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16th

The INTERGROWTH-21st Fetal and Newborn Growth Standards

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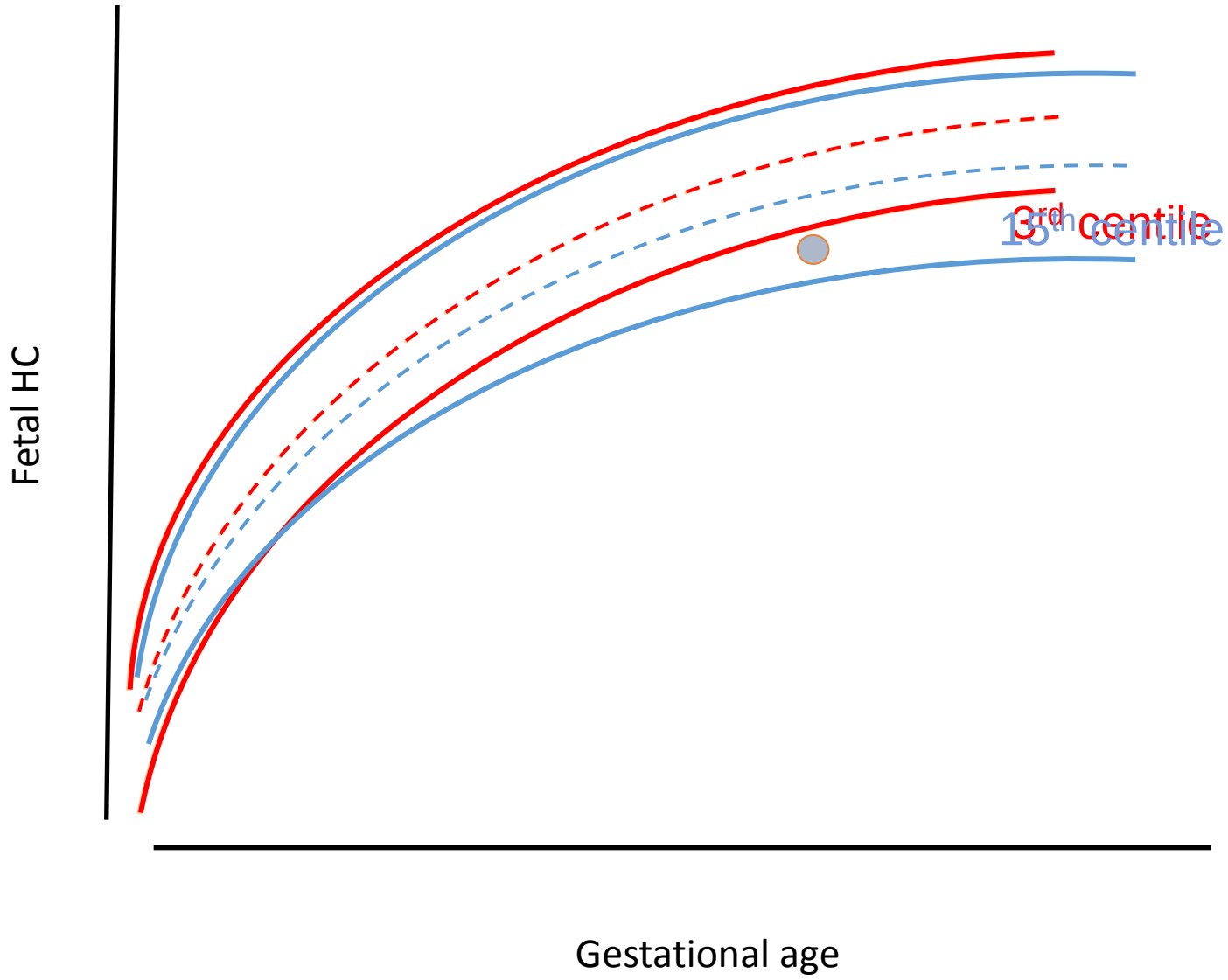
Growth monitoring is a screening tool

- First level **screening tool**

- Abnormal growth patterns are seldom diagnostic and should prompt further investigation.

Garza, 2015 *Adv in Nutrition*


Fetal HC
3rd centile
15th centile
Gestational age

Obstetric Ultrasound is everywhere!

How is size assessed currently?

Crown-rump length / gestational age estimation

- 29 charts
- 4 low risk of bias

Napolitano et al, 2014 *BJOG*

Fetal growth monitoring by ultrasound

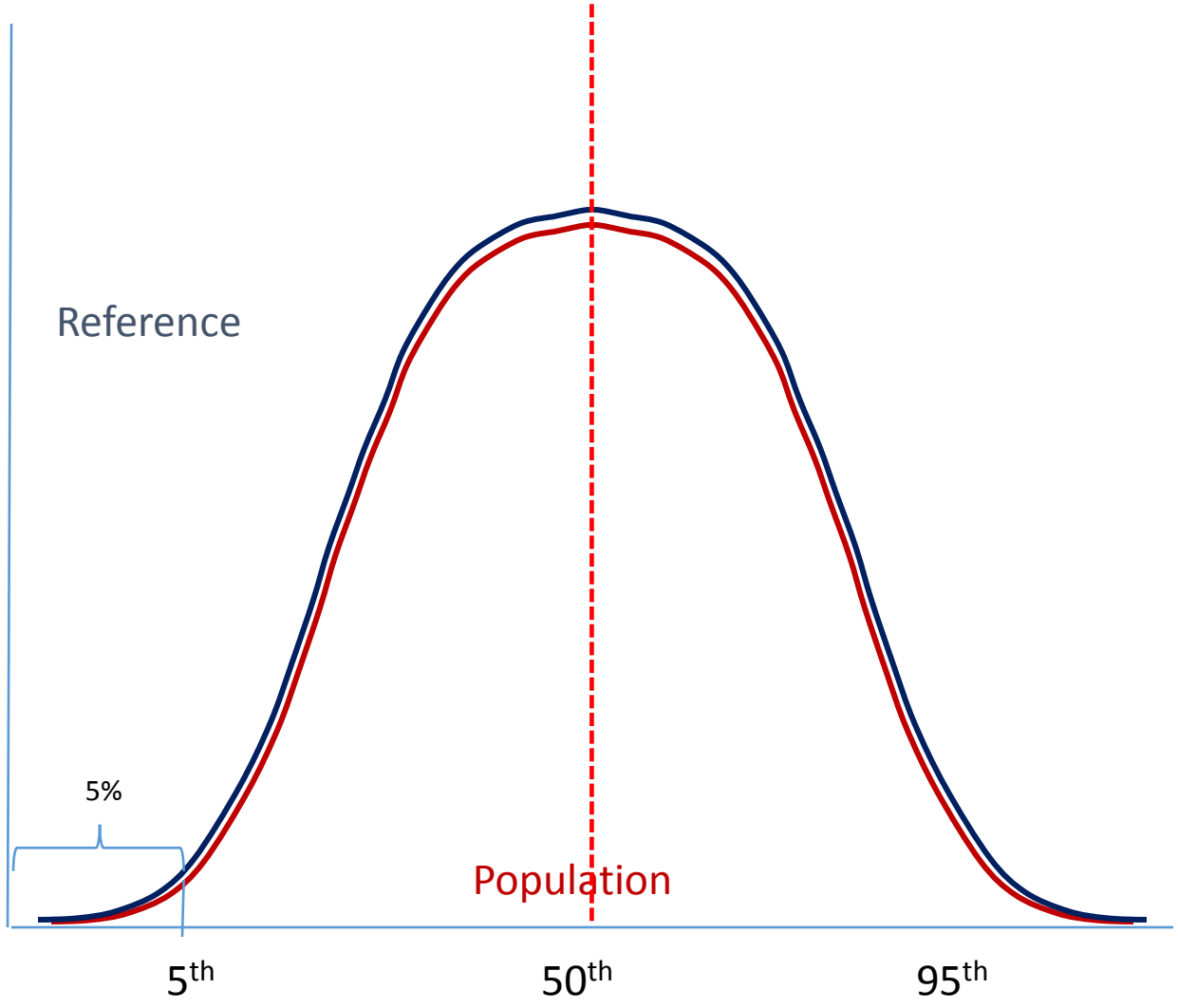
- 83 charts
- Only 12 used reliable dating

