Parenting and Home Environment as Targets in Childhood Overweight Prevention: Results From the ChecKid Study
Overweight is a rapidly growing problem worldwide and is associated with a range of health conditions such as type 2 diabetes, cardiovascular disease, and with psychosocial problems and a reduced quality of life. Obesity during childhood is a strong predictor for obesity in adolescence and adulthood and contributes to high medical costs, impaired health and reduced quality of life. These high impact problems could potentially be avoided when overweight and obesity are prevented at an early age. Overweight is caused by a higher energy intake than energy expenditure, resulting in excessive weight gain. Different energy-balance related behaviours are related to childhood overweight and obesity and for practical reasons these behaviours are divided roughly into: dietary that affect energy intake and physical (in)activity behaviours that affect energy expenditure. The underlying mechanism of the energy imbalance is a complex process in which energy-balanced related behaviours are affected by biological predisposition and socio-environmental changes. The local environment, especially for young children, plays an important role in the overweight prevalence and is particularly determined by the home environment (parenting styles and family characteristics) and the community (demographic and societal characteristics). The overall aim of this thesis is to find indications for the prevention of childhood overweight and obesity in the city of Zwolle, especially in the context of the home environment.

Methods
For the analyses in this dissertation, data were used from the ChecKid study, which started in 2006. ChecKid is a dynamic cohort study in which every three years height, weight and waist circumference are measured in 4-13-year-old children. In addition, the parents complete a questionnaire about the children’s nutritional intake, physical (in)activity, the physical and social home environment, opinions on the neighbourhood (for example, safety and hygiene). Every three years a cross-section of all primary school children is made. Therefore, the ChecKid study gives the possibility to investigate cross-sectional trends and relations and also follows children individually over time. In 2006 and 2009 around 80% of the schools agreed to participate. Around 65% (n = 5,219) of the invited parents gave written informed consent in 2006 and 47% (n = 4,590) in 2009. In 2006, both anthropometrical and parental questionnaire data were available for 4,072 children (78% of the children with informed consent) and in 2009, both anthropometrical and parental questionnaire data were available for 3,026 children (70% of the children with informed consent). Most analyses in this dissertation were performed using the ChecKid 2006 dataset; except for chapter 6 for which longitudinal (children measured in 2006 as well as in 2009) data was used. The total number of children with both an anthropometric measurement and a filled in parental questionnaire in both 2006 and 2009 was 1,048.

Neighbourhood and behaviour
In chapter 2, three neighbourhoods with a statistically significantly higher prevalence of childhood overweight than the other neighbourhoods in Zwolle were identified. Additionally,
the relationship between living in these neighbourhoods and energy-balanced related
behaviours was studied. Children living in these neighbourhoods were significantly more
likely to watch TV for more than two hours on weekdays and less likely to have breakfast
on a daily basis and participate in organised sports than children living in the other
neighbourhoods of Zwolle. However, these children were more likely to eat two or more
pieces of fruit on weekend days compared to children living in the other neighbourhoods.
Unhealthy behaviours in combination with socio-economic status only partially explained
the higher rates of overweight and obesity in children living in these neighbourhoods. This
means that probably other aspects (such as, children’s physical and social environment or
social cohesion) might play a role as well.

**Home environment and behaviour**

In chapters 3, 4 and 5, aspects of the home environment associated with specific
energy-related behaviours (TV viewing and computer use, sleep duration, fruit and
vegetables consumption) are described. The first energy-related behaviour that is examined
was screen time (TV viewing and computer use). The results in chapter 3 shows that
young children aged 4-8 years, who view TV more than 1.5 hours per day, are more
often overweight than young children viewing television less. This association cannot be
explained by family characteristics and unhealthy dietary behaviours measured in this
study, suggesting a possible direct relationship between television viewing and childhood
overweight. In contrast, amongst children aged 9-13 years, TV viewing is not associated
with overweight. Computer use is not statistically significantly associated with overweight
in both younger and older children, however relatively few children use the computer in the
ChecKid 2006 study. Important determinants of viewing TV for more than 1.5 hours are:
having more than two television sets in the household, a TV in the child’s bedroom and not
having rules on television viewing. Interestingly enough, more hours of TV viewing does
not compromise the time devoted to playing outside or participation in sports. TV viewing
is associated with shorter sleep duration; children viewing TV more than 1.5 hours more
often slept less than average compared to children viewing less TV.

