

MOTHER'S SMOKING DURING PREGNANCY INFLUENCE INTRAUTERINE AND POSTNATAL GROWTH - THE GROWUP 1990 GOTHENBURG COHORT POPULATION

Anton Holmgren^{1, 2*}, Aimon Niklasson¹, A. Stefan Aronson^{2*} and Kerstin Albertsson-Wikland^{3*}

¹ GP-GRC, Department of Pediatrics, Institute of Clinical Sciences, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden.

² Department of Pediatrics, Halland Hospital, Halmstad, Sweden.

³ Department of Physiology/Endocrinology, Institute of Neuroscience and Physiology, The Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden.

* = ESPE member*



INTRODUCTION

Smoking during pregnancy is known to influence prenatal and postnatal growth of the offspring.

A growth reference should represent optimal growth in healthy children.

The QEPS growth model can analyse and describe growth patterns in a detailed way with precise growth estimates^{1,2}.

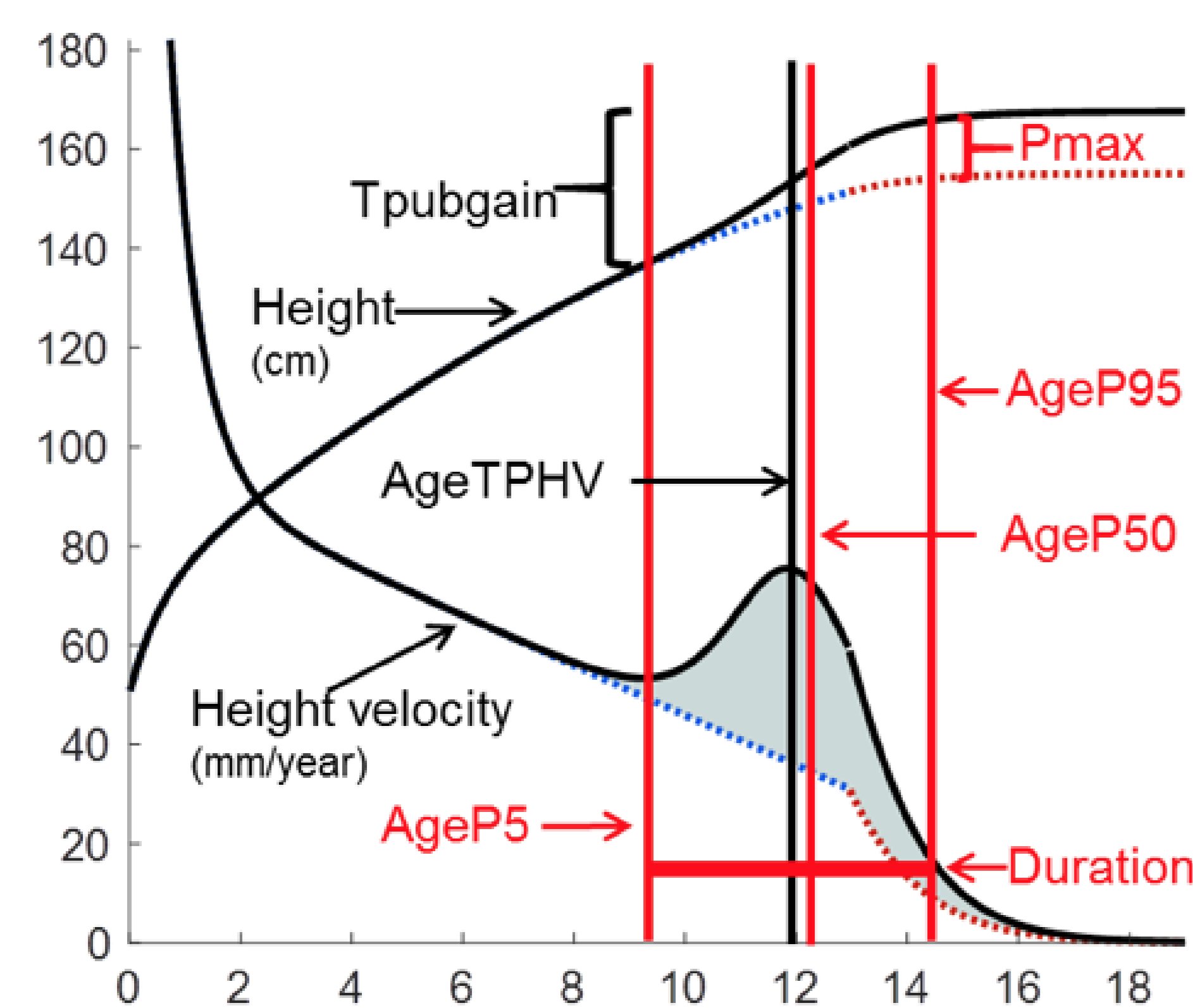
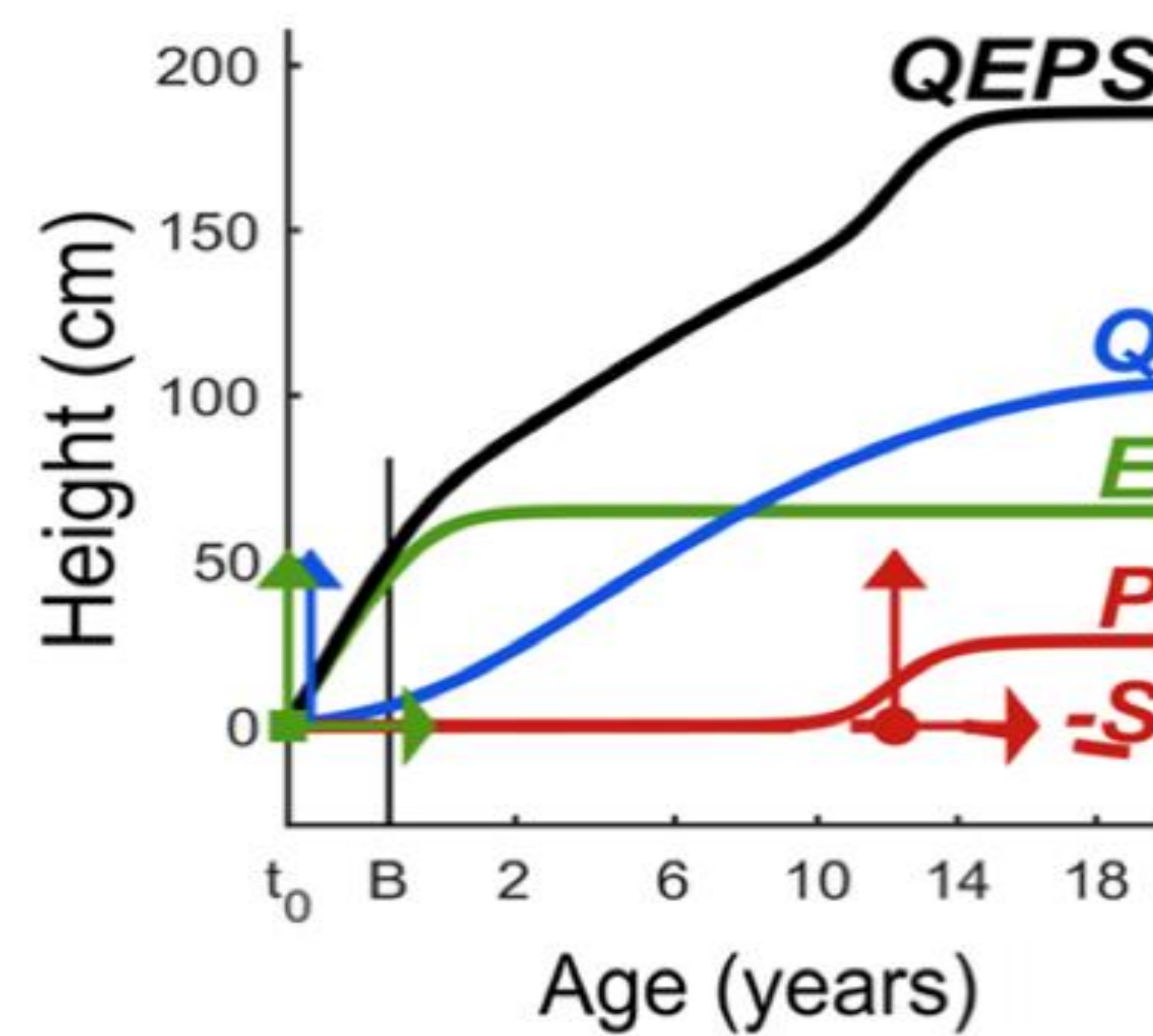


Fig 1. QEPS Growth model (top), with pubertal growth functions (bottom).

