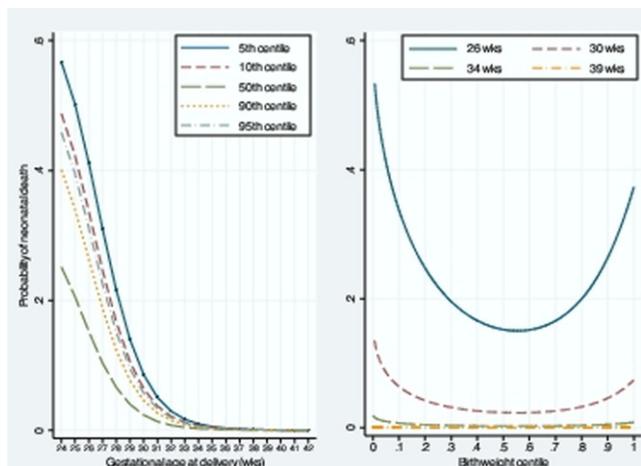
**OBJECTIVE:** The PORTO Trial is a multicenter prospective trial conducted at the seven largest obstetric centers in Ireland, with its goal being to evaluate optimal management of the IUGR fetus. For the purposes of the Trial, IUGR was defined as EFW less than the 10th centile. It is unclear however whether this definition is of clinical significance. The objective of this analysis is to document the outcomes of this population.

**STUDY DESIGN:** A total of 1,056 ultrasound-dated singleton pregnancies with EFW <10th centile were recruited between 24 0/7 and 36 6/7 weeks' gestation between January 2010 and June 2012. Perinatal and early neonatal outcomes were documented for all participants.

**RESULTS:** Of 1,056 pregnancies with EFW <10th centile at recruitment, 820 (78%) remained <10th centile until delivery. 492 (47%) had abnormal umbilical artery (UA) Dopplers and 82 (8%) developed UA AEDF or REDF. Table 1 summarizes the maternal and fetal characteristics. Mean gestational age (GA) at enrollment and delivery were 29.8 and 37.6 weeks, respectively. There were 8 aneuploidies and 40 congenital anomalies. The overall perinatal mortality rate in this cohort was 14.2 per 1000 births. Among the normally formed infants with normal karyotype, there were 6 stillbirths (1:170) and 5 neonatal deaths (1:200).

**CONCLUSION:** Having an EFW less than the 10th centile is a transient finding in 22% of pregnancies. For the remaining 78% with persistently low EFW, constitutionally small size, rather than pathologic IUGR, is by far the most likely outcome. This calls into question the utility of EFW less than the 10th centile as a definition for possible IUGR. A careful evaluation of possible underlying structural or karyotypical abnormalities is warranted in these pregnancies.

**Risk of neonatal death predicted by birthweight centile and gestational age at delivery**



**Maternal and fetal characteristics (n = 1056)**

Age (years)	29.9 +/- 6.4
Ethnicity (European)	851 (83%)
Spontaneous Conception	1042 (99%)
Maternal height (cm)	161cm +/- 14cm
Maternal weight at booking (kg)	64kg +/- 13kg
BMI (kg/m2)	24.0 +/- 5.0
GA at enrollment (weeks)	30.3 +/- 4.0
GA at delivery (weeks)	37.6 +/- 3.0
Weight at delivery (grams)	2476 +/- 1008
NICU admission	324 (31%)
Apgar Score < 5 at 1min < 7 at 5min	17 (2%)
Stillbirths	7 (1:150)
Neonatal Deaths	8 (1:130)

Note: continuous variables are summarized with mean +/- (standard deviation) and categorical variables with n (%).

**26 School-age outcomes of late preterm infants by delivery indication**

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**OBJECTIVE:** Greater than 70% of all preterm births occur between 34 and 36 weeks in the United States. We previously demonstrated improved cognitive outcomes as gestational age increases through 39 weeks; however, it is unknown whether this relationship varies by the reason for delivery (Lipkind et al, AJOG). In this study we aimed to compare school outcomes between preterm (PT) infants at 32-<34 weeks, late preterm (LP) infants at 34-<37 weeks, and full-term (FT) infants by delivery indication.

**STUDY DESIGN:** Birth certificate and Department of Education administrative data for children born in NYC from 1994-1998 were linked as part of the Longitudinal Study of Early Development. We included all non-anomalous singleton infants delivered from 32-42 weeks gestation who had a third-grade test score. Delivery indications included 1) maternal medical conditions 2) obstetric complications and 3) isolated spontaneous labor. Linear regression was used to estimate the

effect of gestational age on test scores. Logistic regression was used to assess the risk of needing special education services.

**RESULTS:** Of our original cohort, 20,450 (9.7%) had medical indications for delivery, 29,559 (14.0%) had obstetric indications and 126,700 (60.2%) had isolated spontaneous labor. Regardless of indication, children who were delivered PT and LP had significantly higher adjusted odds of needing special education than those who were delivered FT. For all indications PT and LP also had lower adjusted math scores than those delivered FT. LP had lower adjusted English scores than the FT group only in the spontaneous labor group (Table). A linear association between gestational age and test scores was seen through 39 weeks gestation across all indications.

**CONCLUSION:** There is a significant risk of developmental differences in PT and LP infants compared to FT infants when examining both indicated and spontaneous preterm deliveries. These findings should be taken into account when determining optimum delivery timing.

**School age outcomes by gestational age at delivery and delivery indication\***

Odds of Special Education	Medical Indications	Obstetric Indications	Isolated Spontaneous Labor
	OR (95% CI)	OR (95% CI)	OR (95% CI)
PT vs FT	1.39 (1.20 to 1.61)	1.35 (1.08 to 1.68)	1.58 (1.34 to 1.86)
LP vs FT	1.25 (1.15 to 1.36)	1.23 (1.12 to 1.37)	1.39 (1.30 to 1.48)
PT vs LP	1.06 (0.83 to 1.34)	1.09 (0.93 to 1.28)	1.11 (0.93 to 1.32)
Adjusted Math Score (z-score)	SD% (95% CI)	SD% (95% CI)	SD% (95% CI)
PT vs FT	-11.59% (-21.0 to -2.3)	-9.9% (-15.9 to -3.8)	-7.8% (-14.4 to -1.2)
LP vs FT	-9.1% (-13.3 to -4.8)	-6.5% (-9.7 to -3.2)	-5.6% (-8.1 to -3.2)
PT vs LP	-3.3% (-1.3 to 6.6)	-3.8% (-10.4 to 2.9)	-1.6% (-9.0 to 5.8)
Adjusted English Score (z-score)	SD% (95% CI)	SD% (95% CI)	SD% (95% CI)
PT vs FT	-4.3% (-13.9 to 5.3)	-5.4% (-11.6 to 0.9)	-5.3% (-12.1 to 1.5)
LP vs FT	-2.7% (-7.1 to 1.7)	-2.6% (-6.0 to 0.8)	-5.7% (-8.2 to -3.2)
PT vs LP	-0.1% (-7.7 to 7.3)	-1.8% (-8.7 to 5.1)	0.2% (-7.3 to 7.7)

\*Adjusting for child sex, maternal age, maternal race/ethnicity, insurance status, parity, 5 minute Apgar <7, neonatal intensive care admission, days absent in third grade, and small for gestational age <10th percentile.