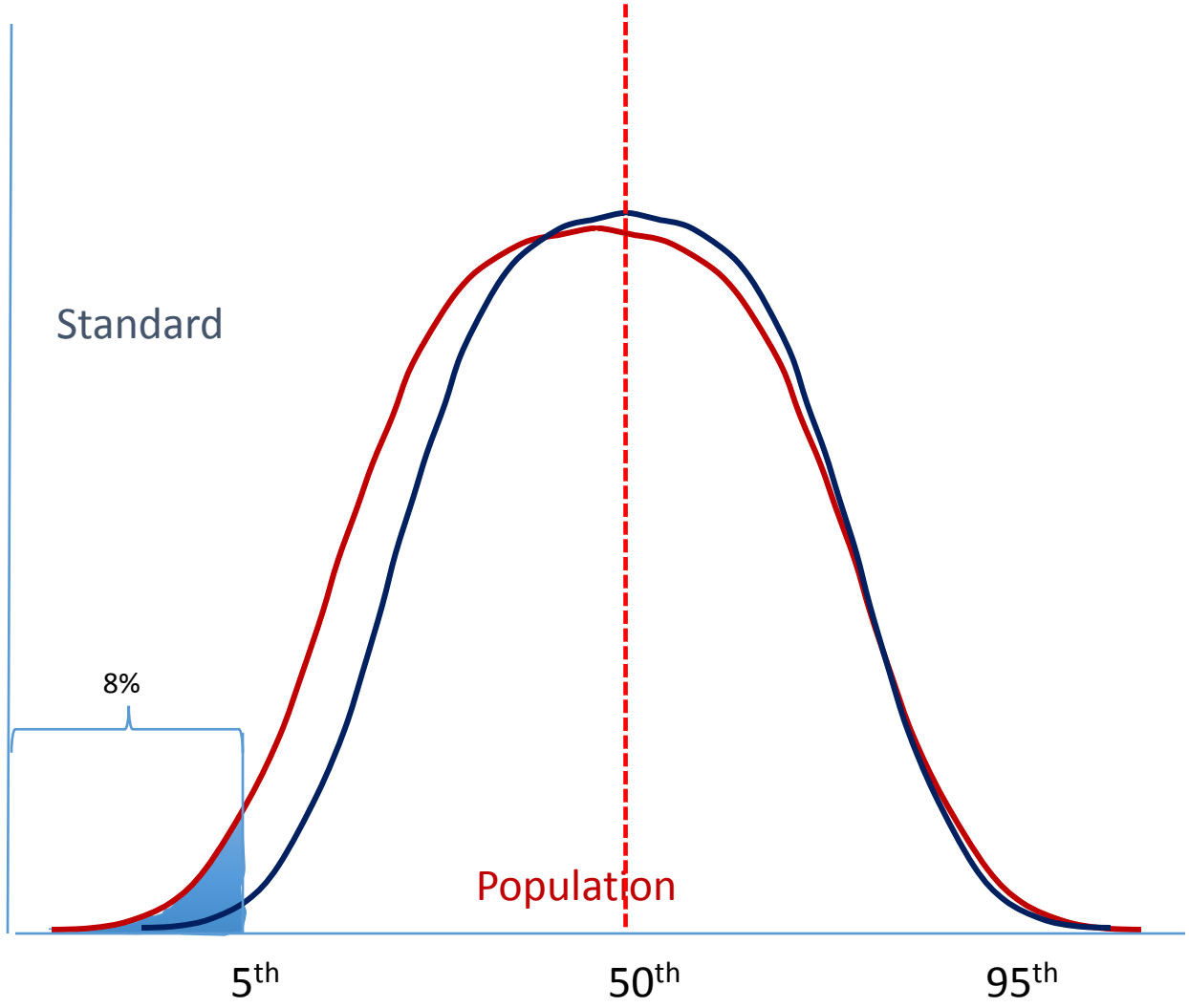
Ioannou et al, 2012 *BJOG*

Birth weight charts

- 102 charts
- 8 low risk of bias

Giuliani et al, 2015 *Acta Paediatr*


Reference
5%
Population
5th
50th
95th


Standard
8%
Population
5th
50th
95th

INTERGROWTH-21st Project

Primary objective

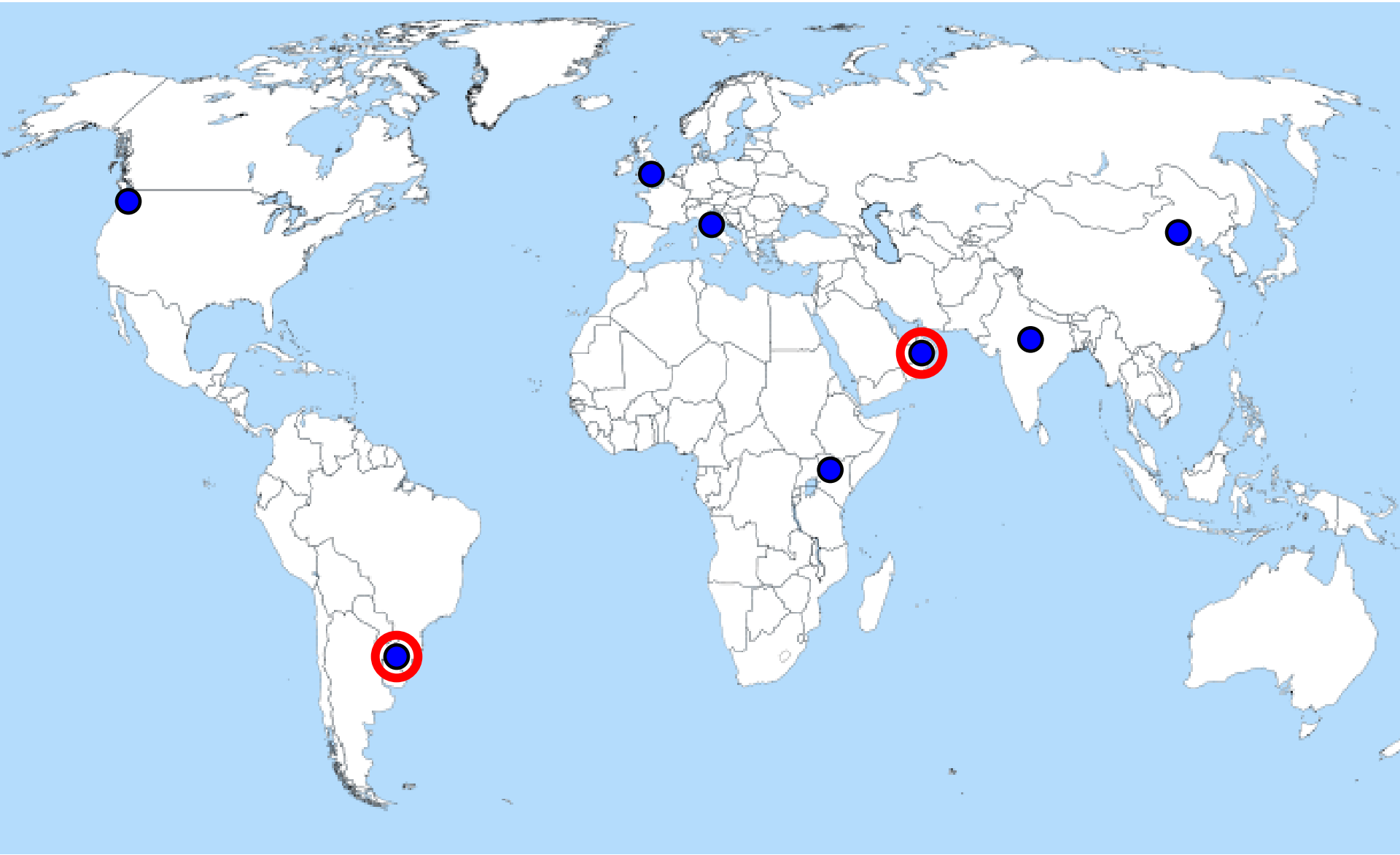
To develop international "prescriptive" fetal growth, newborn size and preterm postnatal growth standards

Three complementary studies

- **Newborn Cross-Sectional Study (NCSS)** of all newborns in eight centres over 12 months
- **Fetal Growth Longitudinal Study (FGLS)** from $<14^{+0}$ weeks to birth, with follow-up to age 2
- **Preterm Postnatal Follow-up Study (PPFS)** of all preterm infants in FGLS to age 2

"Healthy"environment criteria for site selection

