SUMMARY

Cardiovascular diseases are the number one cause of death globally. Intermediate risk factors for developing cardiovascular diseases are raised blood pressure, raised blood glucose, raised blood lipids and overweight and obesity. Although it is clear that genetic factors and adult lifestyle contribute to the propensity towards obesity and associated conditions, recent findings have pointed out that cardiovascular diseases may originate from prenatal environmental factors resulting in fetal growth restriction and prematurity. In addition, there is convincing evidence for an independent role of faster postnatal growth. Studies addressing the relationship of growth in infancy with future cardiovascular risk factors have shown mixed results. There is therefore confusion about what constitutes optimal infant growth for future cardiovascular health. In contrast, there is consistent evidence for an association between faster childhood growth and future cardiovascular risk factors. It is not clear however, whether the relationship of weight gain to later life cardiovascular risk factors comes from the component of weight gain that is due to linear (skeletal) growth or to soft tissue (lean and fat) growth. Early feeding is an example of potential modifiable factors for the prevention of future cardiovascular diseases, either directly, or through an effect of growth. This thesis focusses on the association of maternal pregnancy health with the offspring’s early growth and on associations of early growth and infant feeding with childhood cardiovascular risk factors. The background of this thesis is further addressed in chapter 1. This chapter also describes the ABCD study in which the studies of this thesis were performed. The ABCD study is a prospective cohort study in which information about pregnancy, birth outcomes, postnatal growth and infant feeding patterns has been included. At age 5, children underwent a health check, including measures of anthropometry, body composition, blood pressure and glucose and lipid biomarkers. In the first part of this thesis, we focus on the association of maternal pregnancy health with the offspring’s early growth. In chapter 2, the relation of maternal hypertension with infant growth is examined. The offspring of women with pre-existing hypertension and pregnancy-induced hypertension are more likely to have faster growth in weight and height during infancy. Part of the demonstrated associations seem to work through a reduction in birth weight and shorter pregnancy duration. Moreover, there appears to be additional weight gain in the offspring of mothers with pre-existing hypertension. We found some indication for a possible attenuating effect of the use of antihypertensive drugs on offspring accelerated growth in weight. In the second part of this thesis, one of the outcome measures was validated. Chapter 3 provides evidence that the Kushner BIA equation for school age children, which is incorporated in the Bodystat system, underestimates fat-free mass. This underestimation is non-systematic which means values cannot simply be converted. Application of a recalibrated equation shows a small non-significant bias. Importantly this bias is systematic, thereby allowing more robust assessment of body composition in (pre)school aged children for use in epidemiological field studies. In the third part of this thesis, we address associations of early growth and infant feeding with childhood cardiovascular risk factors. In chapter 4 we demonstrate that lower birth weight and faster growth after the first month and up to 5 years, in either weight or height, are associated with higher childhood BP. Childhood growth appears to be the most influential period. Breastfeeding for more than 3 months and introduction of complementary feeding after 6 months are associated with lower childhood blood pressure. Chapter 5 describes that lower birth weight is associated
with a less favourable body composition and when faster infant weight gain is caused by faster linear growth, it is associated with a healthier childhood body composition. Breastfeeding for more than 6 months and introduction of complementary feeding after 6 months are associated with a lower childhood fat mass, while they are also associated with smaller height and lower fat-free mass. Chapter 6 provides evidence for an association between faster growth in childhood, in either weight or height, and higher markers of insulin resistance. Lower birth weight has a small association with a more favourable childhood lipid profile and growth in infancy and infant feeding are unrelated to childhood glucose and lipid biomarkers. Chapter 7 is a general discussion with a reflection on the results and methodological considerations including loss to follow up, the observational nature of our study and therefore the inability to attribute causality and the possibility of residual confounding. Furthermore, this chapter makes recommendations for future research and public health practice. In short, it seems reasonable to promote a longer duration of breastfeeding and to recommend avoiding consistent upward crossing of centiles for body weight in infancy and especially in childhood.