RESULTS

Individuals of both sexes with smoking mothers were shorter and lighter at birth. Individuals with smoking mothers came earlier into puberty, had earlier peak height velocity (AgeTPHV) and were 1.8-1.9 cm shorter at adult height as seen in Table 1 and Figure 2.

The girls of smoking mothers median weight and BMI remained lighter during infancy and childhood, whereas along +2SDS became greater from 10 years and onwards, resulting in broader ranges (Figure 3). The boys of smoking mothers median weight and BMI remained lighter during infancy, from 2.5 years of age heavier and with greater BMI during childhood and adolescence (Figure 3).

Table 1. Birth characteristics, QEPS growth estimates, adult heights and paren heights of individual born to smoking and non-smoking mothers

Variable	Mean NS, girls	Mean S girls	Diff.	P-value	Mean NS, boys	Mean S boys	Diff.	P-value
Gestational age, days	281.1	281.7	-0.6	0.4369	281.0	280.7	0.3	0.6804
Birth weight, gram	3563	3379	184	<.0001	3691	3530	161	<.0001
Birth length, cm	50.2	49.4	0.83	<.0001	51.0	50.3	0.70	<.0001
E _{max} , cm	62.8	62.72	0.10	0.6877	65.1	65.1	-0.04	0.8376
Q _{max} , cm	98.7	97.3	1.39	0.0453	105.6	104.3	1.30	0.0491
AgeP5, yrs	9.8	9.6	-0.21	0.0130	11.8	11.6	0.24	0.0028
AgeTPHV, yrs	11.8	11.6	-0.22	0.0141	13.7	13.4	0.24	0.0028
P _{max} , cm	13.0	13.1	-0.13	0.6885	17.3	17.0	0.26	0.4059
Adult height, cm	168.6	166.8	1.76	0.0020	182.0	180.1	1.90	0.0004
Mother, cm	167.2	167.1	0.10	0.8279	167.4	166.7	0.70	0.1373
Father, cm	181.7	180.3	1.38	0.0285	181.2	180.2	1.00	0.0941

NS =non smoking mothers, S=smoking mothers. Diff. =Difference. E, Q, P_{max}=maximum of E, Q, P-functions by the QEPS-model. AgeP5=onset of pubertal growth.