- Low birth weight rate <10%
- Mean birth weight >3100g
- Perinatal mortality <20 per 1000 live births
- >75% mothers have attained an educational level/socio-economic status indicator greater than the locally defined cut-off points
- Lack of known, major, non-microbial environmental contaminants
- Altitude <1600m



INTERGROWTH-21st sites

BILL & MELINDA GATES foundation

Low-risk pregnancy criteria

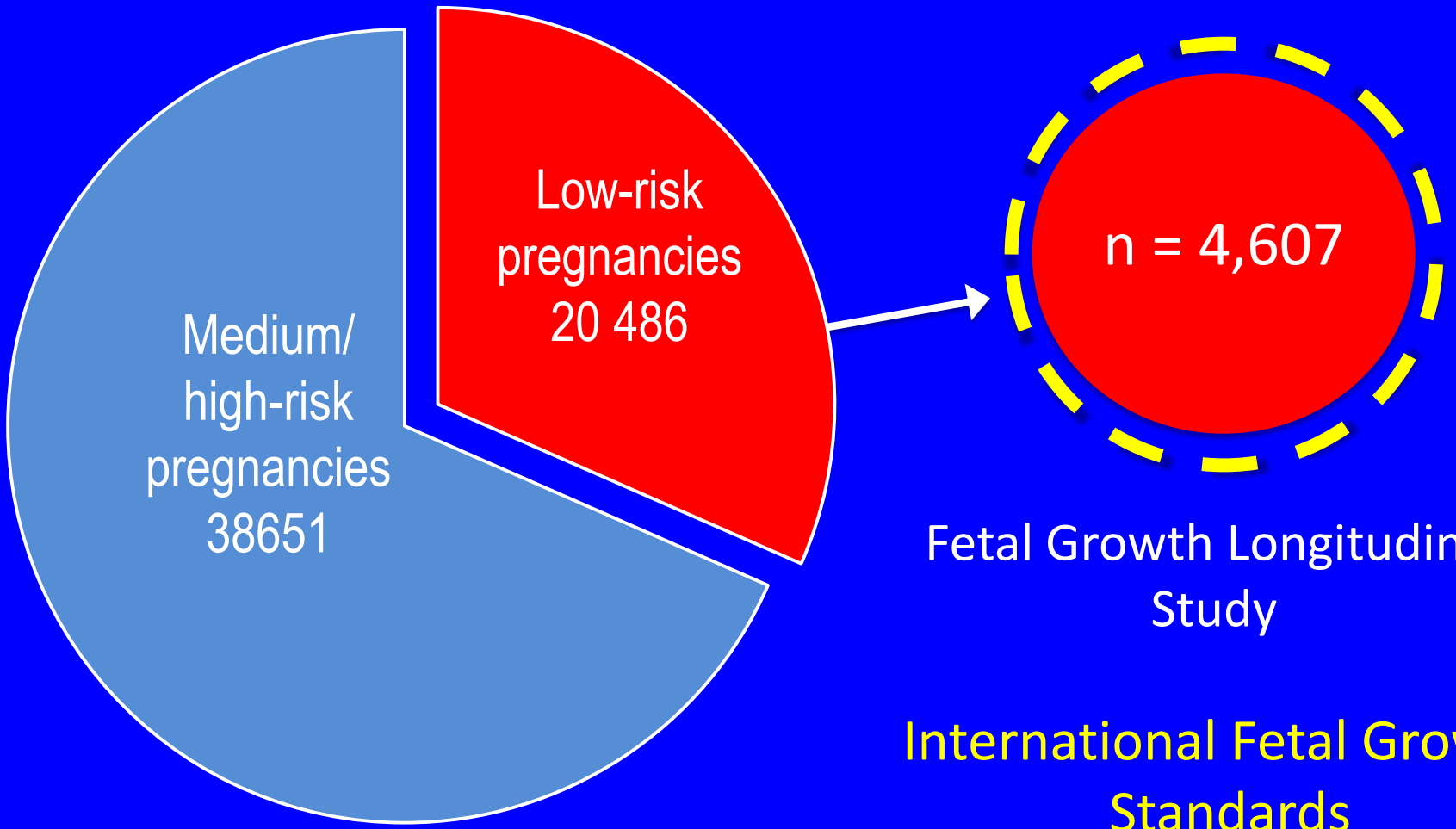
a) aged ≥18 and ≤35 years;
b) BMI ≥18.5 and <30 kg/m^2;
c) height ≥ 153 cm;
d) singleton pregnancy;
e) a known LMP with regular cycles (defined as a 26-30 day cycle in the previous 3 months), without hormonal contraceptive use, pregnancy or breastfeeding in the 3 months before pregnancy;
f) natural conception

