Erasmus MC
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Generation R

The Generation R Study

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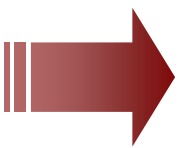
Main hypothesis

Critical periods in fetal and early postnatal life are important for health and disease in childhood and adulthood

Early risk factors  Health promotion
Disease prevention

Design Generation R

Prospective cohort study

From early fetal life

10,000 parents and children

State-of-the-art measurements

Long and complete follow-up

Research projects

Erasmus Medical Center

Child & Adolescent Psychiatry

Epidemiology & Biostatistics

Obstetrics & Gynaecology

Pediatrics

Public Health

Erasmus University Rotterdam

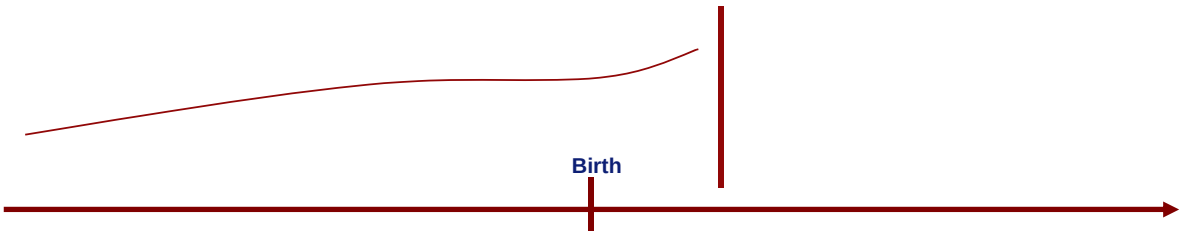
Erasmus School of Law

Faculty of Social Sciences

Municipal Health Service

- **Growth & development**
- **Behaviour & cognition**
- **Diseases in childhood**
- **Health & health care**

Recruitment



From first trimester to the early postnatal period

- Prenatally: mothers approached at routine visit for fetal ultrasound
- Postnatally: mothers approached at the child health centres

Mothers living in study area at delivery date

Written consent

Enrolment mothers

Total	**9,778**

<18 weeks	69%
18 – 25 weeks	19%
>25 weeks	3%
Early postnatal period	9%

Partners	**71%**

Focus cohort	**1,232**

Response

Established at birth

Nominator: number of participating newborns at birth

Denominator: number of eligible newborns in study area and period

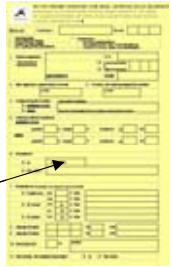
Based on children born in 2003, 2004 and 2005 (full recruitment)

Response 65%

Prenatal phase data collection

Mother and partner (12, 20, 30 weeks)

- Fetal ultrasound examinations (growth, fetal organ development)
- Questionnaires (health, diet, emotions, living conditions)
- Physical examinations (weight, height, blood pressure)
- Blood and urine samples



Follow-up in prenatal phase

Fetal ultrasounds

Fetal ultrasounds	%
Early pregnancy	76
Mid-pregnancy	93
Late pregnancy	93

Fetal ultrasounds used for

- Establishing gestational age (early pregnancy)
- Fetal growth patterns

  Head circumference, abdominal circumference, femur length, cerebellar size

- Placenta function

  Flow uterine and umbilical artery

Follow-up in prenatal phase

Biological samples

Eligible subjects	Blood %	DNA %	Urine %
Mother (n=8,880)	93	91	-
Early pregnancy (n=6,748)	92	-	95
Mid-pregnancy (n=8,241)	91	-	95
Late pregnancy (n = 8,270)	-	-	91
Partner (n =6,347)	-	85	-
Child, cord blood (n=8,821)	68	67	-

Follow-up in prenatal phase

Birth outcomes

Birth outcomes	%
Live birth	97.9
Induced abortion, fetal death	1.4
Loss to follow-up	0.7

Postnatal data collection: birth

Birth

- Information from midwives and obstetricians (pregnancy, delivery)
- Cord blood samples