The focus of chapter 4 is on the association between sleep duration and overweight. An
association between short sleep duration and overweight is found independently of family
characteristics and the intake of sugared drinks and snacks for 4-8 and 9-13-year-old boys
and 9-13-year-old girls. For younger girls a weaker, not statistically significant association
is found. Not surprisingly, a late bedtime is strongly associated with short sleep duration
for all children. Not being active with their caregiver (cycling, sporting going outside in a
forest/park) is associated with shorter sleep duration in younger and older girls and older
boys. Other age- and gender-specific determinants of short sleep duration are: viewing
television during a meal (younger boys and older girls), having a television in the bedroom
(older girls), permission to have candy without asking (younger and older boys) and
eating at least one day per week a take-away meal (older boys). For all children, viewing television or using the computer for more than one hour per day is strongly associated with sleeping fewer hours per night.

In chapter 5, the association between fruit and vegetables consumption and overweight is studied. The results show an association between not eating vegetables on a daily basis and childhood overweight amongst children with a low and middle socio-economic status (SES) background. However, amongst children with a medium SES background the prevalence of not eating vegetables daily is similar to those with a low SES background. The association between not eating vegetables daily and overweight is strongest within the medium SES group. A positive association between fruit intake and childhood overweight is found in children with a high SES background, which might be partly explained by a higher total energy intake of these children, because they eat the same amount of snacks as children with a lower fruit intake. Within the low and medium SES group, determinants of not eating vegetables daily are: eating at the table less than seven days per week, eating a take-away meal for one or more days per week, eating a home cooked meal less than six days per week and parent and children cooking together for less than five days per week. Additionally, amongst the medium SES group, permission to take candy without asking was associated with not eating vegetables daily.

Behaviours and weight

Chapter 6 showed that within a period of three years (2006-2009) various energy-balance related behaviours, especially vegetables, fruit consumption, snack consumption and (game) computer use, change unfavourably in primary school children. Children with a low SES background are more often overweight, have a higher increase in BMI, and show more unhealthy energy-related behaviours and more unfavourable changes in lifestyle behaviours than children with a medium or high SES background. More than one hour of TV viewing and more than thirty minutes of computer use in both years, are associated with an increase in BMI. In addition, an unfavourable change in breakfast consumption (i.e. daily breakfast consumption in 2006, but not in 2009) and sport participation, are associated with an increase in BMI. Adding together the number of adverse behaviours at baseline and the number of adverse changes in behaviours between 2006 and 2009 shows that a higher total score is associated with a higher increase in BMI and higher odds of being overweight in 2009.

In chapter 7 of this dissertation the main findings are being summarised and discussed. The methodological strengths and limitations that should be taken into consideration when interpreting the results in this dissertation are discussed. The main findings were translated into implications and recommendations for clinical practice, public health policy, professional education and research. One of the conclusions is
that the neighbourhood is an important setting for a targeted approach to prevent overweight. Professionals should pay attention to these specific neighbourhoods and pay more attention to a favourable and healthy environment of children. Also to children who are not (yet) overweight. It appears that a lot of children in these neighbourhoods (overweight and normal weight) have unhealthy energy-balance related behaviours. Within the neighbourhoods, schools and families are important settings in the environment of (especially young) children, so this might be a good location where tailored prevention can take place. The findings in this dissertation show that the home environment is important in the prevention of childhood overweight. The identified determinants in the home can be summarized in four main topics that seem important in the prevention of childhood overweight: the physical environment (TVs in the household and in the bedroom), having rules (regarding TV viewing, eating candy, having a regular bedtime), having structure and routine in the household (eating at the table, not eating a takeaway meal, but a home cooked meal) and parents and children doing things together (going outside, sporting, cooking together). Parents are therefore an important focus for interventions and should be supported by professionals and in policy for creating or maintaining a favourable and healthy home environment.