Criteria defining a low-risk study population as healthy and well-nourished (both before and during pregnancy) to ensure that fetal growth is optimal

condition;
o) no clinically significant atypical red cell alloantibodies;
p) negative urinalysis;
q) systolic blood pressure <140 mmHg and diastolic blood pressure < 90 mmHg;
r) haemoglobin ≥11 g/dl;
s) negative syphilis test and no clinical evidence of any other sexually transmitted diseases, including clinical Trichomoniasis;
t) not in an occupation with risk of exposure to chemicals or toxic substances, or very physically demanding activity to be evaluated by local standards. Also women should not be conducting vigorous or contact sports, as well as scuba diving or similar activities

INTERGROWTH-21st populations

Total population N= 59 137



Fetal Growth Longitudinal Study

International Fetal Growth Standards

Fetal Growth Longitudinal Study (FGLS)

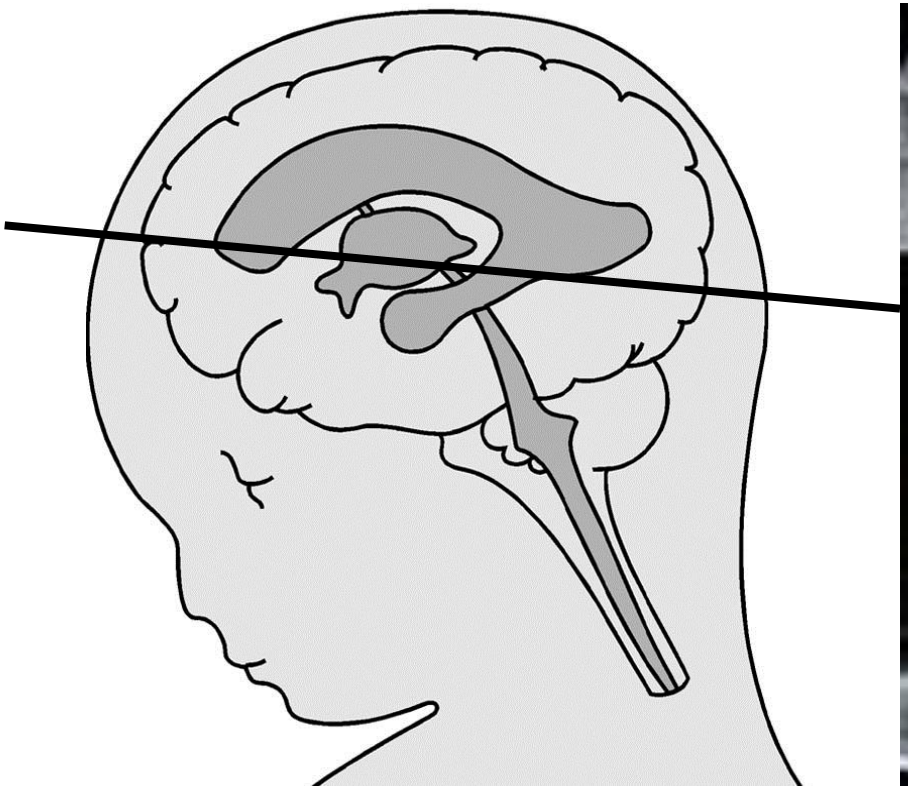
N = 4,607

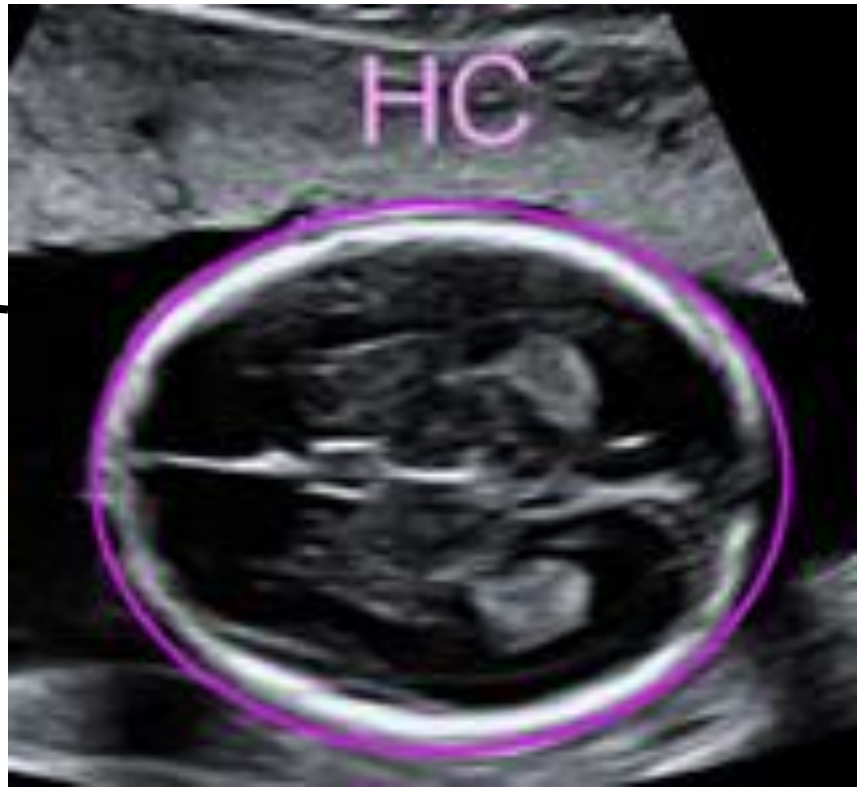
Pregnancy → Birth → 1 year → 2 years

Anthropometric measurements:
Length/height
Weight
Head circumference

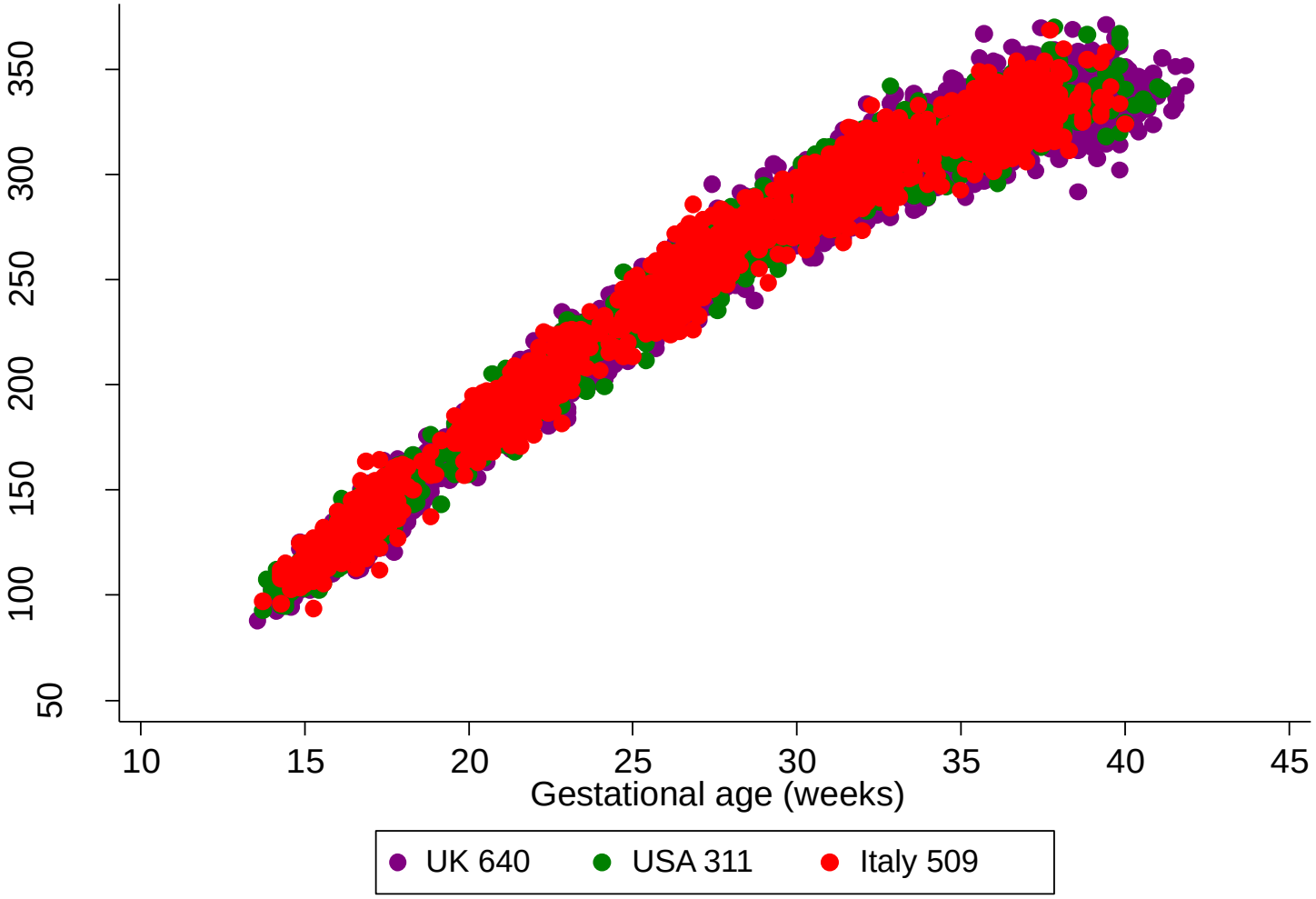
Ultrasound measures:
9-14 weeks
Then every 5 ± 1 weeks