Home visit at 12 weeks

- Consent after birth
- Neuromotoric examinations

Postnatal data collection: first 4 years

Routine child health centres (9 visits)

Growth, development, screening, vaccination

Questionnaires (13 times)

Diet, diseases, behaviour, cognition, health care use

Focus cohort (5 visits)

Ultrasound examinations, growth in detail, blood samples

Postnatal data collection: at 5 years (ongoing), and 8 and 11 years (planned)

Detailed examinations (3 hours) of full cohort (mothers and children) in dedicated examination center (in academic Children's hospital)

- Imaging studies brain, heart, kidneys and bones
- Full behavioural assessment

Limitations

Response 65%

- Selection towards a slightly more affluent and healthy population
- Frequency rates and statistical power may be affected
- Selection bias should be considered in sub-studies

Missing values

- Additional “filling the gaps” questionnaires
- Imputation techniques
- DNA sampled at various occasions

Some early findings

Fetal dating by ultrasound

Smoking and fetal growth

Fetal growth and cardiovascular adaptation

Genes and growth

Brain imaging

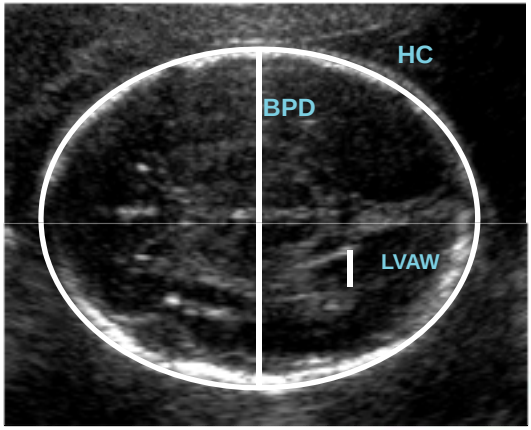
Prenatal ultrasound measurements

Gestational age at measurement

Early preg.: 12 weeks

Mid-preg. : 20 weeks

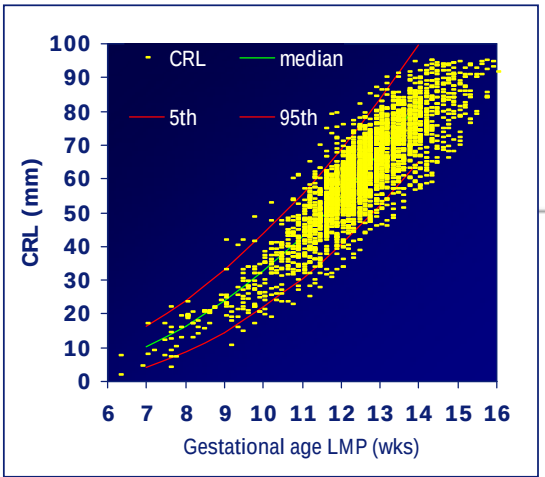
Late preg. : 30 weeks

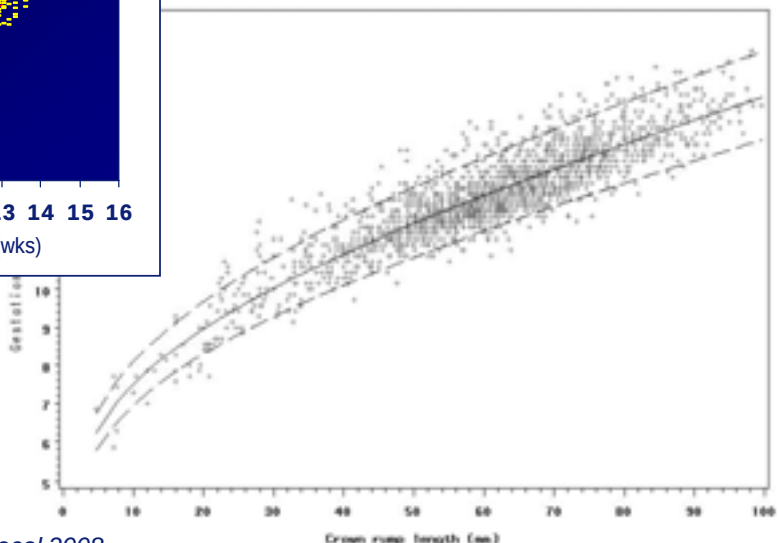


Measures:

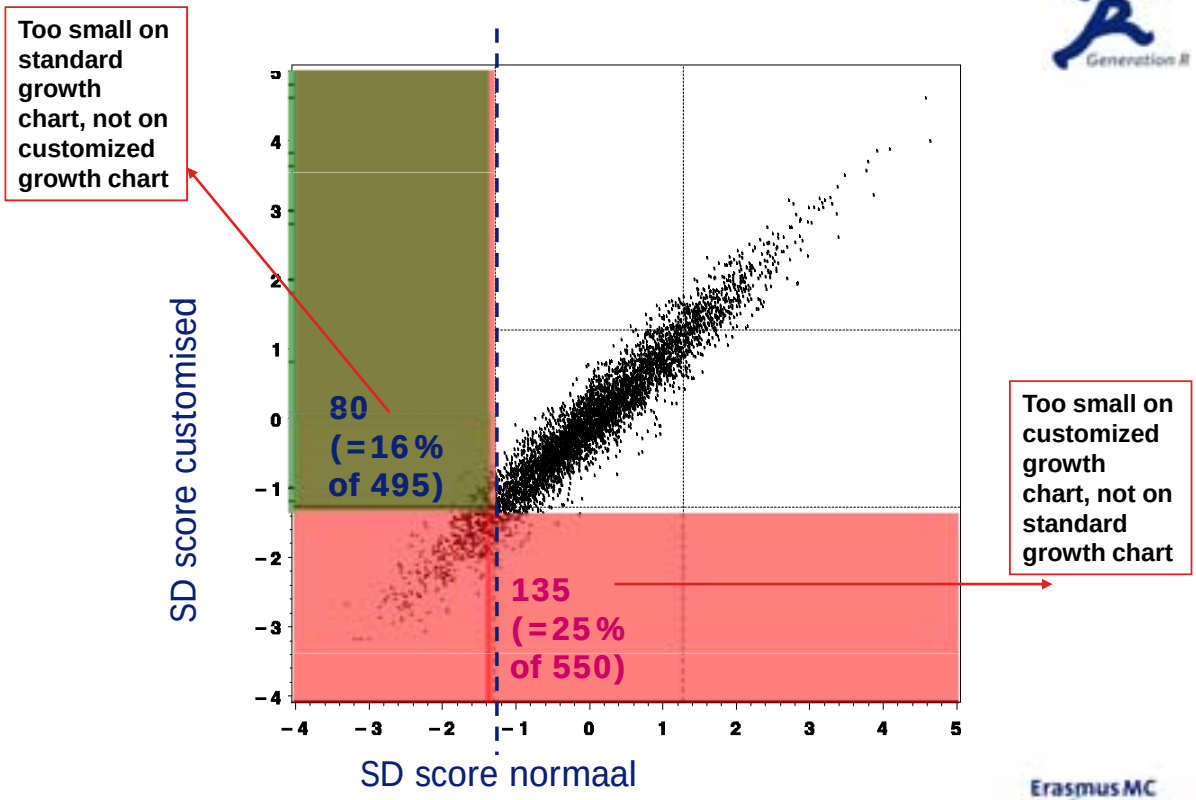
- abdominal circumference
- head circumference, biparietal diameter
- femur length
- estimated foetal weight

Fetal dating by Crown rump length (CRL)





Verburg BO, Ultrasound Obstet Gynaecol 2008



De Ridder M, 2008

Smoking, alcohol and drugs in pregnancy

	Not	Until pregnancy was known	During pregnancy
Smoking	75%	8%	17%
Alcohol	49%	14%	37%
Drugs	93%	3%	2%

Jaddoe V, Am J Epidemiol 2007
Jaddoe V, Ann Epidemiol 2007