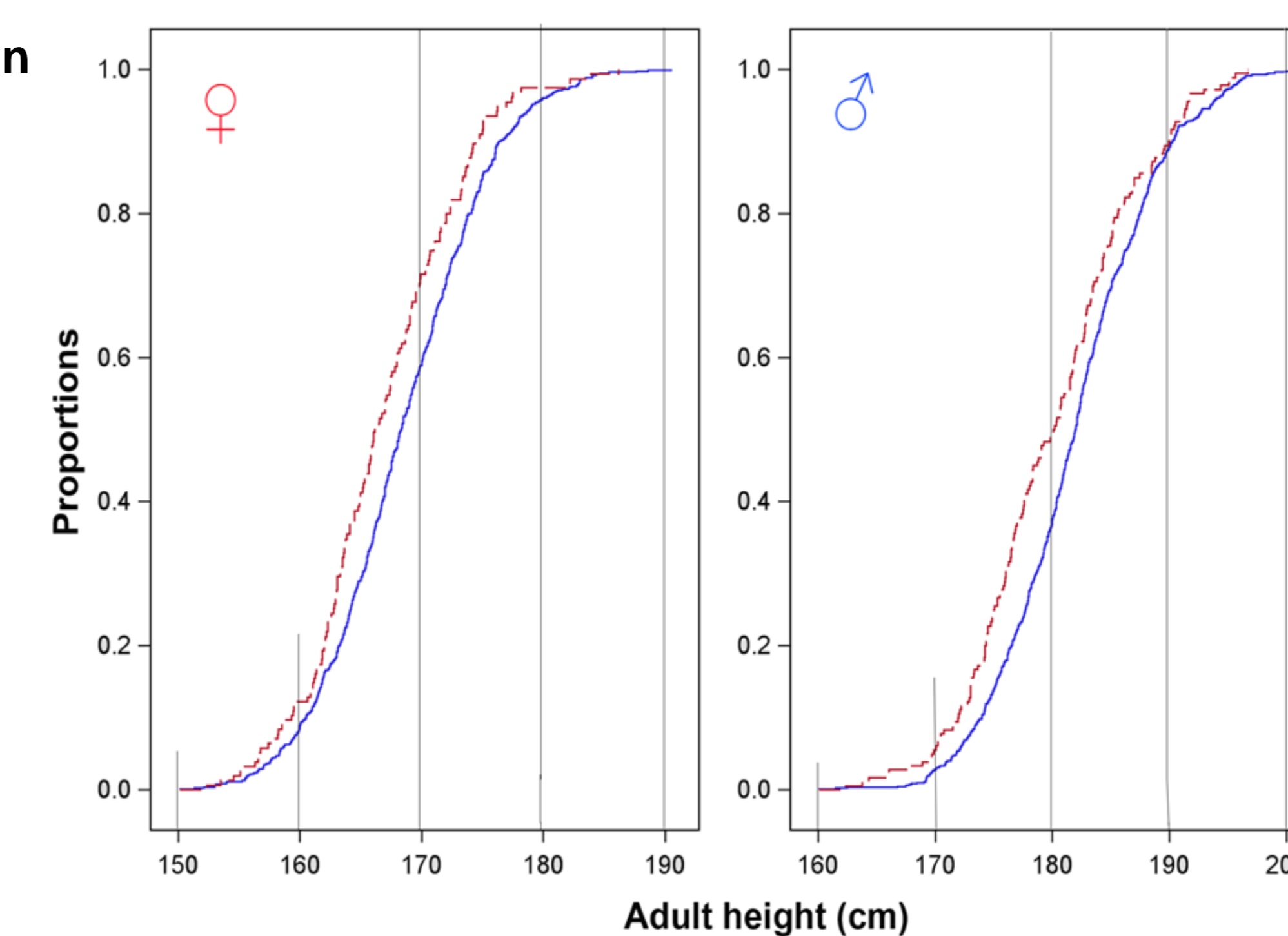


Figure 2. Adult height of individuals born in 1990 to non-smoking (blue) and smoking (red) mothers.