Neurodevelopment assessment:
Psychometric tests
Wireless EEG
Actigraphy

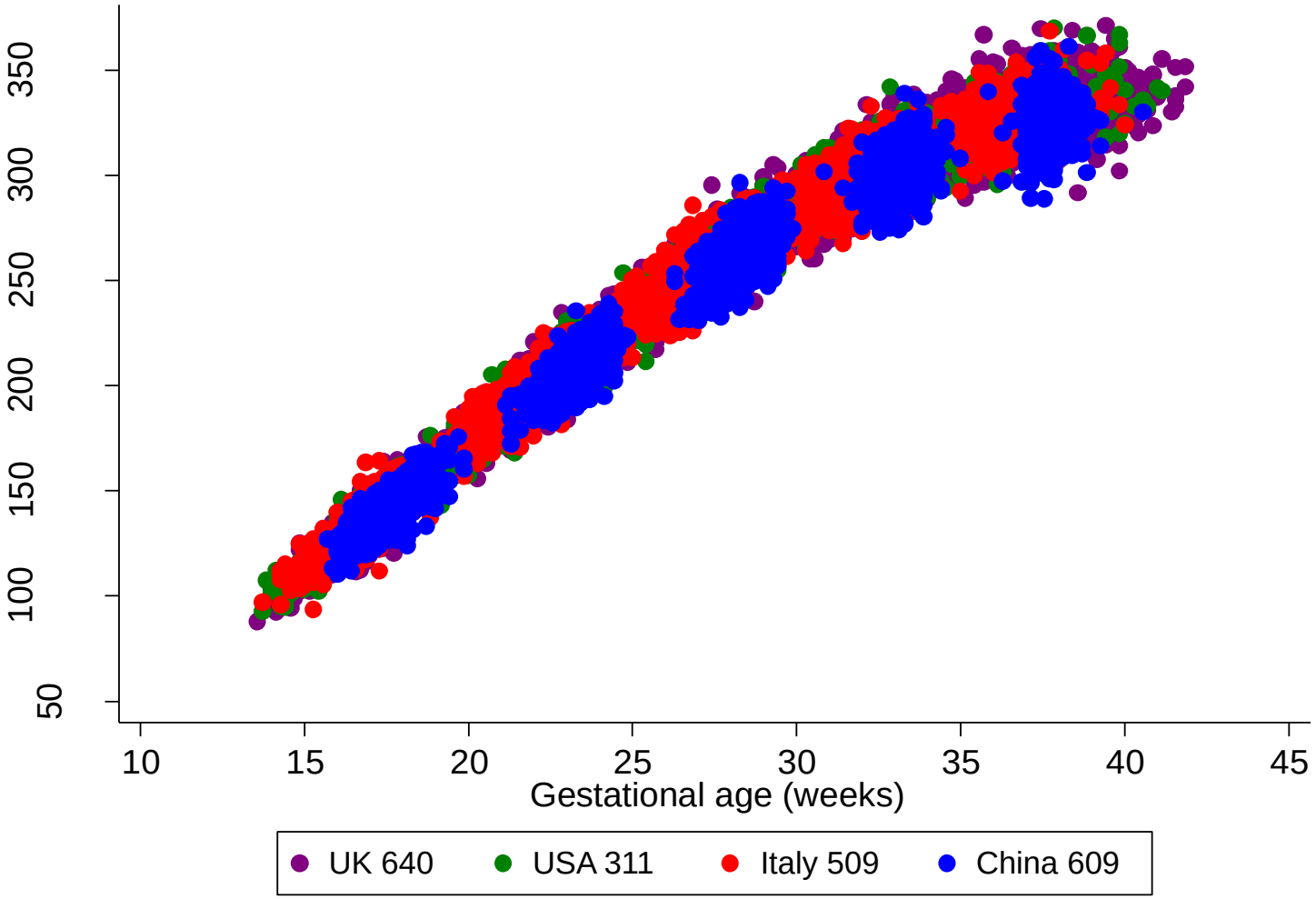



HC

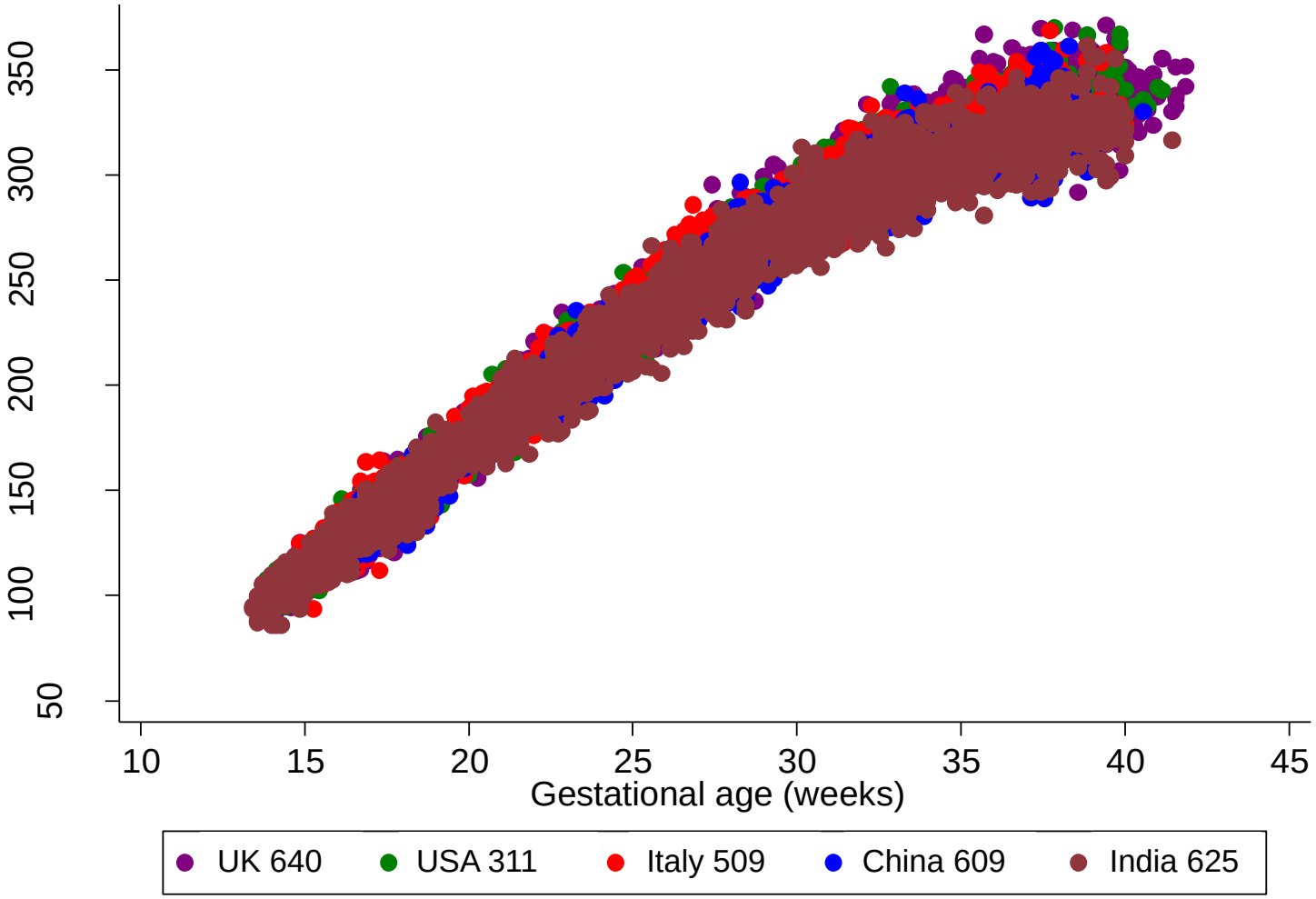
