Introduction

Childhood overweight and obesity are a major public health problem given their high prevalence, short-term and long-term health and social consequences. Over the past few decades, childhood overweight and obesity have become increasingly prevalent around the world. Worldwide, approximately 41 million children under the age of five were overweight or obese in 2014. In the Netherlands, overweight and obesity in children have more than doubled since 1980. In 2009, the prevalence of overweight and obese children was 12.8% and 1.8% respectively for boys and 14.6% and 2.2% respectively for girls (2-21 years). Recent data show the prevalence of childhood overweight and obesity appeared to stabilize in western countries. Overweight and obesity are a major social problem resulting in mental, physical, and social health problems with an increased risk of multiple medical co-morbidities and adult health problems. Furthermore, childhood obesity has been shown to have a high likelihood of persisting into adolescence and adulthood.

The present thesis consists of two parts. The first part describes the steps of the implementation of the integrated health care standard for overweight and obese children, and the role of the general practitioner (GP) within this care. The second part describes epidemiological research on the influence of several environmental factors on childhood overweight and obesity. This introduction provides a local overview of the constraints of the current care for overweight and obesity, followed by an overview of the most important international guidelines. Following this, the steps of implementing the guidelines are described, followed by the aims of the first part of this thesis. Next, individual and contextual determinants of childhood overweight and obesity are described based on an ecological model of health behaviors, followed by the aims of the second part of the thesis. Finally, an outline of the thesis will be given.

PART ONE

Constraints of current care

Current care for childhood obesity seems to be constrained by a number of factors. Firstly, research showed that parents and children did not experience overweight or obesity as a major health problem. Secondly, health care professionals did not signal overweight or obesity in time. Thirdly, when overweight or obesity was signaled and referred, the referral was often inadequate, or insufficient for the child’s situation. Fourthly, care was delivered by a variety of health care professionals and was fragmented, as coordination between health care providers was deficient. Fifthly, obese children and their parents experienced uncertainty in the care process due to a lack of control and of continuity of care. Finally, the health care risks for obese children remained unidentified and are insufficiently monitored.

(International) guidelines

European guidelines acknowledged the need for a multidisciplinary approach to the primary and secondary prevention of chronic diseases, including obesity. The (international) recommended treatment of childhood obesity is a family behavioral lifestyle intervention including dietary and physical activity advice, and a family-targeted approach in children under 12 years of age. While these clinical guidelines describe the recommended care in some detail, including how, when and by whom care should be provided, they don’t specify how this multidisciplinary care should be organized. In its effort to systematically organize the services provided to, and treatment of, children who are overweight or obese on an aggregate level, the Partnership Obesity Netherlands (PON) realized the National Integrated Health Care Standard for Obesity. The PON is a collaboration between 18 partners, consisting of national organizations of health care providers, health insurance companies and patient organizations.

In November 2010, the first National Integrated Health Care Standard for Obesity was published. This integrated health care standard highlights the importance of a central care coordinator whose role it is to oversee the multidisciplinary care process consisting of five key components: identification; diagnosis and risk stratification; individual health care plan and treatment; continuity of care; and multidisciplinary approach. The internationally used cut points for different degrees of obesity were used in the development and dissemination of the integrated health care standard in 2010.

The first step is to identify a child who is overweight or obese. The second step is the diagnostic procedure that includes the differentiation into different levels of obesity for children and adolescents. The weight-related health risk (GGR) needs to be defined in the diagnostic procedure to determine the required level of care. The GGR indicates the extent to which the health risk is increased (see Table 1).

Table 1: Classification of weight-related health risks (GGR) for children and adolescents based on the degree of overweight and obesity and (risk factors for) cardiovascular disease and type 2 diabetes mellitus

<table>
<thead>
<tr>
<th>BMI kg/m²</th>
<th>No risk factors of comorbidities</th>
<th>Risk factors of comorbidities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overweight</td>
<td>Mildly increased risk</td>
<td>Moderately increased risk</td>
</tr>
<tr>
<td>Obesity grade I</td>
<td>Moderately increased risk</td>
<td>Severely increased risk</td>
</tr>
<tr>
<td>Obesity grade II</td>
<td>Severely increased risk</td>
<td>Very severely increased risk</td>
</tr>
<tr>
<td>Obesity grade III</td>
<td>Very severely increased risk</td>
<td>Very severely increased risk</td>
</tr>
</tbody>
</table>

The cut points in the table defined as overweight and obesity grade I are based on international Body Mass Index (BMI) percentiles varying with age and gender, corresponding to BMI 25 and 30 kg/m² in adults. The cut points defined as obesity grade II and III are based on BMI percentiles varying with age and gender from the National Growth Study in 1988, corresponding to BMI 35 and 40 kg/m² in adults.