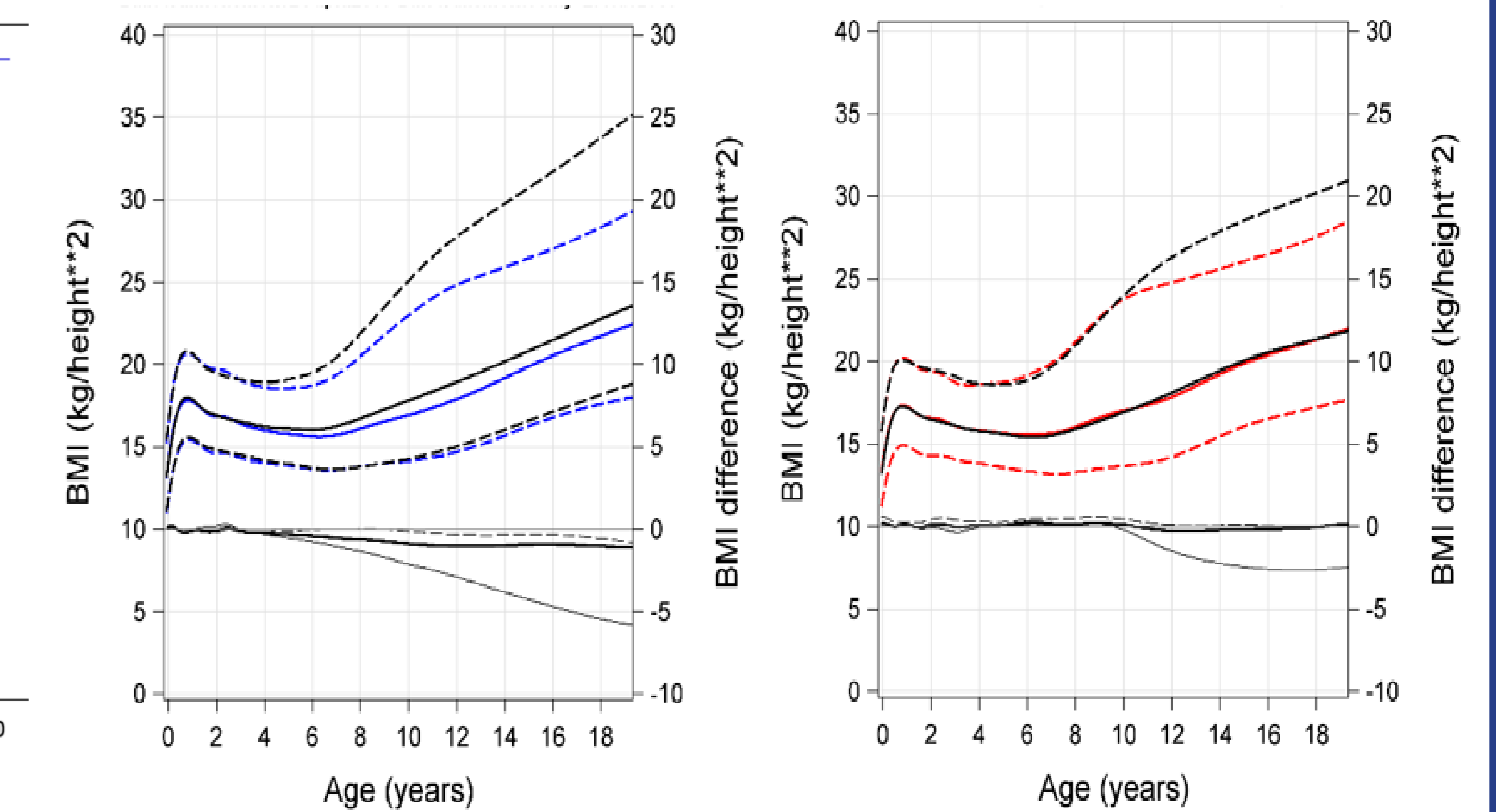


Figure 3. BMI of individuals born in 1990 to non-smoking mothers (blue boys, red girls) and smoking mothers (black).

AIM

The aim of this study was to investigate the impact of smoking in the Swedish reference population for new reference for height, weight, and BMI, the GrowUp1990Gothenburg cohort.

MATERIAL & METHODS

The study was based on 1907 healthy individuals (918 girls/989 boys) born at term in Sweden with Nordic parents and longitudinal growth measurements^{3,4,5}.

Of these, 155 girls and 180 boys was born to mothers smoking during pregnancy

Both traditional measures and estimates from the QEPS-growth model were used for comparisons. Analyses of growth patterns were done with the QEPS-growth model^{1,2}.

CONCLUSIONS

Growth and maturation in individuals born to mothers smoking during pregnancy were influenced. These individuals were shorter, lighter at birth and during infancy than those born to non-smoking mothers. As grown up shorter stature and in boys also increased BMI during childhood, findings which stresses maternal smoking as a life risk factor.

Omitting individuals born to mothers smoking during pregnancy will therefore narrow the range of ± 2 SDS. Thus, we recommend omitting individuals to smoking mothers when developing new references for height, weight and BMI^{1,2,3}. Thereby a sharper instrument for detecting abnormal growth will be obtained.

REFERENCES

- Nierop A.F.M, et al. *Modelling individual longitudinal human growth from fetal to adult life – QEPS 1*. J. Theoretical.Biology,406(2016)143–165
- Holmgren A, et al. *Insight into human pubertal growth by applying the QEPS growth model*. BMC.Pediatrics,2017;Apr19;17(1):107
- Albertsson-Wikland K, et al. *A new Swedish reference for total and prepubertal height*. Acta Paediatrica, 2020;109:754-63
- Albertsson-Wikland et al. *Swedish references for weight, weight-for-height and body mass index: The GrowUp 1990 Gothenburg study*. Acta Paediatrica,2021;110:537-548
- Albertsson-Wikland et al. *A new type of pubertal height reference based on growth aligned for onset of pubertal growth*. JPEM, 2020;33(9):1173-1182

Contact: anton.holmgren@regionhalland.se