Fetal HC by gestational age for UK, USA & Italy



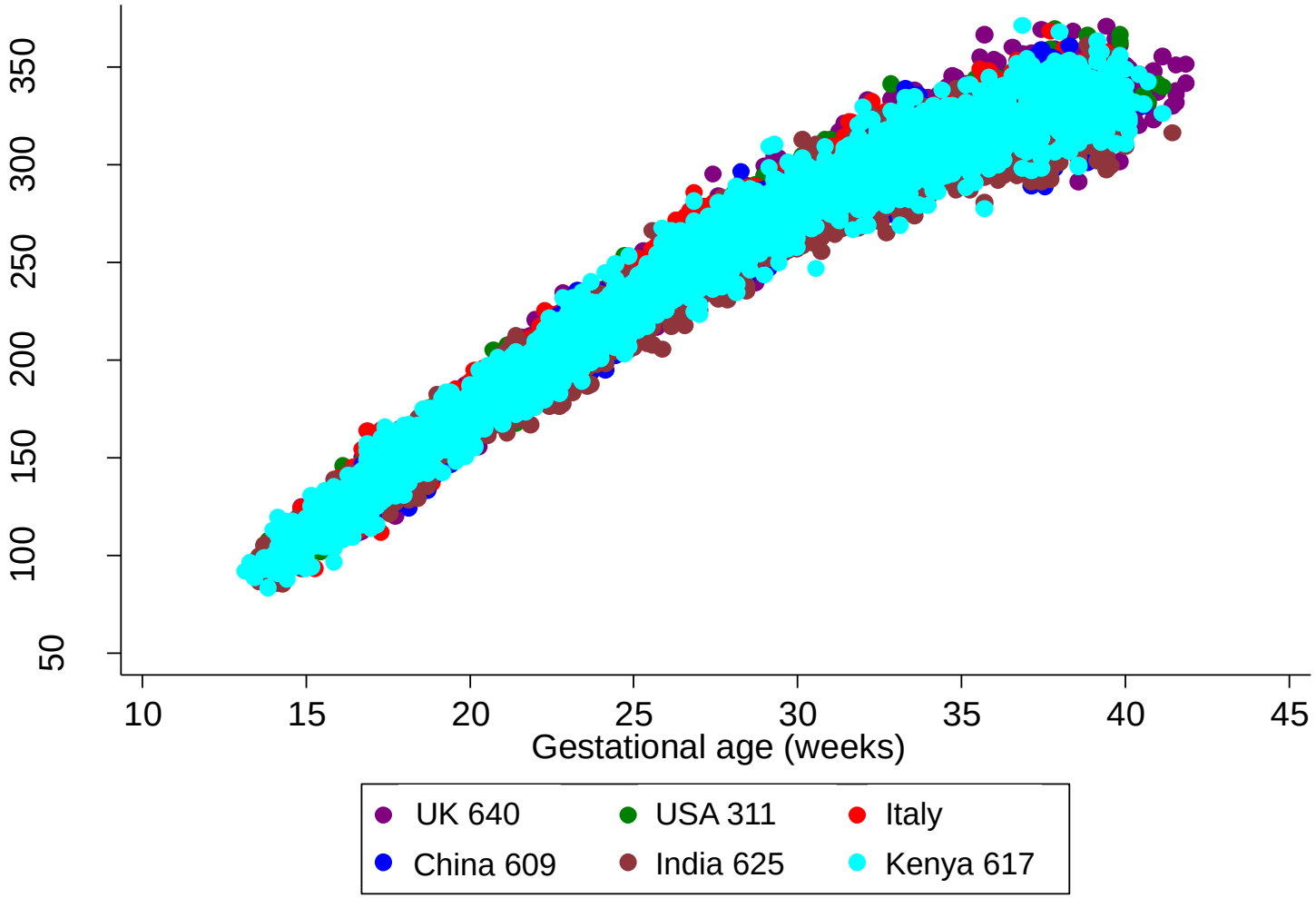
Fetal HC by gestational age for UK, USA, Italy & China