Once the GGR has been determined, physical and psychological co-morbidity and multi-morbidity should be noted as well as additional personal information that plays a role in the child’s health, which may guide the contents and type of intervention. The GGR, and any other co-morbidity or multi-morbidity, form the basis for the third step to set up an individual care plan. For children, it is important that the lifestyle habits (diet, physical activity, sedentary behavior) of the whole family, and the parents’ knowledge, point of view, and potential are taken into account. Parenting and the child’s physical and psychological development should also be investigated. The fourth step is to match child and treatment as optimally as possible.
According to the integrated health care standard principles, the majority of overweight and obese children can be managed by GPs, provided that a multidisciplinary team supporting lifestyle changes in children is available. Indeed, in many European countries, the GP plays an important role in identifying obesity in children and in subsequent interventions. While the integrated health care standard principles specify multidisciplinary care of obese children, their feasibility in current practice has never been investigated.

Implementation

It is well established that dissemination of guidelines alone is unlikely to result in effective implementation in practice, since guidelines are generally not implemented into the daily practices of the healthcare setting. Many factors at different levels (health care professional, internal and external organization) tailored to specific settings and target groups can both inhibit or enhance the uptake of an innovation in clinical practice. For example, the rules and regulations of a practice, the support healthcare professionals receive from colleagues, and also factors that are related to the guideline itself. Therefore, more active strategies have been recommended. A way to facilitate the implementation of a guideline is by developing an implementation strategy such as the change model by Grol and Wensing. This model describes six steps of the implementation process (Figure 1). The first step is the reason for an implementation process, being the introduction of the integral health care standard for obese children and the in the literature described constraints for the care of obese children. The second step is the development of concrete targets for improvement of change, being the integral health care standard recommendations. The third step is the analysis of performance, target group, and setting (i.e., the context within which changes in the routines take place, characteristics of the target group, stimulating factors and barriers, and the aspects of performance). The fourth, fifth, and sixth steps, respectively, are the development of strategies and measures to change practice, the development and execution of the implementation plan, and the evaluation and, where necessary, adaptations to the plan. According to the implementation of change model, it is important to have an overview of the people and organisations that play a role in the implementation. To increase a change in the health care process we implemented these strategies at different levels (i.e., the level of the health care professional, external organizational aspects concerning the health care professional and the target patient group).

![Figure 1: Implementation of change model by Grol and Wensing](image)

Objectives of the first part:

In the first part of the thesis we had the following objectives:

1. To identify barriers and facilitators for parents of overweight or obese children during and after a lifestyle intervention;
2. To identify barriers and facilitators for health care professionals in the care for overweight or obese children in their care;
3. To investigate barriers and facilitators in the care for childhood overweight and obesity after the implementation of the integrated health care standard.

PART TWO

Individual and contextual determinants

The cause of becoming overweight or obese can simply be described as an imbalance of energy intake and energy expenditure. Many individual and environmental determinants associated with childhood obesity have been identified. Genetic and biological factors are examples of individual determinants. Factors that influence the obesogenic environment include political and
commercial factors (e.g. fiscal policies and food systems), the built environment (e.g. availability of healthy foods, infrastructure and opportunities for physical activity in the neighborhood), social norms (e.g. cultural norms regarding the feeding of children and the status associated with higher body mass in some population groups), and family environment (parental nutrition knowledge and behaviors, family eating behaviors)\(^{10}\). Therefore, prevention of childhood obesity should focus not only on the individual, but also on the environment one lives in. The social-ecological framework by Birch and Ventura used for the etiology of childhood overweight shows that a child's weight status is influenced by the intake and expenditure patterns of that child, but these patterns are embedded within the larger ecology of a child's family, community, and demographic characteristics (Figure 2)\(^{10}\). In this model, the child's personal characteristics and individual risk factors are nested within the family context, incorporating parenting style and other family characteristics, which in turn are nested within the community and wider social context. Each layer of the ecological model can both influence and interact with family and child characteristics to facilitate or inhibit dietary and physical activity patterns. For example, participation in outdoor activities is shaped not only by parenting orientations but also by community safety (e.g. crime rates), access to recreational facilities such as parks and playgrounds, and the quality and condition of those amenities.

![Community and Demographics Factors](image)

**Figure 2:** An ecological model for the etiology of childhood overweight by Birch & Ventura\(^{10}\)

Objectives of the second part:

1. To explore the influence of environmental factors on childhood overweight and obesity, cross-sectionally and longitudinally.

Outline of thesis

Part 2 expounds the components of the implementation of the integrated health care standard, starting in chapter 2 with a qualitative study describing the perspectives of obese children and their parents on lifestyle behavior change. In chapter 3, a mixed methods approach describes the health care provider’s perceived barriers to and need for the implementation of National Integrated Health Care Standard on childhood obesity in the Netherlands. Chapter 4 focuses on the lessons learned of the implementation of the National Integrated Health Care Standard. In part two of this thesis, the influence of the environment on childhood overweight and obesity is described. In chapter 5, we aimed to assess the influence of the amount of green space, accessibility to a garden, and the condition of the neighborhood measured at ages 3-5 years on being overweight or obese at age 7. In chapter 6, we assessed the longitudinal association between environment and body mass index (BMI) for children across the ages of 3-11 years and investigated if change in environment affected BMI. This thesis closes with a general discussion of the main findings and recommendations for practice and research, which are presented in chapter 7.