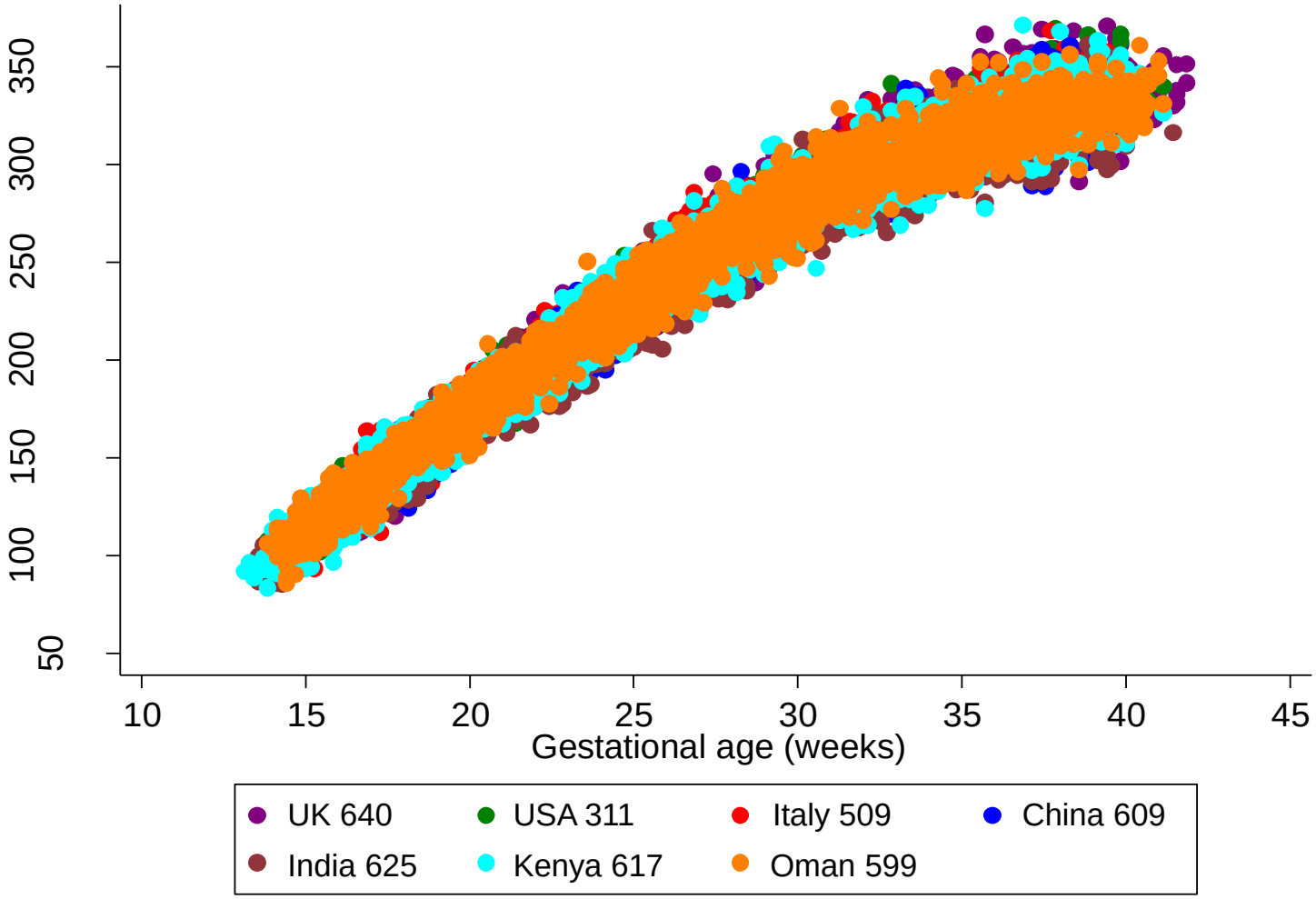
Fetal HC by gestational age for UK, USA, Italy, China & India



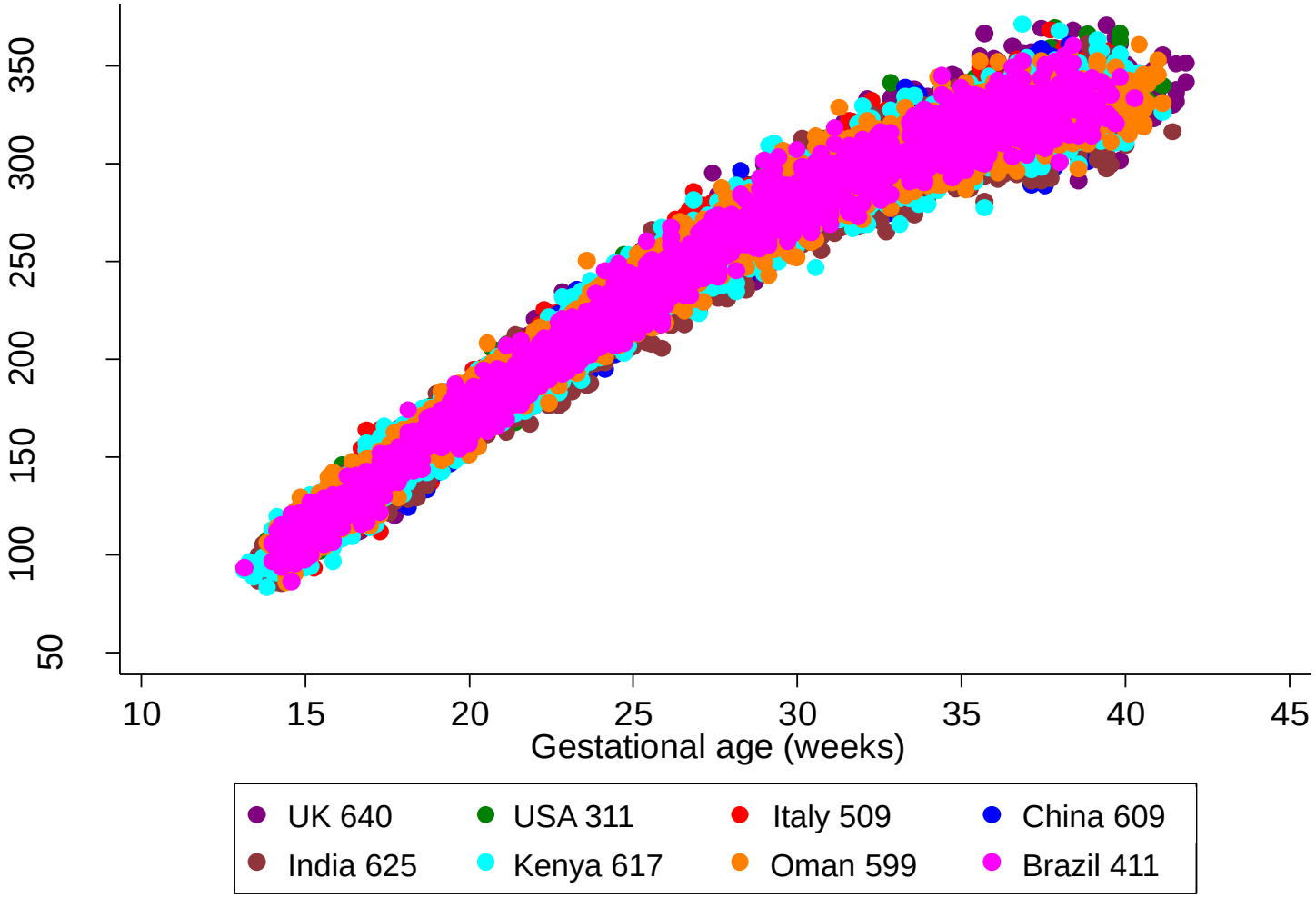
Fetal HC by gestational age for UK, USA, Italy, China, India & Kenya



Fetal HC by gestational age for UK, USA, Italy, China, India, Kenya & Oman



Fetal HC by gestational age for UK, USA, Italy, China, India, Kenya, Oman & Brazil

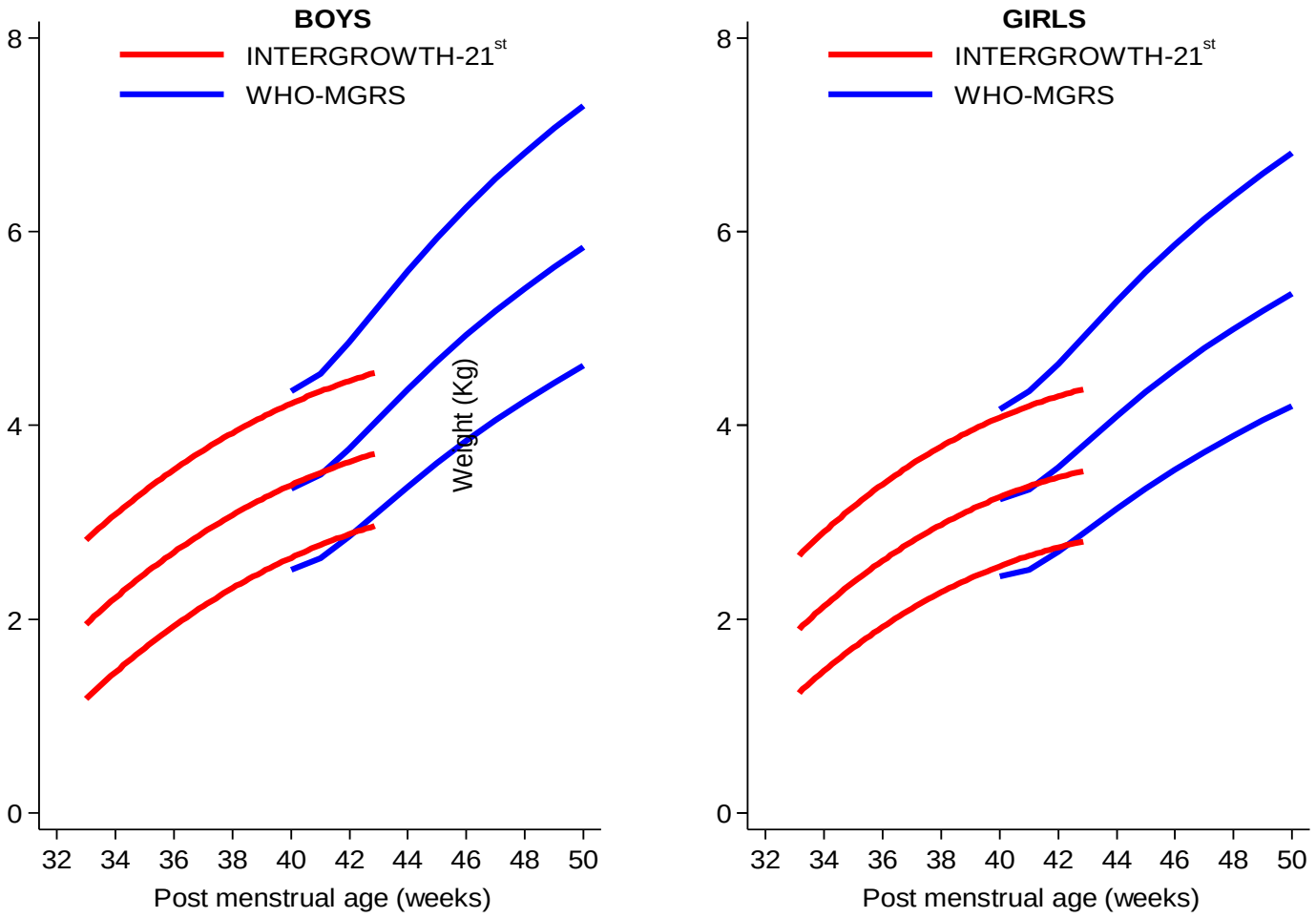


Skeletal growth variance between populations and among individuals

	Fetal CRL	**Fetal** HC	**Newborn** length	**Preterm Infant** length	**Infant** length **WHO-MGRS (2006)**	**Child** Height **Habicht (1974)**
Variance between study sites	**1.9%**	**2.6%**	**3.5%**	**0.2%**	**3.4%**	**3.0%**
Variance among individuals within a site	-	18.6%	-	57.1%	70.0%	-
Unexplained variance	98.1%	78.8%	96.5%	42.7%	26.6%	-

Villar J. et al 2015 AJOG

INTERGROWTH-21st concepts overlap with WHO Child Growth Standards



Villar et al, 2015 *AJOG*

“Men's natures are alike, it is their habits that carry them far apart”.

Confucius, 479 BC